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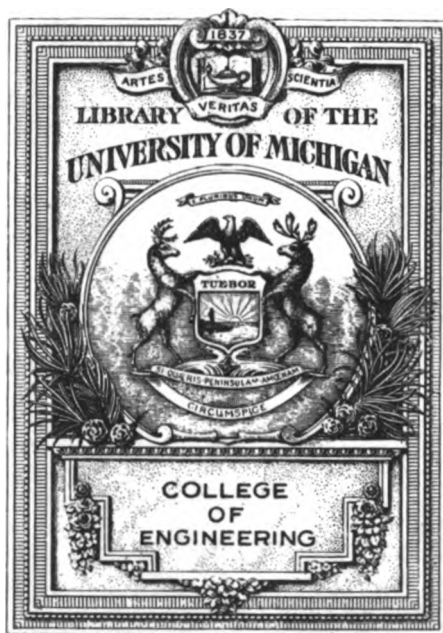
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# Automotive industries











# **AUTOMOTIVE INDUSTRIES**

*The* **AUTOMOBILE**

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Nos. 1 TO 26

## Index to Volume XXXIX

### ASSOCIATIONS

A. A. A. Sanctions Chicago Speedway.....	164
Air Service Clubs Assn. Formed.....	655
American Manufacturers Export Assn.....	768
American Road Builders Assn. Convention.....	853
American Tire Filler Industry Formed.....	655
American Tractor Assn. Meeting.....	895
American Tractor Assn. Membership List.....	895
Automotive Electric to Meet.....	34
Automotive Equipment Assn. New Name of N. A. A. A. J.....	1070
Automotive Wheel Manufacturers Assn. Formed.....	382
Automotive Wheel Mfr. Assn. Elects R. H. West.....	607
Automotive Wheel Assn. Convenes.....	697
Exiles, The, Headed by Geo. M. Graham.....	694
Federal Highways Commission Proposed.....	1018
Ford Tractor Assn. Formed.....	167
Fordson Distributors Assn. of America.....	775
Foreign Trade Convention Meets.....	332
Gear Manufacturers Assn. Meets.....	527
Highways Traffic Assn. National in Scope.....	856
Mid-West Implement Dealers' Assn. Conven- tion.....	853
Midwest Retail Implement Dealers Assn.....	816
M. A. M. A. Closes Washington Office.....	74
M. A. M. A. to Support Airplane Show.....	163
M. A. M. A. Washington Office to Close.....	31
M. A. M. A. Has War Adjustment Committee.....	1076
Motor Truck Association of America.....	610
Motor Truck Assn. Has Dealer Division.....	1071
Motor Truck Club Changes Name.....	610
National Advisory Committee for Aeronautics Meeting.....	688
N. A. A. A. J. Exhibit Abandoned.....	472
N. A. A. A. J. Fall Convention Abandoned.....	512
N. A. A. A. J. Directors to Meet.....	944
N. A. A. A. J. Changed to A. E. Asso.....	1070
Natl. Assn. Motor Truck Sales Mgrs. Meets.....	738
National Assn. Purchasing Agents Will Con- vene.....	434
N. A. C. C. Endorses N. A. D. A. Work.....	76
N. A. C. C. Working for Rural Express.....	125
N. A. D. A. Discusses Car Curtailment with War Industries Board.....	295
N. A. D. A. Getting Many New Members.....	34
N. A. D. A. Work Endorsed by N. A. C. C.....	76
National Assn. of Purchasing Agents, Milwau- kee Branch.....	337
National Assn. Purchasing Agents Meet.....	532
National Assn. Purchasing Agents Elects Ranken.....	607
N. A. P. A. Branch in Kansas City.....	1067
Natl. Federation of Implement Dealers' Meet- ing.....	684
National Implement & Vehicle Assn. Meets.....	735
National Safety Council Meets at St. Louis.....	515
National Safety Council Holds Congress.....	521
Ohio Automobile Accessory Jobbers Assn.....	—
Portland Cement Assn.'s Dinner.....	939

### SOCIETY OF AUTOMOTIVE ENGINEERS

S. A. E. Air Cleaner Discussion at Twin City	652
S. A. E. Meeting January 12-14.....	891
S. A. E. Section Formed in Washington.....	848
Fall Meeting of Detroit Section.....	975
Minneapolis Section Discusses Tractor Hitch- ing.....	1024

State Highways Official Assn.....	1018
Visits Standard Aircraft Plant.....	1066
Washington Section Criticizes Army Truck Methods.....	1018

### BOOK REVIEWS

Automobile After the War.....	1057
Automotive Magneto Ignition, M. E. Toepel.....	371
Ball Bearing Manual.....	54
Cleveland Worm & Gear Co.'s Worm Gear Drive Catalog.....	797
Electrical Equipment of the Motor Car.....	837
Gasoline Automobile, Vol. III.....	1003

### CONDITIONS

Aircraft Spruce Industry, Development of the.....	1038
Airplane Fabric, History of Cotton.....	1013
Australian Gas Engine Market.....	421
Automobile After the War.....	1057
Castor Bean Industry Revived.....	211
Conditions Entirely Unsettled.....	164
Conservation Investigation of Wisconsin Deal- ers.....	296
Conversion Cooperation Assured.....	863
Corporations Cannot Develop Business.....	901
Cotton Fabric Sufficient for Airplanes.....	344
Cotton Fabric, History of Airplane.....	1013
Employment Program.....	643
Employment Schools by Government.....	382
Employment Service Bureau for Women, Gov- ernment.....	484
Employment for All After War.....	856
Engine Market in Australia, Gas.....	421
Export Trade and Labor Problem After War.....	234
History of Aircraft Production.....	968
Implement Dealers Losing Tractor Sales.....	684
Iowa Tractor Developments.....	663
Labor Allotment, Unskilled.....	252
Labor in Michigan Short 11,000 Men.....	437
Labor Conditions Investigated.....	939
Labor Leaving Passenger Car Factories.....	513
Labor Problem and Export Trade After War.....	234
Labor Shortage Continues.....	119
Labor Shortage Closes War Plants.....	384
Labor Situation Improves, Skilled.....	336
Michigan Labor Shortage Still Critical.....	687
Pontiac Centralizes Labor Employment.....	53
Price Cut Not Likely.....	939
Spruce Industry, Development of the.....	1038
Steel Controlled by Government in Canada.....	433
Time Required for Plants to Come Back.....	848
Tractor Activities in Illinois.....	869
Tractor Activities in Northern Ohio.....	619
Tractor Activities in Twin Cities.....	702
Truck Sales Good on Seaboards.....	123
Wages Increase in Automobile Industry.....	117
Wages Increase; Workers Decrease.....	897
Wages to Be Based on Work, Not Sex.....	893
Working Conditions Service Established.....	814
War Work Gradually Dropped by Makers.....	1065

### CONTESTS

De Palma Wins Five Races at Sheephead Bay	337
De Palma Wins at Chicago Speedway.....	207
500-Mile Race May 30.....	1021

### DESCRIPTIONS

#### Accessories

Aircraft Speed Meter.....	19
Allen Self-Locking Differential.....	1099
Axle for Four-Wheel Steer Trailer.....	196
Bennett Air Washer.....	448
Carbo Steel Deck for Loading.....	783
Cleveland National Spring Head Tool holder.....	431
Clutch, Golden, Belknap & Swartz.....	96
Clutch and Clutch Pulley.....	760
Cost Keeping System.....	56
Dictograph, Vanity.....	27
Dixie Standard Aircraft Magnetos.....	954
Door Lock, Ottinger.....	91
Elastic Limit Recorder.....	287
Entz Transmission on Fifth Avenue Bds.....	373
Fafnir Double Row Bearing.....	421
Foot-Strite Tractor Transmission.....	795
Fortney Measuring Wires.....	1014
Fuller Tractor Transmission.....	1014
Golden, Belknap & Swartz Plate Clutch.....	96
Guide Tractor Lamp.....	—
Hoists, Electric, Types and Their Use.....	199
Horn and Lamp Combination.....	118
Lebby Searchlight.....	427
Liberty Engine Electrical System.....	1089
Lubricator, McCormick Spring.....	370
Muffler, Vacuum.....	373
Oiling Car by Single-feed System.....	719
Ottinger Anti-Rattling Door Lock.....	91
Owen Automatic Lighting Power Unit.....	806
Recorder, Elastic Limit.....	287
Redden Universal Truck Attachment.....	322
Speedometer, Stewart.....	27
Spring Wheel, New Design.....	199
Stewart Truck Speedometer.....	27
Stewart Vacuum System.....	27
Stromberg Electric Time Clock.....	56
Tester, Permanent Magneto.....	505
Track for Tractors, Improved Chain.....	280
Transmission, Nuttall Tractor.....	506
Twin Disk Clutch Co. Clutch and Clutch Pulley.....	760
Vacuum System, Stewart.....	27
Vanity Dictograph.....	27
Warmer for Aviators, Foot.....	365
Wheel, New Design of Spring.....	199
Wheels, Two New Demountable.....	461
Willard Tractor Battery.....	837
Wismack American Gage Blocks.....	965

#### Airplanes

A. E. G. Twin-Engined.....	63
Ago Austrian Flying Boat.....	66
Armstrong-Whitworth.....	66
Aviatik.....	60
Avro Training Machine.....	707
Breguet Bomber.....	61
Breguet Reconnaissance.....	61
Bristol Battleplane.....	62
Bristol Scout Model D.....	16
Bristol Two-seater.....	548
Bristol Tractor Biplane.....	62
Bristol Tractor Monoplane.....	15
Burgess U-2 Flying Boat.....	66
Caproni Biplane Equipped with Liberty Engine.....	335
Caproni Triplane with Three Engines.....	65
Caudron.....	64
De Havilland IV Biplane.....	181
De Havilland 4 Features.....	671
De Havilland Single-seater Scout.....	627
Farman F-40.....	63



F. B. A. Flying Boat.....	66	Aircraft Co-operation.....	158	Bus Transportation for Ford Employees.....	200
F E 2-B Pusher Biplane.....	62	Aircraft Experience on Car Design.....	810	Charts, Operators' Progress.....	859
Friedrichshafen Bombing Plane.....	19	Aircraft Inventor Handicaps.....	288	Confidence Between Employer and Employee, Lack of, Tipper.....	625
German, New Giant.....	238	Aircraft Report Unfair to Industry.....	377	Curtiss Training Women.....	362
Halberstadt Single-Seater.....	60	Aircraft Waste.....	811	Dayton Engineering Laboratories Install Safety Equipment for Women.....	150
Handley Page.....	65	Airplane Industry Establishments.....	683	Department of Labor Standardizes Working Conditions.....	814
Langley, Biographic Sketch I.....	660	Americanization From Practical Point of View.....	469	Efficiency, Effect of Long Hours on.....	89
Langley, Biographic Sketch II.....	714	Anti-Friction Crankshaft Bearings.....	1062	Efficiency of Male and Female Operatives, Relative.....	537
Langley, Biographic Sketch III.....	761	Australia, Do We Want to Sell Cars in.....	332	Employee Group Insurance.....	94
Langley, Biographic Sketch IV.....	798	Brake-Shaft Bushing Standardization.....	972	Employment Centralized in Pontiac.....	53
Lohner Flying Boat.....	66	Cars in Australia, Do We Want to Sell.....	332	Employment Relations Handled Without Outside Help.....	722
L. V. G.....	62	Cast Connecting Rods.....	1108	Factors in Causation of Industrial Accidents.....	916
Macchi Flying Boat.....	66	Catering to the New Demand.....	28	Female Labor Problems.....	57
Martinsyde Scout.....	60	Civilian Soldier's Task, \$6,000,000,000.....	553	Freight Car Loading Improved.....	36
Morane Parasol.....	16	Clerical Work and Female Labor.....	158	Freight Car Loading Methods.....	50
Morane Three-Place.....	16	Colleges on War Service Basis.....	511	General Motors Truck Co. Prepares Men for War.....	374
Pfalz Single-Seater Scout.....	52	Commercialism in the Wrong Place.....	973	Girl Trained for Drafting Room.....	235
Pfalz Single-Seater.....	407	Convincing Short Haul Argument.....	159	Hours and Wages of Labor.....	419
Pfalz Single-Seater II.....	462	Cultivators, Motor-Propelled.....	245	Ignition Plant Rest Room.....	191
Pfalz Single-Seater III.....	503	Do Not Force the Issue.....	376	Incentive Needed by Industrial Worker.....	582
Pfalz Single-Seater IV.....	549	Double vs. Single Valves.....	1063	Industrial Plans, British Pro-War.....	239
Pfalz Single-Seater Fighter V.....	592	Dynamometers for Airplane Testing.....	115	Labor the Next Great Problem.....	873
Pemilio.....	16	Eight-Hour Day as a Wage Basis.....	594	Labor Not a Commodity.....	912
Roland Single-Seater Fighter.....	267	Employer's Responsibility.....	552	Labor Problems Solved by Manufacturing Diffusion.....	281
Roland Two-Seater.....	63	Employment Department, The.....	469	Labor Representatives Lack Power.....	835
Royal Aircraft Factory Products.....	236	Engine Cooling, Tractor.....	1017	Labor School Established in Chicago.....	686
Rumpler C-4.....	60	Engines, Sixteen Cylinder.....	468	Labor Selection Cuts Turnover, Intelligent.....	936
Rumpler Two-Seater.....	62	Engineering Education Reform.....	846	Labor Surveys Monthly.....	686
Rumpler Two-Seater Biplane.....	962	Engineering Standardization Future.....	1016	Labor Turnover, Keeping Track of.....	445
S. E. 5 A Fighting Plane.....	251	England's Dope Scandal.....	429	Labor, Wages and Hours of.....	419
S. E. 5 A.....	61	Export Opportunity.....	888	Living Conditions to Be Examined.....	688
S. E. 5 A Single-Seater.....	315	Farm Implement Designs.....	115	Loading of Freight Cars.....	50
S. I. A. Two-Place Combat.....	63	Farm Lighting Outfits.....	510	Long Hours, Effect of, on Industrial Efficiency.....	89
Sopwith "Camel".....	790	Fool-Proofing the Tractor Engine.....	724	Manufacturing Diffusion to Solve Industrial Problems.....	281
Sopwith Dolphin Equipped with Hispano Engine.....	225	Foreign Recognition for Liberty Engine.....	203	Men Prepared for War Tasks.....	374
Sopwith "Hippo" Two-Seater Fighter.....	707	Glare Control.....	889	Morgan & Wright Employ More Women.....	92
Spad Pursuit Biplane.....	17	Goose, Killing the.....	333	National Pressed Steel Plant.....	59
Sturtevant Scout.....	61	Heels.....	429	Norton Grinding Co. School for Workers.....	5
Spad Single-seater Tractor Scout.....	706	Industrial Demobilization.....	889	Organization for Small Establishments.....	1083
Thomas Morse S 4 C.....	17	Industrial Trucks in Manufacturing Plants.....	29	Pension Plan for Employees.....	608
Vickers ES-1.....	61	Internal Combustion Engine Improvements.....	725	Plans, British Post-War Industrial.....	239
Vickers FB-14 Reconnaissance Biplane.....	706	Inventor's Opportunity.....	1108	Rest Rooms in an Ignition Plant.....	191
Voisin Bomber.....	65	Italy Stages Automotive Exposition.....	725	Schools Meeting Needs, Vestibule.....	385
		Killing the Goose.....	333	Schools for Employment Mgr. by Government.....	382
		Labor Turnover.....	28	Selection, Training and Supervision of Women Workers.....	318
		Law Requirements Not Enough.....	511	Shell Manufacture, Converting Assembling Room for.....	156
		Lessons Learned From a 100-Hour Tractor Test.....	245	Skilled Workers, Making of.....	5
		Let's Save Our Number Plate Steel.....	114	Supervision, Training and Selection of Women Workers.....	318
		Liberty Bonds.....	595	Teaching by Intensive Methods.....	534
		Maintain Americanism.....	973	Training Can't Be Done, Where Shop.....	544
		Maybach Engine Article.....	810	Training Departments for Aircraft Factories.....	892
		National Shows Suggestion.....	289	Training and Dilution of Service.....	512
		Necessities of Reconstruction Are at Hand.....	847	Training, Selection and Supervision of Women Workers.....	318
		Notch Bar Test Value Questioned.....	202	Training 150 Operators Per Week.....	277
		Oil Cooling of Kerosene Engine.....	724	Training Women in Aircraft Plant.....	362
		Outlook for Tractor Exports.....	846	Transporting Ford Employees.....	200
		Parachutes for Airplanes.....	594	Turnover, Keeping Track of Labor.....	445
		Passenger Car and Truck, Case of the.....	203	Unproductive Worker, Status of the.....	1045
		Post-War Model.....	930	Wages and Hours of Labor.....	419
		Price Adjustment.....	931	War Labor Policies Board Establishes Standards.....	770
		Production Value of Employees.....	68	Welfare Work in a Rubber Plant.....	413
		Propellers, Super-Induction and Variable Pitch.....	244	Which Side Are You On?.....	669
		Quality in Tractor Construction.....	638	Whitman & Barnes Establishes Pension Plan.....	608
		Quenching Media.....	158	Women Capable of Foundry Work.....	687
		Rearing of Tractors.....	767	Women Employed After Installation of Safety Equipment.....	150
		Readjustment.....	1062	Women Industrial Workers in France.....	411
		Recognition From Abroad for Liberty Engine.....	203	Women, More, Employed by Improved Equipment.....	92
		Reconstruction.....	888	Women, Rules for Employing.....	120
		Reconstruction Necessities Are at Hand.....	847	Women Trained in Aircraft Plant.....	362
		Reform in Engineering Education.....	846	Women Workers, Demand and Supply.....	490
		Research Work Encouraged.....	766	Women Workers, Selection, Training and Supervision.....	318
		Sales Representatives, Tractor.....	552	Women Workers Must Be Taught to Eat Properly.....	608
		Shortening the Power Plant.....	1109	Women Workers' Standards.....	770
		Show Abandonment, National.....	930	Workers, Training of, in School.....	5
		The Spirit Maketh Alive.....	1017	Working Conditions Standardized.....	814
		Standardizing Tractor Parts.....	288		
		Test, Value of Notch Bar, Questioned.....	202		
		Things That Have Hurt.....	244		
		Time Element in Industrial Development.....	428		
		Tractor Axles, Specialized Manufacture of.....	429		
		Tractor Curtailment Effects.....	683		
		Tractor Export Outlook.....	846		
		Tractor Industry Outlook.....	972		
		Tractor "Rearing".....	767		
		Tractor Seat, The.....	376		
		Tractor Service.....	766		
		Tractor Sizes.....	767		
		Tractor Standards Urgently Needed.....	510		
		Tractor Test, Lessons Learned from a 100-Hour.....	245		
		Transatlantic Flight.....	202		
		Truck and Case of the Passenger Car, Care of the.....	203		
		Truck Curtailment, Why.....	638		
		Unsprung Weight Should Be Minimized, Why.....	428		
		Vestibule School and Shop Training.....	68		
		War Truck Repairshops.....	1063		
		War Work and Commercial Work.....	114		

## EDITORIAL

Acetylene Welding, Skilled.....	468
Advertised Tractor Performances.....	639
Aerial Mail Service Extension.....	766

## EMPLOYMENT EFFICIENCY

Accidents in Cadillac Plants Lessened.....	673
Accidents, Factors in Causation of Industrial.....	916
Accuracy Training Most Rigorous Test.....	615
Agreement vs. Bargaining.....	784
Airplane Repair Trouble Shooters.....	642
Assembling Room Converted for Shell Manufacture.....	156
Bargaining Outside or Inside, Tipper.....	712
Bargaining vs. Agreement.....	784
British Post-War Industrial Plans.....	239

## EXPORT

May.....	77
June.....	248
July.....	274
August.....	648
September.....	816
October.....	1112
Canada Affected by U. S. Export Restrictions.....	472
Canadian Exports Need Licenses.....	75
Cars and Trucks for Six Years.....	982
Credit in Export Trade.....	49
Denmark Exports Announced.....	380
Denmark Shipments Allowed.....	560
Detroit District Exports High for June.....	291
Detroit Establishes Record in August.....	685
Export Commodity List Revised.....	780
Export Commodities to Mexico Allotted.....	893
Export Commodities Removed from Conservation List.....	1071
Export Conservation List of Commodities.....	561

Exports Controlled by War Industries Board.	561
Export Licenses, New, Rules for.	74
Export Products List Revised.	978
Export Regulations, New.	122
Export Restrictions Nearly Abolished.	1071
Export Tax Elimination Likely.	813
Exports Not to Be Taxed.	73
Exportation of Second-Hand Articles.	778
Gasoline, April.	30
Holland Exports Announced.	380
Latin American Good Automotive Market.	606
Latin America, August Exports to.	649
Latin America, September to.	850
Latin American Exports for Three Years.	1032
License Plan Simplified.	641
License Regulations, New.	122
Licenses for Exports Under New Rules.	74
Licenses for Export Still Good.	901
Licenses Restricted.	473
Mail Export Rates, New.	740
New York, May.	125
New York Export Figures Improve.	292
New York Exports Drop Slightly.	474
New York for September.	817
New York Shows Great Falling Off.	1021
Norway Exports Restricted.	436
October.	1112
Oil Exports for August.	601
Oil From Tampico.	938
Petroleum Products Exports.	774
Plumbago Ceylon Output Affected by American Import Restrictions.	380
Regulations Modified.	249
Regulations Revised.	598
Regulations Modified.	938
Regulations Restrict Licenses, New Export.	473
Restrictions Affect Canada.	472
South American Export Rules, New.	850
Spanish Duty on Cars Damaged.	1071
Statistics Reclassified.	1112
Tax, None, on Exports.	73
Tin Import Licenses Revoked.	775
Tin Plate Exports Regulated.	383
Truck Exports Small, July.	520
Truck Exports 95% Increase for August.	648

## FOREIGN

Argentina Has Good Prospects.	899
Argentine Patent and Trade Mark Laws.	192
Australian Automobile and Motorcycle Census.	936
Australian Car Demand Excellent.	729
Australian Gas Engine Market.	421
Australian Import Rules Modified.	1021
Australian Tractor Sale Prospects.	415
Australian Zinc for England.	36
Aviation Development in England, Commercial.	1064
Aviation, Commercial, for Foreign Trade.	87
Belgian Industry to Be Reconstructed.	42
Bellem Wins French Kerosene Tests.	792
Brazil to Have Air Service.	1070
Brit. Motor Mfrs. Elect President.	336
Brown, Albert, President of Brit. Motor Mfr.	336
Buenos Ayres Overland Organization.	79
Burma Mineral Output.	934
Canada Admits Tractor Radiators.	728
Canada Adopts Gasoline Regulations.	737
Canada Controls Steel.	433
Canada Company Adds Sterling.	42
Canadian Automobile Makers Ask for Steel.	208
Canadian Automobile Price Rise Expected.	562
Canadian Exports Need License.	75
Canadian Ford Plant Closes.	118
Canadian Ford Stops Dividends.	472
Canadian Hayes to Make Axles.	1075
Canadian Settlers May Import Vehicles.	42
Car Imports, Canadian Rules on.	818
Chevrolet Motor Co. of Canada Merges with General Motors.	727
Chile Has No Electric Cars.	166
China Poor Prospect for Automotive Industry.	526
China, Automobile Trade in Shanghai.	515
Denby to Build Canadian Plant.	945
Dope Investigation in Britain.	409
Dutch East Indies Offers Automotive Market.	1033
Egypt Car and Truck Market After War.	604
Engine Market in Australia, Gas.	421
England's Air Force Enlarged.	608
England Licensing Use of Roads.	79
England Plans Post-War Show.	1068
England Plans for Canadian Trade.	897
England Prepares for South African Trade.	422
England Takes Australian Zinc.	36
England Unifying Transportation.	79
English Commercial Aviation Development.	1064
English Aircraft Production Increasing.	121
English Airplane Activity.	801
English Aviators to Fly Over West.	165
English Planes Standardized to 5 Per Cent.	161
Fiat After-War Policy.	1068
Ford, Canadian, Financial Statement.	818
Ford Canadian Plant Closes.	118
Ford Resumes Operations in Canada.	301
Fordson to Be Distributed in Canada.	473
Fordsons in England, 3780.	440
Fordsons to Be Built in Mexico.	852
Foreign Trade, Commercial Aviation in.	87
France and Tractor Development.	787
French Army Automobile Service, Organization of.	1093
French Factory Makes Propellers.	9

French Kerosene Tests Won by Bellem.	792
French War-Worn Vehicles Sold.	1116
Gasoline Conserved in Canada.	475
Gasoline Shortage in South Africa.	708
General Motors Canadian Merger.	727
G. M. Builds Another Plant in Canada.	945
German Airplane Activities.	622
German Airplane, New Giant.	238
German Army Aviation Service Organization.	226
German Cities Bombed Intensively.	293
German Speed Meter.	19
Germany's Gasoline Supply Cut Off.	854
Grace Motors, Ltd., Adds Sterling.	42
Hawaii Has More Automobiles.	535
Holland Automobile Outlook.	412
Italian Air Service Plans and Accomplishments.	272
Japanese Automotive Field, Cultivating—I.	867
Japanese Automotive Field, Cultivating—II.	923
Japanese Automotive Field—III.	971
Japanese Automotive Field—IV.	1011
Japanese Automotive Field—V.	1059
Kerosene Tests Won by Bellem in France.	792
Mexican Mines Need Trucks.	516
Mexican Plant for Ford.	293
Mexican Plants for Ford.	380
Mexico Wants Tractors.	248
Mineral Output in Burma.	934
New Zealand Automobile Merchandising Analysis.	572
Gasoline Substitute to Be Sold Jan. 1.	977
Gasless Sundays Request Withdrawn.	730
Gas Tax Eliminated.	939
Gear Manufacturers Decide on Closer Cooperation.	527
General Motors Acquires Chevrolet.	215
General Motors Acquires United Motors.	645
General Motors Builds Samson Tractors.	215
General Motors Builds Three Tractors.	1065
General Motors Erects Body Plant.	121
General Motors Increases Stock.	391
General Motors Makes Refrigerators.	695
General Motors on War Work.	389
General Motors Patent Department Moved.	36
General Motors Profits.	693
General Motors Trucks for Medical Corps.	40
General Staff Holds Truck Control.	434
General Steel Co. Opens Detroit Office.	1075
Gerlinger to Double Capacity.	82
Geuder, Paeschke & Frey Adds.	82
Gilson, James W., Promoted to Major.	819
Gitchel, Major, Succeeds Neill.	83
Glide Price Increase.	129
Glover, Fred, Col., Heads New Motors Division.	554
Goethals, Maj.-Gen., Member of War Industries Board.	646
Goodrich Earnings Almost Double.	301
Goodyear Accused of Unfair Practices.	165
Goodyear Arranges Free Movies.	126
Goodyear Branch Managers Transferred.	170
Goodyear Claims Its Policies Misunderstood.	392
Goodyear Employs 3000 Women.	123
Goodyear Patents Not Infringed by Firestone.	1065
Goodyear Sales Are \$13,562,915 for June.	293
Goodyear Record Profits.	1022
Gordon, George R., Heads Selden Truck Sales Co.	812
Goss, W. W., Joins Lincoln.	31
Government May Take Aircraft Plants.	34
Government to Buy Platinum.	484
Government Will Pay Over 25% of Cost of Production.	435
Grant, G. D., Heads Kerosene Company.	31
Graphite Banned for 1918.	75
Graphite Crucible Imports Restricted.	73
Griffin, J. M., Joins Kerosene Equipment.	127
Grimmelman, F. F., Joins Perfection Spring.	38
Grossman, Emil, Resigns.	127
Grossman, Emil, in New Business.	522
Grossman Gets Post-Office Contract.	122
Hackett Production Suspended.	512
Hall, Col., Going to France.	73
Hamilton L. M., Heads Lane Truck Co.	214
Handley-Page, First, Launched.	46
Hanks, M. W., Leaves S. A. E.	382
Happy Farmer Equipment Designed.	82
Happy Farmer Tractor Co. Increases Capital.	1075
Hare, Emilen S., Vice-President of Packard.	388
Harrisburg Plowing Performances.	644
Harrisburg Tractor Demonstration.	530
Harroun Shipping Shells.	41
Hart-Parr Brake Tests.	568
Harvey, T. H., Resigns.	38
Hawkins, Norval A., in U. S. A. Ordnance Dept.	522
Hayes-Ionia Expands Plant.	171
Hayes, Lawrence, Joins Hess-Pontiac.	38
Hayes to Handle Fender Sales.	36
Haynes New Model.	129
Headlamps, Scientific Tests for.	85
Headlamps Submitted for Test.	165
Headlight Law, Scientific.	71
Headlamp Law for New York.	415
Headlight Law Application Scored.	900
Heaters Curtailed, Electric.	693
Hendee Financial Statement.	775
Henderson, C. P., Transferred.	127
Henderson F. W., Succeeds Burch.	83
Hewitt-Ludlow Taken Over by Ralston Iron.	984
Highways Industries Ass. Meets.	1018
Highway Meeting in Chicago, Joint.	851
Highway Projects All Approved.	892
Highways Marked in Illinois.	852
Highways Transport Committee Work Developed.	476

Highways Transport Committee Snow Removal Program.	1036
Highways Transport Committee Work Reviewed.	1020
Highways Use Advocated.	561
Hispano-Suiza Engines to Be Built by Pierce-Arrow.	299
Hispano-Suiza Contract for Franklin Mfg. Co.	558
Hodgkins, R. T., Leaves Studebaker.	298
Holmes, Milton, Forms Truck Company.	129
Holt Back on Peace Work.	1075
Hood, Wallace C., Forms Garage Company.	388
Hopkinson, Prof. Bertram, Dies.	753
Horowitz, Louis J., in Charge of Tanks.	480
Hotel Garage for New York.	78
Housing Corporation Formed.	121
Housing Provisions Determined.	41
Housing of Tractor a Big Problem.	217
Howard, K. B., Joins Stutz.	38
Howells, E. F., Joins Sanford.	170
Hughes Aircraft Report.	741
Hudson Super-Six Prices Increased.	478
Hupmobile Industrial Wagon Production Started.	246
Hupmobile Prices Increased.	478
Hupmobile Surplus \$1,176,262.50.	517
Hurd, E. W., Promoted.	127
Hyatt Opens Coast Branch.	82
Hydro Station for Morehead City.	386
Hydroplane Contract Cancelled.	945
Hyman, H. R., Promoted.	127
Illinois to Mark Its Highways.	852
Industries Curtailed, Non-War.	516
Industries, List Being Formulated, Preferred.	385
Inspectors of Airplanes to Fly.	643
International Harvester Co. Dissolved.	255
International Harvester Merger Ratified.	519
I. H. C. Suit Dismissed.	731
Inventors' Guide, Airplane.	271
Iron and Steel Limited for Tractors.	555
Iron and Steel Price Unchanged.	559
Iron Ore Imports Permitted.	850
Iron Ore Price Increase.	564
Iron Ore Import Restrictions Modified.	1033
Irwin, N. E., Capt., Head of Naval Air Service.	378
Jacoby, K. R., Promoted.	38
Janesville Machine Reorganized.	171
Janesville Mch. Co. Starts New Plant.	389
Jarosch, F. G., Leaves Bearings Co. of Amer.	522
Jim Dandy Cultivator Bought by General Motors.	603
Johnson, Glenn, Resigns from Lincoln.	31
Johnson, H. S., Resigns.	127
Johnson, R., Resigns from Lincoln.	31
Johnston, R. H., Vice-President of White.	83
Jones Car Prices Increased.	478
K. A. L. Products to Be Marketed.	41
Kellogg, T. O., Transferred.	38
Kenly to Testify in Airplane Hearing.	161
Kenly, Wm. L., Major on Army-Navy Board.	515
Kerosene Tractor Plowing Test.	221
Ketcham, H. S., Joins Cleveland Tractor.	127
Kerosene Economy Urged.	858
Kerosene Equipment Elects Officers.	31
Kerosene and Gasoline Priority.	814
Kiefer, D., Joins Navy.	38
Killen-Strait Tractor Co. in Receivership.	654
Killen-Strait to Be Auctioned.	736
Killen-Strait Mfg. Co. Sold.	1075
King M. C. Co. to Make Kitchen Trailers.	654
Kissel Prices Increased.	478
Kitchen Trailer Bids Opened.	83
Klaxon Sales Office for Detroit.	1067
Kleist, F. W., Joins Dart.	164
Knobloch, A. F., in Ordnance Dept.	697
Labor to Be Protected by Government.	257
Labor Administration Complete.	120
Labor Boards, Local.	78
Labor Competition Condemned.	120
Labor Department Reorganized.	977
Labor Program Adopted by Government.	162
Labor Recruiting Plans Complete.	120
Labor Recruiting Rules.	78
Labor Section Merged with Defense.	733
Labor Layoff Rumor Denied.	898
Lacey, V. E., Leaves Cunningham Co.	214
Lane Truck Receives Priority Rating.	647
Lapeer Tractor-Truck Plant Complete.	82
Lauson Tractors Have Starters.	1036
Lavine Gear Co. Has Milwaukee Factory.	255
Laws, Patent and Trade Mark, of Argentine.	192
Laying the Egg on the Hun.	230
Lee, General, Flies Over Washington.	122
Lee Rubber Co. Shows Substantial Earnings.	296
Lee Tire Price Increase.	31
Leicher Brothers Make Converter.	38
Lenses, Amber, in Massachusetts.	214
Liberty Aero Oil Developed.	210D
Liberty Engines, 2514, Delivered.	121
Liberty Engine Builders Form Association.	855
Liberty Eight Engines Ordered, 8000.	378
Liberty Engines Made by Overland.	389
Liberty Engine Output.	596
Liberty Engine Production 10,151, Oct. 10.	689
Liberty Engine Production Pennant for Marmon.	813
Liberty Engine Profits Not Excessive.	781
Liberty Fuel to Be Sold Jan. 1.	977
Liberty Planes Being Rushed to Europe.	599
Liberty Electric Starter for Fords.	1026
License to Wire Wheel Corp. from Government.	258
Licenses for Flying.	556
Licenses for Gasoline Men.	557
Lightless Nights, More, Ordered.	168
Lippard-Stewart to Be Auctioned.	736
Lippard-Stewart Moves.	984

Lipsner, Capt., to Head Airplane Mail.....	129
Loco-tractor Invented by Ford.....	206
Loening Plane Breaks Record.....	986
Loose, T. L., Joins Canton Spring.....	38
Lumber Prices Set.....	35
New Zealand Automobile Merchandising Analysis—II.....	634
New Zealand Automobile Merchandising Analysis—III.....	751
Registration of Passenger Cars in Europe.....	252
Renault Tanks for French Army.....	410
Shipping Urged for Latin America.....	896
Show for England, Post-War.....	1068
Siberian Tractor Prospects.....	947
South Africa Has Gasoline Shortage.....	708
South Africa Imports, 1917.....	124
South African Imports.....	689
South Africa Poor Tractor Field.....	79
South Africa Using New Motor Fuel.....	121
South America Big Automotive Buyer.....	519
South America Hurt by Lack of Ships.....	79
South American Trade Mark Laws.....	809
Switzerland Has 6140 Vehicles.....	774
Tin and Tungsten Output of Siam.....	938
Tractor Development in France.....	787
Tractor Import Duty Wanted in Canada.....	982
Tractor Prospects in Siberia.....	947
Tractor Replaces Horse in Canada.....	980
Tractor Sales Prospects in Australia.....	415
Trade, Credit in.....	49
Uruguay Sees American Tractor Demonstrate.....	978

## FORUM

Rolling Resistance of Tractor Wheels.....	25
Diesel and Similar Engines.....	754
Engine for the Fuel of To-morrow.....	331
Engine, Constant Compression.....	929
Gear Standardization Problems.....	330
Kerosene Vaporization.....	845
Liquid Metal Spraying Improved.....	754
Magneto Patent Situation.....	844
Tanning by Means of Chromium Salts.....	331
Throttle-Controlled vs. Constant Compression Engines.....	330
Universal Joints as Shock Absorbers.....	1015

## PRODUCTION

Asbestos.....	317
Coal, June.....	74
Coal, Week of July 1.....	119
Coal, Bituminous and Anthracite Production Decreases.....	352
Coal Production Increases.....	651
Coal Production Maintained.....	732
Coal Drops Slightly.....	602
Coal Production Drops.....	816
Coal Production, Bituminous.....	853
Coal Drops.....	895
Copper Production Maintained.....	895
Cotton Fabric Sufficient for Airplanes.....	344
Cotton Airplane Fabric.....	896
Douglas Fir.....	35
Fir and Spruce Output Nears Requirements.....	210
Gasoline—April.....	81
Gasoline Output Increased.....	249
Gasoline Production Well Maintained.....	345
Gasoline Production Shortage Next Year.....	556
Gasoline from Gas Gains 111%.....	600
Gasoline, September.....	939
Gasoline and Oil Figures.....	475
Iron Mined in 1917.....	779
Manganese Supply Doubled, Domestic.....	937
Oil Output Increased 2000 Bbl. Daily.....	597
Oil Production Down.....	730
Oil Supply From Utah Shale Beds.....	581
Oil From Texas.....	1036
Petroleum Supply Limited, Unmined.....	491
Plumbago, Ceylon Output Affected by Ameri- can Import Restrictions.....	38
Shale Beds Provide Oil Supply.....	581
Spruce.....	35
Steel in Sight for Cars in July.....	31
Steel Lack Causes Curtailment.....	117
Steel Production Increases.....	736
Zinc, 1915, 1916 and 1917.....	937

## REGISTRATION

Canada.....	244, 615
Canada Has 237,172 Cars.....	473
Canadian.....	243
Europe Has 522,122 Passenger Cars.....	252
Massachusetts Registration Gains.....	1076
Michigan Has 254,722 Cars.....	480
Michigan.....	167
Ohio.....	38
Pennsylvania.....	38
United States.....	308
Registration in Wisconsin Totals \$2,049,680.....	437

## SHOWS

Airplane Show Abandoned.....	726
Automotive Exhibition Suggested, War.....	940
Boston May Have a Show.....	901

Chicago Exposition Draws Ninety.....	165
Chicago Show in Jan.....	1068
Detroit Wants a Show.....	898
Importers' Salon Abandoned.....	525
Industrial Conditions Reported.....	163
Milwaukee Show in Jan.....	1035
National Tractor Demonstration Exhibitors.....	80
National Tractor Demonstration Lists.....	124
New York Show in Feb.....	1026
Philadelphia to Have Truck Show.....	1025
Pittsburgh Show Helps Trade.....	894
Salina Exhibitors Listed.....	169
Salina Tractor Demonstration.....	175
Salina Tractor Demonstration, Attendance at.....	204
Shows Scheduled for Twenty-six Cities.....	932
Tractor Show in Milwaukee.....	1073

## TABULATIONS

Efficiency of Male and Female Workers, Rela- tive.....	538
Gasoline Production and Consumption in East.....	447
Gasoline Saved by Motorless Sundays was 100,000 bbls.....	433
Gasoline Substitute Tests.....	945
Latin American Exports for Three Years.....	1032
Manganese Production.....	937
Oil Output for 1917-18.....	939
Petroleum, Production, Consumption and Stocks.....	600
Rubber Imports Drop Slightly.....	383
Tractor Test Results, Harrisburg.....	531
Zinc Production.....	937

## TECHNICAL

Air Cleaners Analyzed and Compared.....	678
Air Flow Through Poppet Valves.....	1047
Aircraft Fabrics, Effect of Moisture on.....	100
Airplane Altitude Record Now 28,900 ft.....	662
Airplane Engine Inspection.....	1
Airplane Nomenclature.....	11
Airplane Propellers, Predicting Strength of.....	109
Airplane Propellers, Predicting Strength of, II.....	152
Airplane Ribs, Testing Methods.....	140
Airplane Tubing.....	67
Airplanes of America, Representative Types of.....	105
Airplanes, War, of To-day, I.....	14
Airplanes, War, of To-day, II.....	60
Air Service, Medical Problems of.....	26
Axle Standardization Possibilities, Front Tractor.....	264
Belts, Paper Driving.....	1003
Benz Uses Aluminum Pistons.....	361
Benzol Tested as Motor Fuel.....	834
Bomb Sight Design Problems.....	404
Bombing by Airplane.....	230
Bombing, Problems of Aerial.....	324
Bombing Plane Engines, Thoughts on.....	590
Brake Tests, Hart-Parr.....	568
Brinell Hardness, New Method of Obtaining.....	457
Car Practice Affected by Aeronautical Ex- perience.....	776
Case Hardening Compositions.....	1051
Chassis Lubrication, Grease vs. Oil for.....	186
Chassis Lubrication System, New.....	95
Chemistry of Pickling Baths.....	960
Commercial Design as Affected by War Ap- paratus.....	905
Crankshaft Defects.....	1041
Design Refinements Facilitate Maintenance.....	1061
Diagram, Theoretical Indicator.....	499
Diagram, Theoretical Indicator.....	545
Dynamometers for Aircraft Engine Tests.....	675
Dynamometer Installation.....	449
Electric Heating and Heat Treating of Forgings.....	188
Electric Steel Making.....	97
Engine Efficiency Demanded, Greater.....	544
Engine Weight, Internal Combustion.....	927
Engines, Heavy Oil, for Automotive Pur- poses.....	20
Engines, Thoughts on Bombing Plane.....	590
Engine Tests, Sleeve Valve.....	495
Exhaust Headers and Mufflers.....	145
Experiments on Heat Dissipation.....	509
Forging in Automotive Plants, Machine.....	327
Forgings, Electric Heating and Heat Treat- ing.....	188
Gasoline Recovered from Natural Gas.....	103
Gasoline Substitute Tested.....	933
Gear Ratio, Chart, Tractor.....	372
Generator Control, a Success, Thermostatic.....	460
Generator, Automatic Variable Speed.....	953
Grease vs. Oil for Chassis Lubrication.....	186
Guide for Airplane Inventors.....	271
Hardness, New Method of Obtaining Brinell.....	457
Hardness Definition.....	104
Hart-Parr Brake Tests.....	568
Heat Dissipation, Experiments on.....	509
Heating and Heat Treating, Electric of Forgings.....	188
Heavy Oil Engines for Automotive Purposes.....	20
Hoists, Electric, Types and Their Use.....	199
Houdaille Adjustable Suspension.....	1005
Inspection of Airplane Engines.....	1
Instruction Book, Owners' Conception of Tractor.....	430
Insulators, Resistance of Hot Spark Plug.....	907
Laboratory for Engine Tests.....	868
Lubrication System, New, for Chassis.....	95
Lubrication and Fuel Tests.....	875

Magnetism in Magneto-Generators.....	616
Magnetos, Non-Distributor and Multipolar.....	222
Maintenance Facilitated by Design Refine- ments.....	1061
Maps by Camera.....	485
Maps by Camera, Making War, II.....	541
Measuring Wires, Use of.....	1056
Medical Problems of Air Service.....	26
Metal Casting Under Pressure.....	852
Milling cutters and Small Tools Standardiza- tion.....	195
Moisture, Effect of on Aircraft Fabrics.....	100
Mufflers and Exhaust Headers.....	145
Nitre Cake, Steel Pickling with.....	1102
Oil Hardening Compositions.....	1051
Oiling System.....	647
Petroleum Supply Limited, Unmined.....	491
Pickling Baths, Chemistry of.....	960
Pickling Steel with Nitre Cake.....	1102
Piston Slap, Method of Preventing.....	431
Pistons, Benz Now Uses Aluminum.....	361
Poppet Valve, Air Flow Through.....	1047
Problems in Aeronautics, Some Outstanding.....	368
Problems in Aeronautics, Some Outstanding, II.....	424
Problems in Aeronautics, Some Outstanding, III.....	464
Propeller Manufacture Development.....	55
Propeller Manufacture Illustrated.....	9
Propellers, Predicting Strength of.....	109
Propellers, Predicting Strength of, II.....	152
Pumps, Test of Tire.....	243
Radiator Design Principles, Tractor.....	1000
Range of Travel in Airplane Future.....	559
Royal Airplane Factory Products.....	236
Screw Thread Checking Apparatus.....	1008
Spark Plug Insulators, Resistance of Hot.....	907
Standardization of Milling Cutters and Small Tools.....	195
Steel Making, Electric.....	97
Steering Creeper and Two-Wheeled Tractors.....	269
Two-Wheeled and Steering Creeper Tractors.....	269
Strip Steel Practice.....	59
Struts, Investigation of Woods for.....	509
Tanks, New French.....	405
Temper from Steel, Removing.....	534
Testing Airplane Wing Ribs.....	140
Tests, Hart-Parr Brake.....	568
Tests of Benzol as Motor Fuel.....	834
Tests of Resistance of Hot Spark Plug In- sulators.....	907
Theoretical Indicator Diagram.....	499
Theoretical Indicator Diagram.....	545
Thermostatic Generator Control, Success.....	460
Threshers for Gas Tractors, Special.....	589
Trailers for War Department.....	138
Tractor Instruction Book, Owners' Conception of.....	430
Tractor Problems, Comment on.....	312
Tractor Radiator Design Principles.....	1000
Tractor Tests, Useful Data from Harrisburg.....	530
Truck Weights Distribution.....	47
Tubing in Airplane Construction.....	67
War Airplanes of To-day, Part I.....	14
War Airplanes of To-day, Part II.....	60
Weight of Internal Combustion Engines.....	927
Welding and Cutting, a.c. Arc.....	241
Wires, Use of Measuring.....	1056
Wood for Struts, Investigation.....	509

## NEWS

Acid Prices Fixed.....	34
Act Creating Aircraft Board, Text of.....	570
Aerial Acrobatics Banned Over Cities.....	1070
Aerial Weather Forecast.....	978
Aero Oil, Liberty, Developed.....	210D
Aero Squadrons in Service, 39.....	1114
Aeronautics Department Planned.....	246
Ahara Patent Upheld.....	640
Air-Brake for Trucks and Trailers.....	895
Air Department Favored by Senate.....	513
Air Flights, Army.....	918
Air Lanes to Be Charted by Army.....	855
Air Mail Service from Coast to Coast.....	976
Air Mail Service, Three-Stop.....	976
Air Mail Service Development.....	1034
Air Mail Service Appropriation Passes.....	1071
Air Mail Service Increases 600%.....	1113
Air Mail Under Supervision of Army, Would Place.....	1067
Air Mail route Proposed, Southern.....	944
Air Mail Service for Navy.....	938
Air Ministry Opposed by Daniels.....	204
Air Service Reopened for Induction.....	516
Aircraft Board Created Without Power.....	569
Aircraft Board 1917 Program Successful.....	613
Aircraft Department Annual Report.....	1113
Aircraft Divisions for Dayton.....	338
Aircraft Inquiry, Major Rice in.....	118
Aircraft Parts Discarded, \$23,000,000.....	641
Aircraft Plants May Be Taken Over.....	34
Aircraft Production Board Accomplishments.....	1028
Aircraft Production Board History.....	968
Aircraft Production Headed by Col. Mars.....	1065
Aircraft Report By Senate Expected Soon.....	298
Aircraft Report by Senate, Complete.....	391
Aircraft Report in Full.....	741
Aircraft Report Testimony Extracts.....	699
Airmen, Physical Test for.....	384
Airplane Assembly System in Training Course.....	521
Airplane Base at Galveston, Navy.....	475
Airplane Bombing.....	230
Airplane Bombing Demonstrated.....	76
Airplane Contracts Canceled.....	938
Airplane Delays, Causes of.....	349



Airplane Factories Output at 40 Per Cent.....	640	Buick Prices to Be Increased.....	299	Copper Price Approved by President.....	300
Airplane Flying Stunts Vitaly Important.....	477	Buick Uses Women Drivers.....	171	Copper Price Unchanged.....	770
Airplane Landing Field Chain Across Con- tinent.....	386	Building Construction Permitted.....	938	Corcoran to Increase Capacity.....	41
Airplane Flight Records Broken.....	256	Bull Tractor Co. Merged with Madison Motors Corp.....	438	Cossey, L. W., Joins Lane.....	38
Airplane Investigators Go to Dayton.....	76	Bureau of Aircraft Production Controls Air- craft Supplies.....	434	Cost of Operating Tractor in Corn Belt.....	197
Airplane Investigators in East.....	164	Bureau of Mines Annual Report.....	1112	Couzens, J., to Run for Mayor.....	83
Airplane Mail Expansion Planned.....	124	Bureau of Standards Developing Compass Test.....	348	Crockett, Frank, Joins Koehler.....	83
Airplane Mail Expenses.....	655	Cadillac Auto. Co., Boston, Employs Women.....	518	Crow-Elkhart in Receivership.....	648
Airplane Mail Rate Reduced.....	76	Cadillac Price Increase.....	34	Crowther Plant Sold.....	165
Airplane Mail Service Records.....	206	Cadillac Prices Increased.....	478	Crucible Steel Forge Co. Absorbed by Elec- tric.....	481
Airplane Mail Service Surpasses June, July.....	251	Cadillac Taking Census of Employees.....	169	Crude Oil Prices to Be Regulated.....	346
Airplane Mail Service Tested.....	436	Cadillac to Continue Present Type.....	36	Crude Rubber Imports Limited for Aug. and Sept.....	345
Airplane Mail from Chicago in One Day.....	526	Cadillac Reduces Price.....	891	Curtailment Caused by Steel Lack.....	117
Airplane Mail, New York-Washington 100 Per Cent Efficient.....	565	Camp Holabird Truck Overhaul Depot.....	1052	Curtailment Not Dependent on Fuel.....	119
Airplane Mail Records 100 Per Cent Perfect.....	642	Cancellation of Truck Orders Modified.....	937	Curtiss Engine Contract Given Overland.....	518
Airplane Observers Needed.....	732	Caproni Contract-Canceled.....	443	Curtiss Subsidiary in Atlantic City.....	164
Airplane Plant for Government.....	76	Caproni, Liberty Equipped Makes Climbing Record.....	518	Dart Adds to Personnel.....	164
Airplane Production Satisfactory.....	72	Caproni, Tests of.....	596	Davis, H. W., Succeeds Grossman.....	127
Airplane Production History, Further Light on.....	1069	Car Production Cut to 25 Per Cent.....	379	Davis Mfg. Co., Absorbed by Avery Co.....	347
Airplane Program Criticized.....	334	Car Production of 25 Per Cent Expected for 1919.....	338	Deaf Mutes Won't Make Good Flyers.....	256
Airplane Program, Huge, Expected.....	160	Car Production in Detroit Reduced.....	290	Deeds, Col. E. A., Severs Connection with Dept. of Aircraft Production.....	358
Airplane Repair Trouble Shooters.....	642	Car Production Cut 50 Per Cent.....	247	Defense Section Merged with Labor.....	733
Airplane Shipping, Methods of.....	341	Car Production Cut of Only 75 Per Cent Hoped for.....	290	Deferred Classification for Transportation Co. Employees.....	521
Airplane Tour Route Mapped.....	250	Car Production Steady.....	727	De Haviland, American, Undergoing Trial.....	292
Airplanes, Elementary Training, Delivered.....	76	Car Tax Protested.....	344	De Haviland Scandal Exploded.....	256
Airplanes, Many, Over Washington.....	122	Car Tax Trebled; Truck, Doubled.....	433	De Havilands Make Successful Reconnaiss- sance, American.....	336
Airplanes Built by Victor Talking Mch. Co.....	347	Car and Truck Taxes Lowered.....	296	De Havilands Shipped Daily to France.....	597
Airplanes to Be Sold, Government.....	1113	Cars and Trucks to Be Taxed on Cost.....	204	Deeds presented with Testimonial.....	1113
Aitken, John D., Dies.....	685	Car Repair Parts May Be Sold.....	769	Delco Co. in France.....	731
Ajax to Move Executive Offices.....	163	Cassidy to Market Fuel Economizer.....	129	Denver-Chicago Airplane Mail Department of Aeronautics Planned.....	775
Ajax Issues \$1,000,000 Stock.....	1070	Cast, J. F., Promoted.....	127	Derf Spark Plug Co. Reorganized.....	246
Alaska Wants Air Mail.....	1070	Chaffant, E. P., in Export Trade.....	645	Design, Commercial, Effect of War Apparatus on.....	255
Allen-Bradley Capacity Doubled.....	171	Chalmers and Maxwell Combined in Boston.....	41	Detlaff to Make Clutches.....	905
Allen, J. E., Promoted.....	127	Chalmers Stock Reduced \$660,000.....	597	Detroit Factories on War Work.....	1076
Allen Prices Down.....	1022	Chamber of Commerce of U. S. Meets at Atlantic City.....	974	Detroit Liberty Loan Subscriptions.....	512
Allis-Chalmers to Bring Out Two New Trac- tors.....	984	Chandler to Have Tractor Plants.....	126	Detroit Plane to Make Flight.....	726
Amazon Rubber Co. Purchased O'Neill.....	523	Chandler Profits to June.....	250	Detroit Plants Enlarge.....	129
Ambulance Program, Standardized Army.....	578	Chandler Delivering Artillery Tractors.....	596	Detroit Priorities Office Opened.....	606
America Working for World Trade.....	79	Chapin, R. D., in Charge of Highway Labor Problems.....	418	Detroit War Contracts \$2,000,000,000.....	641
American Ball Bearing Service Taken Over by Puritan.....	983	Chapin Resigns from Highway Transport Committee.....	1018	Detroit-Wyandotte Plant Auctioned.....	122
American Motor Truck Sold.....	126	Chevrolet Building New Factory.....	299	Deutsch, S., Enters Signal Truck.....	171
American Steel Tube Co. Doubles Capital.....	731	Chevrolet Motor Co. to Dissolve.....	525	Diamond T Distributors Changed.....	161
Amory, J. H., Joins Dixon.....	127	Chevrolet General Motors Stock Transfer.....	215	Dine, J. M., Promoted.....	170
Amputations Few Among Wounded.....	300	Chevrolet G-M Plan Disclosed.....	612	Division of Military Aeronautics Controls Air- craft Supplies.....	38
Anderson Electric Adds.....	41	Chevrolet to Vacate New York Plant.....	169	Doehler Enlarges Plant.....	434
Anderson Electric Car Co. Elects.....	681	Chevrolet Prices Increased.....	206	Donovan, J. S., Adds Sanford.....	389
Anderson, Lee with Aircraft Production Bureau.....	694	Chevrolet Prices Reduced.....	891	Dope Making Plant Nearly Ready.....	41
Anderson, W. C., Resigns.....	685	Chicago-Denver Airplane Mail.....	775	Dowson, E. H., Commissioned.....	386
Andis Tool Co. Organized.....	654	Chicago-New York Airplane Mail Service Planned.....	775	Drake, C. B., Brig. Gen., Head of Motor Transport.....	127
Anti-Glare Devices Approved in New York.....	514	Chicago-St. Louis Barge Service.....	733	Drake, J. W., on War Board.....	306
Arbenz Factory Suspends Production.....	523	Chrome Import Licenses Revoked.....	850	Driggs-Seabury to Redeem Bonds.....	127
Argo Electric Purchased by Puritan Machine Co.....	255	Chrome Ore Supply Plentiful.....	729	Dupont, Lamont, Heads Flint Varnish.....	851
Argon for Navy Aircraft.....	1067	Clarkson, J. B., Coming to New York.....	83	Eagle, First, Launched.....	726
Army Expenditures for Cars.....	1075	Class A Bids Asked.....	216	Eagle Boats by Ford Methods.....	123
Army Planes for Air Mail.....	1069	Class A Trucks Ordered.....	383	Earle, Capt., Transferred.....	136
Army Trucks to Be Used for Mail.....	936	Class A, AA, B and TT 75,000, Ordered.....	160	East, G. L., Resigns.....	127
Atlantic Flight Prize Offered.....	34	Class AA Trucks Bids Asked.....	130	Edison Battery to Have Philadelphia Office.....	170
Austin Developing Farm Tractor.....	82	Class AA Trucks to Be Made by Saxon.....	383	Edison Industries, War Contracts for.....	37
Auto-Lite Co. to Make Gun Sight Parts.....	299	Class B Trucks, 5,000, Delivered.....	83	Effect of War Apparatus on Commercial De- sign.....	171
Automobile & Mch. Eng. Co. to Build Car.....	654	Class TT Trucks Adopted.....	160	E. G. Mfg. Co. Started by Emil Grossman.....	905
Automobile Taxes of \$23,981,368 Paid.....	1065	Cleary, J. A., Joins Cadillac.....	169	Eight-Hour Day for Metal Workers.....	522
Automobile and Accessories Exposition Opened.....	521	Cleveland Smelting Plans Building.....	83	Eight-Hour Day Advised for Government.....	253
Automotive and Accessories Exposition Fair Success.....	567	Cleveland Tractor to Be Made in Great Britain.....	247	Eight-Hour Day Adopted by Steel Corp.....	34
Automotive Battery Takes Post-Office Service.....	171	Coal for Michigan Car Industry, Limited Supply.....	380	Eisemann to Be Sold.....	558
Automotive Committee in Indianapolis.....	174	Coal for Passenger Cars 25 Per Cent.....	75	Electric Steel & Forge Co. Absorbs Crucible.....	894
Automotive Corp. to Make Royal Tractor.....	165	Coal Refused Newark Dealers.....	296	Electric Storage Battery Co. Profits.....	481
Automotive Dealers May Have Lights.....	851	Coal Storage Limited in the East.....	387	Elgin Revises Its Lines.....	693
Automotive Sales Co. Incorporates.....	82	Coal Storage Limits Arranged.....	564	Ellis, Guy W., on War Work.....	734
Avery Co. Absorbs Davis Mfg. Co.....	347	Coal Storage Increased.....	734	Emerson Motors Found Guilty.....	31
Aviation Service Deaths, July 15.....	76	Coal Storage Limit Abolished.....	939	Enameling & Stamping Corp. Takes Over Fickling.....	523
Ayres, J. C., Elected Vice-President D.A.D.A.....	254	Cody, H., Promoted.....	38	Endurance Tire Price Increase.....	31
Baker & Ryan in France.....	475	Coffin, Howard E., Protests to Congress.....	359	Engineers, Fuel Oil, Wanted.....	116
Ball Bearing on Preferred List.....	606	Columbus Tractor Changes.....	127	England Lightens Driving Restrictions.....	1114
Balloon Corps to Be Increased.....	650	Comet in New Plant.....	126	Essential Industry Group Enlarged.....	433
Balloon Manufacture in U. S.....	925	Commerce Dept. Takes Over War Sections.....	1121	Evans, G. M., Commissioned.....	38
Barley M. C. Co. Plans on War Work.....	434	Commercial Finance Corp. to Finance Tractor Purchases.....	297	Evinrude Making Grenades.....	215
Baruch Resigns from War Industries Board.....	980	Commission Plan, New.....	729	Exemption Asked for Detroit Skilled Labor.....	257
Base for Hydro-Airplane, Training.....	256	Commercial Aviation, Advocate Government Assistance for.....	1110	Experts Wanted by Government, Oil.....	252
Batchelder, C. F., Joins Olds.....	170	Community Labor Board to Make Monthly Surveys.....	686	Falls Motors Men Have Clubhouse.....	126
Beach, E. W., on Aircraft Board.....	127	Compass Flying Field Training.....	650	Farm Implement Profiteering Barred.....	246
Bearings for Farm Equipment, Better.....	565	Compass Tests Being Standardized.....	348	Farm Implement Types Reduced.....	118
Beaudette Co. to Make Transport Bodies.....	654	Conservation of Truck Time and Man Power.....	257	Federal Pressed Steel Expanding.....	82
Beckenbach, Homer, in Government Service.....	170	Continental Auto Parts Co. Increases Capital Stock.....	475	Federal Highways Commission Endorsed.....	1066
Ben Hur Plant Acquired by Government.....	299	Continental Motors Corp. Declares Dividend.....	695	Federal Trade Commission Investigates Profits.....	32
Benford Develops Aviation Plug.....	75	Contract Adjustment Board Created.....	855	Feltes, N., Treasurer of Studebaker.....	41
Berger, Fred, Joins Gray Motor.....	127	Contract for Trailers Given Olds Motor Works.....	346	Ferro-Silicon Output Increased.....	74
Bicycles and Motorcycles Classified Essential.....	336	Contracts, Class B Trucks.....	685	Fickling Enameling Corp. Taken Over by En- ameling.....	523
Bishop, George H., Joins Wright-Martin.....	38	Contracts Cancelled Gradually.....	980	Firestone Declares Additional Dividend.....	336
Bloomington Shops Organize.....	41	Contracts Cut Gradually.....	824	Firestone Sales to Reach \$75,000,000.....	392
Blumberg Mfg. Co. in Texas.....	119	Contracts, Curtiss Engine Given to Overland.....	518	Flanders, George E., Enlists.....	346
Board of Metallurgical Matters Established.....	388	Contracts, Detroit's, to Reach \$2,000,000,000.....	122	Flying Fields Named, Four New.....	256
Bock Bearing Output to Be Doubled.....	126	Contracts, Hispano-Suiza Engine for Franklin.....	558	Flying by Compass, Field Training.....	650
Bombing, Resume of Allied Airplane.....	476	Contracts to Mich. Delayed by Lack of Parts.....	484	Flying Fields to Be Closed.....	894
Bombing Plane Manufacture Delay.....	402	Contracts to Be Adjusted, War.....	894	Ford Ambulance.....	578
Bosch Controlled Bicycle Plant Taken.....	206	Contracts, to Validate "Illegal".....	1067	Ford Buys Tractor Assembling Site.....	126
Bosch Plant Bought by Wright-Martin.....	81	Convoy Routes to Be Cleared of Snow.....	689	Ford Car Prices Advanced.....	335
Bosch Plant Taken by Wasson.....	171	Cooper, L. K., Promoted.....	83	Ford Chaser Plant in Kearney.....	126
Bosch to Be Sold.....	894	Copper Imports Restricted.....	117	Ford Discontinues Passenger Cars.....	479
Bosch Plant Sold for \$4,150,000.....	1068	Copper Price Agreement Approved by Wilson.....	129	Ford Employees Laid Off.....	167
Brede, O. M., in Aviation Section.....	83	Copper Price Set at 26 Cents.....	247	Ford Equipped with Electric Starter.....	1026
Breeze, M. H., Joins Metal Parts.....	170	Copper Price May Be Increased.....	37	Ford Files Suit Against Lippow Cycle Co.....	348
British Organize Research Associations.....	558			Ford Financial Statement.....	735
Bristol Fighter Failure.....	402			Ford Heads Labor Umpires.....	166
Bristol Plane Abandoned.....	161			Ford Hospital Taken by Government.....	668
Buckeye Brass Adds to Plant.....	40			Ford Leaves Ford Motor.....	936
Buda Develops New Tractor Engine.....	852				
Buda Engineers Test New Fuel.....	851				

Ford Loco-Tractor	206	Military Tractors a Month, 1200	440	Parker Motor Truck Takes Over Stegemen	438
Ford Notes to Be Bought	167	Militar Truck Bids	685	Parker's Interest Sold	898
Ford Plant, Another, for War	41	Miller, L. T., Joins Elgin	127	Parrett, Dent, a Captain	127
Ford Plant for Mexico	293	Millner, M. D., Joins Dart	164	Parts Sent as Baggage	36
Ford Plants for Mexico	380	Milwaukee Organizes Branch of National Ass. of Purchasing Agents	337	Parts Tax Removed	890
Ford Production is 700,000	336	Milwaukee Spends War Work	130	Patents and Trade Mark Laws of Argentina	192
Ford Pulley Attachment in November	685	Milwaukee Tank Co. Restrained	859	Penland, H. O., Promoted	170
Ford Reduces Production	73	Mink, D. L., Joins Dart	164	Pennsylvania Will Have Tractor Demonstration	434
Ford Releases 25,000 Cars	893	Mitchell Prices Drop	1023	Perfex Radiator to Expand	82
Ford Resumes Operations in Canada	301	Moline-Overland Exchange Basis	652	Petroleum Losses Enormous	892
Ford Utilizes Water Power	340	Moline Flow Co. Issues \$6,000,000 Notes	392	Petroleum Demand Will Increase	1117
Ford War Profits for Government	435	Moline Plow Controlled by Overland	567	Petroleum Specifications Standardized	246
Ford & Son Shares \$100	129	Moline Opens Baltimore Branch	41	Petroleum Stock Decreases	600
Fordson Distributors Meet at Dearborn	1023	Moline Knight Prices Advance	340	Petroleum Supply Limited, Numined	491
Fordson Export Distributor Appointed	480	Montgomery, Robert L., Col., Severs Connection with Dept. of Aircraft Production	358	Phelps, Frederick, with Duesenberg	562
Fordson Reports Misleading	79	Moon, Earl J., Charge of Transport Repair Yard	819	Photographers Fine Record, U. S.	854
Fordson Reports Prices Advanced	294	Moore, W. H., Transferred to New York	160	Pierce-Arrow, New Model for	161
Foreign Aviation Mission's Aid Not Accepted	443	Motor Transport Corps Consists of 154,774 Men	470	Pierce-Arrow Surplus	854
Foreign Aviation Mission Requested to Leave	559	Motor Transport Corps Controls Motor Vehicles	855	Pilots to Carry Oxygen	688
Foreign Corporations Barred from Wisconsin	253	Motor Transport Corps Formed	121	Plants for Government Contracts	294
Foreign Shipments Controlled by War Ind. Board	561	Motor Transport Corps Needs 200,000 Men	814	Platinum to Be Bought by Government	484
Foreign Trade Investigation Desired Enlarged	891	Motor Transport Corps' New Insignia	652	Platinum Controlled by Government	602
Fossick, Fenn, in Ordnance Work	127	Motor Transport Corps Organization Chart	868	Platinum Substitute Found	1120
Fowler, Lieut.-Col., in America	129	Motor Transport Corps Organization Complete	856	Platinum Used Extensively for War Purposes	561
Fox, C. L., Leaves Saxon	525	M. T. C. School for Milwaukee	643	Pledge, Passenger Car	479
Franklin Mfg. Co. Gets Hispano-Suiza Contract	558	Motor Transport Corps Supersedes Motor Transport Service	305	Plowing Test of Kerosene Tractor	221
Franklin Prices Increase	439	Motor Transport Corps Wants Men	562	Plow Types, Number of, Reduced	118
Franklin Reduces Prices	945	Motor Transport Corps Work Report	1022	Plumbago, Ceylon, Output Affected by American Import Restrictions	380
Fraser, R., Joins Pennsylvania	83	Motor Transport Service Superseded by Motor Transport Corps	305	Porter, G. Stanley, Joins Hayes	83
Freight Car Loading Rules	36	Motor Transport Service Divisions Defined	209	Post Office Wants Anti-Freeze Solutions	934
Freight Cars Used Efficiently	36	Motor Transport Service Spends 15% of Money	161	Post Office Appropriation Passes	1071
Freight Embargo, L.C.L.	651	Motors Division of the Quartermaster Corps Organized	554	Potter, W. C., Now Asst. Director Airplane Production	358
Freight Rate Concession on Bodies	118	Motor Truck Mail Service Proves Success	813	Preference List Applications Being Mailed	602
Freight Rate Increase Opposed	294	Motorcycle and Bicycles Classed Essential	336	Preference List of Seventy-four Industries	471
Freight Rate for Road Materials Cut	116	Motorcycle Production Restricted	688	Preference List Includes Truck Makers	517
Freight Reclassified	72	Mountain, W. W., Resigns from Flint Variational Munitions Patent Board Formed	726	Preferred Industries List Being Formulated	385
Fuel Consumption Tests by Tracy	73	McGrath, Blaine, Succeeds Sibley	127	Prest-O-Lite Service Taken by Automotive Battery	171
Fuel Curtailment Not to Affect Production	119	McLaughlin Carriage Co. Merges with General Motors	727	Preston R. A. D., Commissioned	38
Fuel for Internal Combustion Engines Announced	980	Nash, Chas. W., Aircraft Production Head	117	Post Office to Use Trucks	35
Fuel Restriction May Be Abolished	982	Nash, Chas. W., Remains Dept. of Aircraft Production	358	Premier Rubber to Make Insulation	41
Fuel Supply Adequate for Nation	769	Nash, Charles W., Returns to Kenosha	937	Price, R. J., Resigns	38
Fuel Tested by Buda Engineers, New	851	Nash Prices Increased	478	Price-Fixing by Government Agency	1033
Fulton Trucks Cuts Price \$150	938	National Highways Proposed	1018	Priorities for Refineries Discontinued	436
Furlow, J. F., Col. Asst. Head Motor Transport	306	Navy Workers Needed	122	Priorities Issued, Supplementary	249
Garbed a Failure	34	Nelson Mfg. Co. Moves	126	Priorities Not Needed for Steel	43
Garage Construction Limited	820	Newman to Bring Out Truck Line	1118	Priority Warning Issued	340
Gardner, Russell E., Sells St. Louis Chevrolet Interest	257	New York Closing Saturday Afternoons	123	Prizes Offered for Flights	1070
Garfield Resigns	1025	Nickel Matte Importation	850	Production of Aircraft Weekly	892
Garford Prices Advance	343	Night Photography Invention	42	Production Cut of 50 Per Cent in Car Manufacture	247
Gary Motor Truck Expands	126	Nilsen Tractor, Receiver for	1118	Production Restrictions Cut	938
Gasoline Conservation Requested	379	Noble Truck Plant Enlarged	166	Production of Tires and Tubes Cut 50 Per Cent	204
Gasoline Consumption Exceeds Production	515	Non-War Industries Curtailed	516	Production Situation Clarified	596
Gasoline Men to Be Licensed	557	Non-War Industries Power Curtailed	815	Production Increase of 50 Per Cent	821
Gasoline Price Increase 1/4 Cent	164	Oakland to Build Trucks Almost Exclusively	299	Production of Cars and Trucks for 1918	975
Gasoline Priority	814	Oakland to Make Trucks	161	Profiteering in Farm Implements Barred	246
Gasoline Production Would Be Increased by Process Refining System	447	Oberberger, Frank P., Leaves A. O. Smith Co.	254	Profits Too Large, Says Federal Trade Commission	32
Gasoline Rationed	652	Oil Companies Making Huge Profits	32	Propellers, Poplar, at Kelly Field	167
Gasoline Saved Was 100,000 bbls.	433	Oil Controlled by Government	251	Pull-More Motor Truck to Be Sold	984
Gasoline Saved, 413,000 bbls., on Motorless Sunday	520	Oil Economy Campaign	850	Purchase and Storage Department	557
Gasoline Shortage Predicted for Next Year	556	Oil Experts Wanted by Government	252	Purchasing Agents Discuss Priority	532
Gasoline Specifications Adopted	728	Oil Industry Asked to Lift Restrictions	1066	Purchasing Control System Planned	124
Gasoline Substitute Tested	933	Oil Lands to Be Developed, New	560	Puritan Machine Co. Purchases Argo Electric Parts	255
Hide Restrictions Off	1113	Oil Specifications Standardized	434	Puritan Gets American Ball Bearing Service	983
Legalize "Illegal" Contracts	1114	Oil Tanks for France, Four	439	Quad Royalties Not to Be Paid	42
Mac, Walter C., Heads Hoover Steel Ball	737	Olds Motor Works Receives Trailer Contract	346	Quartermaster Branch in Chicago Closed	130
Mackie, J. H. W., Promoted	38	Olds to Make Own Engines	41	Quartermaster Corps Has New "Motors Division"	554
Madison Dealers Help Farmers	301	Olds Price Advance Rescinded	935	Quartermaster Dept. in Charge of Trucks	470
Madison Motors Merges with Bull Tractor Co.	438	Olympian Price Increase	129	Race Suspension Requested	609
Magnesium May Be Imported	74	O'Neill Paint Expands	82	Railroads Largest Steel Consumers	383
Mahaffey, H. E., Transferred	127	O'Neill Purchased by Amazon	523	Rainbow Oil Co. Incorporates	654
Maibohm Will Rebuild	1118	Operating Cost of Tractor in Corn Belt	197	Rainier Adds 1 1/2-Ton Model	77
Mail Truck Appropriation of \$8,000,000	1033	Ordnance Dept. Establishes District in St. Louis	257	Ralston Iron Adds Trucks	984
Mail Truck Service Costs	1120	Oshkosh Motor Truck Mfg. Co. New Name of Wis. Duplex	481	Rankin, D. D., Heads Purchasing Agent Ass'n	607
Makers Gradually Drop War Work	1065	Overland Controls Moline Plow Co.	567	Reconstruction Body Proposed	848
Manganese Ore Located	771	Overland Completes Moline Purchase	894	Reconstruction Congress Resolutions	996
Manfield, F. A., Resigns	127	Overland Factory Enlarged	82	Reconstruction Problems to Be Discussed	850
Mantrach, J. C., Heads American Welding	35	Overland Gets Ordnance Contract	86	Reconstruction Should Be Governed by Business	974
Map Air Lines	1069	Overland-Moline Exchange Basis	652	Rector Kerosene Carburetor	598
Marathon Executives Enlist in Army	170	Overland Plant in Walkerville	126	Red Cross Needs Drivers and Mechanics	647
Marburg, E., Dies	127	Overland Prices Increased	478	Redden Adds Two Units	34
Marine Corps Schools	604	Overland Price Increase	77	Redfield, Wm. C., Member Priorities Committee	378
Marine Engine War Service Committee Formed	602	Overland Prices Down	1022	Refinery Priorities Discontinued	436
Marine Engine War Service Committee	727	Overland to Make Liberty Engines	389	Regal Sold at Auction	34
Marlin-Rockwell Takes Braeburn Plant	174	Overland Receives Contract for 1500 Curtiss Engines	518	Reo Awarded Artillery Tractor Order	389
Marmon-Chicago Develops Farm Light	610	Overland Reduces Price	1068	Reo Annual Report	1036
Marmon Delivers First Liberty Engine	121	Overmeyer to Build Planes	611	Reo Speedwagons for Canadian Service	86
Marmon Wins Liberty Engine Production Pennant	813	Owen Develops Farm Lighting System	479	Report on European Trade Reconstruction Policies	690
Marmon, Major, Going to France	73	Owston, C. W., Promoted to Major	439	Report on Aircraft Production Board	1028
Mars, Col., Heads Aircraft Production	1065	Oxygen to Be Carried by Pilots	688	Republic Truck Opens Baltimore Branch	126
Mason Sales Increase	171	Packard Car Not to Be Changed	121	Republic Truck Financial Statement	773
Mason Tire & Rubber Co. to make U. S. Raincoats	654	Packard Leases Adjoining Plant	163	Republic Issues \$3,000,000 Notes	1068
Massachusetts Gasoline Pumps 100% Perfect	518	Packard Elects E. S. Hare Vice-President	388	Research Associations for Britain	558
Master Trucks Has New Plant	126	Packard Financial Statement	735	Return Loads Bureau Established in St. Louis	380
Maus, J. B., Starts on Trip	170	Packard 100 Per Cent on War Work	479	Return Load Work Transferred in Detroit	165
Maxwell and Chalmers in Boston Combined	41	Packard Prices Increased	478	Rice, Major, in Aircraft Inquiry	118
Maxwell Financial Report	812	Page Steel Insures Employees	126	Ritchie, P., Joins Westinghouse	83
Maxwell, W. A., Commissioned	170	Paige Prices Increased	2101	Roads. Permits for Use of	79
Maxwell Passes Dividend	899	Paige Sale Denied	31	Road Building Material Prices	896
May, O. J., Capt., of Texas Co. Dies	340	Palmer, C., to Manage Permalite	83	Road Building Obtains Federal Approval	387
Mechanics, Automobile, Reclassified	78	Parachutes Used by Navy Pilots	976	Road Machinery Production Curtailed	733
Mechanics, 12,000, Trained	122			Road Making Machinery and Parts Curtailed	697
Menober, Made Aircraft Head	1114			Road Materials, Freight Rates of, Cut	116
Metal Auto Parts Formed	126			Robinson, Floyd, Dies	170
Metal Workers Get Eight Hour Day	253			Rogers, E. D., Joins Beck-Hawkeye	127
Metzger, W. E., Heads Truck Committee	163				
Meyer, N. W., Joins Roeding	83				
Michigan Divided for War Work	37				
Michigan Press Co. Builds Tractor	737				

Royal Tractor to Be Made by Automotive Corp.	165	Sulphur Controlled by Government.	73	U. S. Employment Service to Recruit War Labor	209
Rubber Imports Increase in June	77	Sulphuric Acid Plants to Be Erected.	609	U. S. Rubber Co.'s Earnings Show Big Increase	336
Rubber Imports Drop Slightly	383	Sun Motor Car Co.'s Plant Sold	523	U. S. Employment Service Plans	120
Rubber Imports Decline	475	Sunday Closing Plan Mixed Up	258	U. S. Rubber Sales \$10,000,000	123
Rubber Imports Still Decline	692	Supreme Motors Corp. to Build Engines	695	U. S. Rubber to Issue Notes	565
Rubber Imports	897	Swope, Herbert Bayard, Asst. to Baruch	388	U. S. Rubber Sells \$6,000,000 Notes	731
Rubber Imports Gain in October	853	Tank Credited to America	42	U. S. Rubber Record Earnings	981
Rubber Import Licenses, Individual	850	Target for Aviators	515	Universal Motor Co. Increases Capital	984
Rubber Imports Still Decline	1072	Tax on Car Owners Cut 50%	693	Universal Products Co. to Make Cars	984
Rubber Restrictions Removed	1072	Tax on Cars May Be 10 Per Cent.	72	Utz, Jack, Back with Standard Parts	646
Rural Express for Michigan	125	Tax on Cars Trebled; Trucks, Doubled	433	Velie Develops Kerosene Device	523
Rural Express Lines, More, Started	125	Tax on Electric Trucks Protested	516	Velie Reduces Price	1068
Russia to Receive Economic Aid	854	Taxation of Cars Protested	344	Victor Talking Mch. Co. Builds Airplanes	347
Russian Bureau Organized	1023	Tax on Cars Cut to 5%	640	Vincent Exonerated	978
Ryan & Baker in France	475	Tax on Cars Dropped, Federal	945	Vincent Returns to Packard	1022
Ryan, John D., 2nd. Asst. Secretary of War	351	Tax on War Profits in Controversy	247	Von Richthofen's Diary—I	827
Ryan's Office Moved	36	Tax of \$23,981,368 Paid, Automobile	1065	Von Richthofen Diary Extracts	878
Ryan, John D., Resigns from Aircraft Board	934	Taxation of War Profits by Treasury Plan	298	Wadleigh, C., Joins Republic Rubber	83
Safety Movement Important	902	Taxes Agreed on, Lower Car and Truck	296	Walden-Worcester Opens Chicago Branch	171
St. Louis Develops Return Loads Bureau	380	Teetor-Hartley Gets Government Order	171	Wall, Major, Promoted	30
St. Louis Production District Headquarters Established	257	Templar Adopts Thermoid Universal Joints	938	Walnut Needed for Propellers	124
Sales Directors Association to Be Formed	520	Templar Price Increase	129	War Apparatus, Effect of, on Commercial Design	905
Sale of War Materials	1064	Test of Kerosene Tractor, Plowing	221	War Automotive Exhibition Suggested	940
Salvage Division Formed	1121	Test for Airmen, Physical	384	War Department Wants Skilled Men	557
Salvaging Damaged Planes in France	681	Testing Five Types of Planes	378	War Industries Board Hears Value of Trucks	131
Samson Tractors Built by General Motors	215	Tin Controlled by War Industries Board	560	War Industries Board Issues Supplementary Priorities	249
Samson Tractor at \$650	939	Tin Stock Supply Investigated	513	War Industries Board May Control All Raw Materials and Finished Products	179
Sandusky Tire Starts Plant	126	Tire Filler Makers Convene	472	War Industries Board Sections Taken Over	1121
Sanford Price Increase	167	Tire and Tube Production, 50% Cut During August and September	204	War Industries Board Withdraws Pledges	1114
Saxon Moves Service Department	129	Tire Production at 50%	603	War Industries Board Controls Pig Tin	560
Saxon to Make Class AA Trucks	383	Tire Sizes, Concentrated on 9 Cars	30	War Industries Board Co-operates on Contracts	892
Scharon, W. A., Joins Hyatt	38	Tire Sizes Standardized, 14 Solid	603	War Industries Board Controls Foreign Shipments	561
Schenck, Charles, Resigns	83	Tires, Solid, to Be Standardized	76	War Industries Board Production Ruling	823
School Teachers as Shop Workers	71	Toledo Screw Gets Shell Order	130	War Industries Board to Be Abolished	1019
Schweppes & Wilt Enter Machine Tool Field	82	Tractor Concerns Aided by Surplus Stocks	653	War Industries Board Finishing Work	1070
Screw Thread International Standards	1098	Tractor Course Planned by University of Illinois	163	War Labor to Be Recruited	209
Scripps-Booth Prices Increased	213	Tractor Curtailment Discussed	521	War Labor Board Recommends 8-Hour Day	34
Seaplane Carries 50 Passengers	977	Tractor Curtailment Protested	657	War Material Sale	1064
Selden Increases Price	1068	Tractor Curtailment Order Modified	849	War Problems to Be Discussed, After	898
Selden Declares Dividend	1076	Tractor Demonstration for Pennsylvania	434	War Purchases to Be Centralized	124
Senate Aircraft Report	741	Tractor Housing a Big Problem	217	War Revenue Tax Nets \$23,981,000	247
Senate Aircraft Report Testimony Extracts	699	Tractors Investigated by New York State	942	War Service Committee for Highways Industries	944
Service for Tractors to Be Organized in Wisconsin	336	Tractor Operating cost in Corn Belt	197	War Trade to Aid Russia	854
Service Truck Capacity Doubled	166	Tractor Production in 2½ years	859	War Trade Board Considers Import Applications	1071
Shipping Airplanes, Methods of	341	Tractor Production Regulations	605	War Workers to Have Badges	121
Shows Abandoned During War	432	Tractor Production Strictures Modified	812	Warner, Harry J., Joins Federal Truck Co.	214
Shows Abandonment Urged	471	Tractor Production Started, Artillery	1096	Wasson Takes Bosch Plant	171
Shows Abandoned for 1919, National	890	Tractor Purchases to Be Financed	297	Watson Heads Hispano-Suiza Engine Section	688
Shuler Axle Mfg. Co. Moves	1066	Tractor Restriction Removed	1019	Wedder, H. G., Joins Army	38
Sibley, H., Joins Packard	38	Tractor Sale Prospects in Australia	415	Welch, C. J., Promoted	38
Sieverkropp Builds 24-Cyl. Aviation Engine	737	Tractor Service to Be Organized in Wisconsin	336	Wermes, F., Joins Dart	164
Signal Corps Loses Aircraft Supplies	434	Tractor Tests, Useful Data from Harrisburg	530	Westinghouse to Close Indianapolis Office	859
Signal Corps Accomplishments	1077	Tractor Tests at Hempstead	731	Wheel Manufacturers Organize	382
Silver, C. F., Loses Wire Wheel Suit	293	Tractors at Wisconsin State Fair	295	White, Bishop, Died	780
Simplex Will Be Continued	1076	Tracy, J., to Conduct Tests	73	White, James L., Dies	694
Skilled Men Required by War Department	557	Trade Acceptances as Regarded by Business Man	584	White, W., Heads Transport Operations	30
S. K. & S. Co. Bought by General Motors	603	Trademark and Patent Laws of Argentina	192	Whitman, G. C. Joins Oakland	170
Slater, William J., Joins Williams Fdry. & Mch. Co.	298	Trademarks on Goods, National	297	Wichita Motor Adds Tractor	727
Smith & Egge Mfg. Co. Oiling System	647	Trademarks, German Piracy of American	966	Wilcox Making Army Tents	82
Smith & Hemmway Adds	40	Traffic Offices for Government Established	295	Williams, John R., Joins Dart	164
Smith Motor Truck Corp. Sold to John Campbell	812	Traffic Trucks to Be Shown at Chicago	171	Williams Heads Highways Industries Association	1119
Sparks-Withington Infringes Stewart	1026	Transport Truck Co. Elects Officers	260	Willys-Overland Declares Quarterly Dividend	981
Spruce, Men Called to Cut	120	Transport Truck in Production	1118	Wilson, Charles, Curtiss Vice-President	605
Spruce and Fir Output Nears Requirements	210	Transportation Co. Employees Get Deferred Classification	521	Winborn, B. R., Promoted	83
Square Turn Tractor Moves to Norfolk, Neb.	654	Trego Gets Ordnance Contract	121	Winningham, C. C., Resigns	83
Squires, John, to Leave Signal Motor Truck	388	Truck Output Maintained	471	Winningham, C. C., Appointed Oil Chief	204
Standard Aircraft Elects Two Directors	567	Truck Program for Army Settled	167	Winningham Out of Oil Division	737
Standardization of Screw Threads	1098	Trucks and Cars to Be Taxed on Cost	204	Winther Building New Factory	299
Stanley, Francis E., Dies	250	Trucks Classified as Essential	291	Wire Cutter Demonstrated	117
Steel and Iron Limited for Tractors	555	Truck Curtailment Protested	554	Wire Wheel Corp. Makes Government Agreement	258
Steel and Iron Price Unchanged	559	Trucks, Essential Nature of, Described	131	Wire Wheel Corp. Wins Over C. T. Silver	293
Steel Consumed Mostly by Railroads	383	Truck Essential Use Defined	559	Wisconsin Bars Foreign Corporations	253
Steel Decision Held Up by Delayed Inventories	261	Truck Importance Emphasized by Highways Transport	555	Wisconsin to Organize Tractor Service	336
Steel in Factories to Be Inventoried	116	Trucks Important at Chateau-Thierry	733	Wisconsin Duplex Auto Co. in Production	255
Steel Inventories Asked	437	Trucks Important in Food Haulage	851	Wisconsin Duplex Auto Co. Now Oshkosh Motor Truck Co.	481
Steel Lack Causes Production Cut	117	Truck Mail Service Development	1034	Wisconsin Motor Mfg. Co. Increases Capital	1024
Steel in Sight for Cars	31	Truck Order Cancellations Modified	937	Woelfel, G. J., Resigns	83
Steel Prices Controlled by Government	861	Truck Order Not Cancelled	1019	Woelfel, George, Joins Zincke	170
Steel prices to Remain Fixed	891	Truck Parts Makers Position Critical	1019	Wolverine Truck, First, Out	75
Steel Requested by Canadian Automobile Makers	208	Truck Prices Paid by Government	771	Women Efficient in Metal Trades	164
Steel Restriction to Cease Jan. 1	1019	Truck Production by Car Concerns Halted	596	Women in Industry, Hazards to, Studied	163
Steel Shipments Without Priorities	43	Trucks Purchased by Army	1069	Women Must Be Employed to Greater Extent	478
Steel Situation Considered	860	Truck Repair Depots in Six Cities	732	Women to Be Health Officers	40
Steel Supply Assured for Trucks	131	Truck Repair Depot, Camp Holabird	1052	Women Working on Airplanes	78
Steel in Open Market	898	Trucks Show Saving on Wagon Costs	858	Women's Division in Labor Department	171
Stegeman Becomes Parker	438	Truck Tax Doubled; Car, Trebled	433	Woodin, T. C., Joins Champion	83
Stevens Making New Body Model	166	Trucks Used for Mail	35	Woodward, W. L., Promoted	38
Stewart Patent Infringed	1026	Turnbull Sales Transferred	903	Workers, 300,000, Needed in War Industries	78
Stinson Tractor Co. Buys Stillwater Plant	685	Turner, Frank, Is Buick Comptroller	983	Wrench Makers Conserve	473
Stocks Being Investigated	646	Twin City S. A. E. Discussion of Air Cleaners	652	Wright-Martin Buys Bosch Plant	81
Store Door Delivery for New York	80	Union Switch Adds Equipment	174	Wright-Martin Production, June	31
Streator M. C. Co. Foreclosed	555	United Motors Corp. Acquired by General Motors	645	Wright-Martin Financial Statement	768
Stroh Castings Enlarges Plant	82	United Motors Dissolves	854	Wyckoff, J. B., in Washington	127
Studebaker Adds Sedan	74	United Motors Corp. Taken Over by G. M. C.	207	Zaughop, C. W., Joins Hurlburt	38
Studebaker Discontinues Car Production	512	United Motors Service Expands	129	Zweibel Bros. Co. Incorporates	296
Studebaker Gun Carriage Christened	380	U. S. Carburetor Starts Plant	82		
Stutz Profits Decrease \$221,912	432				
Sullivan, E. F., Joins Homer-Laughlin	170				





JUL 8 1918.

# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

Vol. XXXIX  
No. 1

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NEW YORK, JULY 4, 1918

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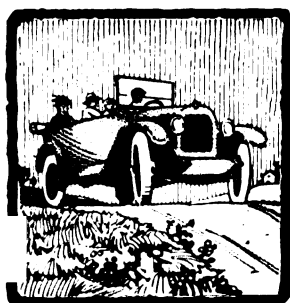
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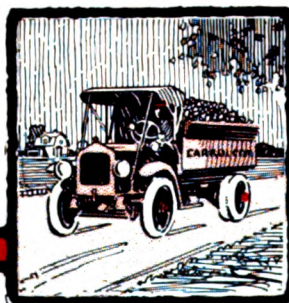
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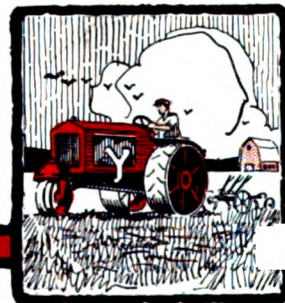
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# AUTOMOTIVE INDUSTRIES

## AUTOMOBILE

VOL. XXXIX

NEW YORK—THURSDAY, JULY 4, 1918—CHICAGO

NO. 1

## Complete Inspection Procedure for Airplane Engines

Inspection Work in Engine Factories Falls Into Four Divisions—A List of  
Things to Be Checked Under Each Heading

By Lieut. P. J. Piccirilli\*

**A**IRPLANE engine inspection may be conveniently divided under four headings, as follows:

- 1—Parts Inspection      3—Inspection on Test  
2—Assembly Inspection   4—Overhaul Inspection

In parts inspection each individual part is inspected separately. Under the name of each part is given a list of important dimensions and other features to be checked up. An inspection of any part under this heading should show whether its further consideration in the assembly is warranted.

It will be noticed that in the parts inspection in a good many cases a number of considerations are omitted to allow for a complete detail inspection. This is based on the writer's experience with airplane engines.

It was very often found that in carrying out a complete detailed inspection on parts, a great many times such parts would fail to pass. On the other hand, in assembling on the engine the same parts which were otherwise rejected would bear the proper relationship with other parts. Therefore, in most cases, to carry out a complete detail inspection on the individual parts, such as camshafts, crankshafts, gears, etc., might give rise to excessive rejection of such parts which, when assembled, would prove serviceable.

For this reason, the writer has included all these details under the second heading and discussed them in connection with the assembly. The advantage of this method of procedure from the points of view of production and salvage is evident. No comment is called for by headings 3 and 4.

### 1—Parts Inspection—Camshaft

1—A general survey by sounding the entire case is very advisable. This will give an idea as to the grade of

casting as a whole and indicate the existence of cracks or welds.

2—Make a careful scrutiny of the inside of the case and note the degree of porosity, especially in the various webs and bosses, paying particular attention to the presence of welds, checks or cracks. The main bearings and bosses should be examined very closely, as very often they are split when studs are set in.

3—Examine gear case for cracks or welds where the magneto base fastens on. See that hole for magneto drive is not bored oversize. Try all tap holes in gear case face with plug gage for oversize.

4—All camshaft bearings must be machined according to drawings. Pay particular attention to the stock under the front camshaft bearing, as the greatest stress due to whipping and vibration occurs at this point (propeller end). Carefully observe the holes drilled for camshaft retaining screws and see that they are not oversize or plugged.

5—Examine deck of upper half of crankcase and, in the case of V type motors, closely watch apex, noting possible cracks, checks or degree of porosity, welds, etc. Note carefully the amount of stock at breather pipe studs and make sure that it is sufficient. Insufficient stock at this point might cause a weakening of surrounding material where studs are set in place. Above all, note that the decks are of equal thickness.

The case should be properly faced for cam follower guides. Cam follower guide holes and cylinder holes should be chamfered. This is to allow these assembled parts to lie flush. Removing all feather edges will also improve resistance of material at the above points.

Allow no defective metal, plugs or welds in the walls between the cylinder decks and the case flanges; also be sure that all engine tie-down lugs are of substantial material, not tolerating defective material of any de-

\*Lieut. P. J. Piccirilli supervised the construction of several hundred Curtiss airplane engines at the Hammondsport plant.

scription, as all stresses due to thrust are transferred through these parts.

See that the case flange is of the proper thickness to give sufficient strength.

6—See that all main bearing shells are tight in place in the bore all around, and flush with the top of the case, being sure to observe that they do not come below the case level, so as to provide a proper fit when the cap is put in place. Otherwise you may have a loose main bearing shell.

Be sure to have all main bearing studs tight in the lugs, and see that the lugs were not cracked when the studs were put in place.

Screws in the main bearings holding the bearing to the case should not be too near the surface of the bearing metal, and the babbitt should be countersunk.

7—In the main bearing caps note the condition of the babbitt and allow no cracks, checks or excessive porosity.

Note possible cracks at stud holes. Cracks in main bearing caps are apt to occur at this point. Very often main bearing caps are injured by turning down the nuts without the washers or plates being in.

8—All case clamping studs want to be tight in the case and of proper height. Note the condition of the threads.

9—See that the gear case face is machined to allow the proper clearance between the gear case cover and the half-time (magneto) gear. Also observe that the screw bosses allow the proper clearance for the magneto gear.

10—Lower half of crankcase should be carefully scrutinized and the degree of porosity noted. Look for cracks, welds or defective material, especially at corners.

In conclusion, see that both upper and lower halves are scraped clean and all sand or dirt is removed.

#### Camshafts

- 1—Check over all measurements of intake cams.
- 2—Take measurement of rear bearing.
- 3—Take measurement of front bearing.
- 4—Take measurement of gear bearing.
- 5—Size of all front bearings and gear bearings (micrometer).
- 6—Scleroscope test of cams and bearings.
- 7—General inspection as to physical properties.

#### Cam Follower Assemblies

- 1—Inspection for alignment of cam followers in guide.
- 2—Scleroscope test.
- 3—General inspection as to physical properties of cam followers and guides.

#### Camshaft Gears

- 1—Sizing of bored or reamed hole.
- 2—Inspection in gear center fixture to insure free running.
- 3—Inspection as to physical properties and finish.

#### Carbureters (Assembly)

This includes a general inspection of the assembly work as follows:

- 1—Inspection of the throttle valve as to fit and alignment.
- 2—Inspection of the throttle valve lever.
- 3—Inspection of the hot air valve and lever.
- 4—Inspection of the wiring of screws.
- 5—Inspection of body, noting degree of porosity.
- 6—Checking up settings.
- 7—See that slow speed adjustment is not plugged.

#### Crankshafts

- 1—Length over all from thrust bearing cap to half-time gear.

- 2—Height and width of propeller hub key.

- 3—Micrometer dimensions of each bearing and crank pin.

- 4—Inspection as to checks in main bearings and crank pins.

- 5—General inspection of half-time gear and oil drive gear.

#### Cylinders (Assembly)

- 1—Length of rocker arm support and manifold studs.
- 2—Dismantling of valves to get size of valve stem guides, condition of valves and valve seats in cylinders, testing of valve springs for pressure.
- 3—Size of bore for out-of-roundness and taper.
- 4—Height from rocker arm support seat to tie-down flanges.
- 5—General inspection of jackets for porosity.
- 6—Test with thread gage of spark plug hole and inlet water nipple.
- 7—Water test, 80 lb. per sq. in.

#### Intake "Y" Assembly

- 1—Inspection of all studs for length and condition of threads.
- 2—General inspection for porosity and condition of finish of inner and outer surfaces.
- 3—Inspection for cracks around stud bosses and water test.
- 4—Water test, 80 lb. per sq. in.

#### Intake Manifolds

- 1—Length of stud bosses.
- 2—Gaging manifold coupling stud hole threads.
- 3—Inspection of inner and outer surfaces.
- 4—General inspection for porosity.
- 5—Alignment of part flanges.
- 6—Water test, 80 lb. per sq. in.

#### Intake Manifold Coupling

- 1—Inspection of inner and outer surface.
- 2—General inspection for porosity.
- 3—Water test, 80 lb. per sq. in.

#### Oil Pump Assembly

- 1—Gaging master gear shaft which drives oil-drive pinion.
- 2—Clearance of gears and running condition of same.

#### Oil Drive Assembly

- 1—Gaging master gear fit in pinion.
- 2—Gaging pinion fit in bracket.
- 3—Checking trueness of bore in bracket to facing of pinion.

#### Piston and Connecting-Rod Assemblies

- 1—Weighing within limits of  $\frac{1}{8}$  oz. total variation.
- 2—Testing of frictional resistance of piston pins in piston.
- 3—Checking skirt for size and distortion with micrometers.

#### Pistons

- 1—Getting side clearance of piston rings with feeler gage.
- 2—Condition of piston pin bearing after being rolled in.
- 3—General inspection for cracks and porosity.
- 4—O. D. of top and bottom of piston.
- 5—Depth and width of ring grooves.

#### Connecting-Rods

- 1—Gaging size of bearings with plug gage.
- 2—See that rods are of proper hardness as may be indicated by scleroscope or Brinell tests.

3—Note length of bolt lugs.

4—General inspection as to porosity, bolts, nuts and bore of bearing.

#### Propeller Hub Assembly

1—Testing with plug gages to determine proper taper and size.

2—Inspection of fit of nuts, radius of bolt heads, cotter pin holes, fit of propeller hub lock nut and tension of propeller hub nut lock spring.

3—Inspection of keyway with gage to see that key is central.

#### Piston Pins

1—Scleroscope test.

2—Location of lock screw holes.

3—General inspection of outer and inner surface.

4—Check up outside diameter for size.

#### Piston Rings

1—Check width with micrometer.

2—General inspection of physical properties.

#### Valve Action Assemblies

1—Inspection of clearance between rocker arms and yokes.

2—Fit of push rod threads in yokes.

3—Distortion of push rods.

4—File test of tappets for hardness.

5—General inspection for cracks and assembly workmanship, note degree of porosity and watch out for soft solder spots.

#### Thrust Bearing

1—General running condition.

2—Obtain width and outside diameter of bearing.

#### Water Pump

1—Note end thrust of shaft.

2—General inspection for porosity of bodies and assembly workmanship.

3—Inspection on hot water running test for leakage.

#### Pressure Pumps

1—Inspection of general running condition at 4 to 5 lbs. pressure.

2—Inspection of bodies for porosity and assembly workmanship.

#### Crankshaft (Balancing)

1—Inspection for static and dynamic balance.

2—Inspection for width and thickness of cheeks.

3—Inspection for fit and finish of oil plugs.

4—Inspection for misalignment of bearings.

5—Gaging propeller hub taper.

6—Gaging thrust bearing lock nut and propeller hub nut threads.

7—Gaging dimensions of propeller hub keyway.

8—Check for trueness.

#### II—Assembly Inspection

Following is a list showing operations for the complete motor which will be referred to numerically in discussing Assembly Inspection:

1—Tap and stud case.

2—Cut fillets and ream.

3—Fit gear covers and clean case.

4—Fit cam followers and cam shaft.

5—Fit crankshaft and oil drive.

6—Fit connecting rods and breather pipes.

7—Fit cylinders.

8—Fit manifolds and valve actions.

9—Fit magnetos, timing wiring.

10—Fit lower half, gear case covers and magneto cover.

11—Fit intake pipes, water pump and carbureter.

#### Belting

1—5-hr. limber run. 2—5-hr. official run.

#### Assembly Inspection Details

##### OPERATION 1. Studding.

1—All stud holes are to be hand-tapped to size and should be slightly countersunk on the inside of the case.

2—All studs are to be hand-threaded to size and all nickel is to be removed from the case end of same, in case of nickeling.

3—All studs should be tried to see that they are absolutely tight in the case.

4—At this point in the assembly the studs are not to be drilled for cotter pins.

5—Note proper location of name plate.

##### OPERATION 2. Reaming of main bearings.

1—Examine all main bearings carefully and note degree of porosity or defective babbitt. Be sure that there is sufficient bearing metal for reaming and that it has a good bond with the shell. Also see that the shell fits tight in the case bore.

2—Examine all grooves and oil retainers to see that they are machined to drawing; also that all screw heads are set deep enough to have sufficient clearance after bearings are finished.

3—After main bearings are finish-reamed in the case, try them for alignment by inserting a testing bar 0.001 in. smaller in diameter than the main bearings. Note that the bar can be rotated freely by hand and moves through the bearings without springing.

4—All bearings must be reamed 0.002 in. larger than the crankshaft main bearings, with a 0.0005-in. tolerance under or over. These working limits on the bearings are determined by plug gages. No burnishing or scraping should be tolerated. The main bearings are to be reamed smooth.

##### OPERATION 3. Case cleaned.

1—Note that fits of gear case cover, magneto drive half covers and thrust clamp are correct.

2—Oil grooves should be cut in thrust clamp and must correspond with those in the lower half.

3—The case should be scraped smooth and all sharp corners removed, and the case should be washed clean with gasoline before proceeding with next operation.

##### OPERATION 4. Camshaft and cam followers assembled.

1—All cam follower guides are to be properly fitted to the case.

2—Examine cam followers for cracks and checks, and see that they have the proper clearance in the guides and do not bind. See that the case is spot-faced under the retaining screws and that they are tight in the guides.

3—See that the cam bearings fit tight in the case and that the camshaft rotates freely in the bearings. All bearings must be reamed 0.0015 in. larger than the camshaft journal, with a 0.0005-in. tolerance under and over. The shaft must have at least 0.002 in. end-play and not more than 0.006 in. end-play. See that the cam followers follow the cams properly.

4—Examine the front cam bearing carefully for cracks.

5—See that all pilot screw holes are tapped to the correct size and that the under side of the screw heads fits flush with the boss.

##### OPERATION 5. Fitting of crankshaft and oil drive.

1—Before fitting crankshaft, examine all bearings carefully and see that they are free and clean.

2—Examine crankshaft, seeing that all pins and main bearings are free from checks, cracks or rust and have

all sharp edges removed from checks. Examine gear and see that all teeth are milled uniformly.

3—Burnishing bearings and scraping should not be allowed unless authorized by inspector. See that sides are filed for crankshaft end clearance.

4—Shaft must rotate freely in bearings. A minimum clearance of 0.045 in. is allowed between the cheek and the side of the bearings on the thrust side, and 0.025 in. on the opposite side.

6—After the crankshaft has been inspected and passed, remove the front bearing. Wire up the main bearing castle nuts. Drill and tap the holes and fix the studs for the oil drive pinion brackets.

7—Apply and fit the oil drive pinion bracket to the front bearing.

8—See that the shaft of the gear rotates freely in the bushing.

9—When fitting, try the gears and line them up. Back lash in the gears to be between the limits of 0.003 in. and 0.006 in. Outside diameter of oil drive to be central with shaft within 0.010 in. and bottom set level within 0.0015 in.

10—After it has been inspected and passed, remove bracket and front main bearing cap. Drill and tap threads in front bearing cap and bracket for retaining screws. Replace bearing cap and finally fix bracket.

11—Replace camshaft gear and try back lash, allowing a minimum of 0.003 in. and a maximum of 0.006 in.

#### OPERATION 6. Fit connecting rods and breather pipes.

1—Assemble breather pipes to case, noting thickness of flange and length of studs.

2—See that holes in studs are drilled correctly for cotter pins to line up with castellation of nuts. Assemble connecting rods and pistons to crankshaft pins. Burnishing of bearings should not be permitted. Examine bearings for porosity and poor bond between shell and bab-bitt.

3—When assembled, try for fit, seeing that all connecting rods have the necessary clearance between bearings and pin. The clearance here should be 0.0015 in. to 0.002 in.

4—See that all nuts have cotter keys and are pulled up snugly.

#### OPERATION 7. Fit cylinders.

1—Note the degree of porosity in the top and lower heads and see that the nickel-plating does not peel off, if the rod is nickel plated. Water jackets to be free from bad dents. See that no cracks occur around the studs and bosses of the water outlet seat. All nuts on the bottom flange of the cylinders must have lock washers and be snugly pulled up. Lock washers to be replaced with cotter pins in overhaul.

2—After cylinders have been fitted, inspect for line-up. Intake faces of cylinders are to be in alignment within 0.005 in. Intake manifolds to be in alignment within 0.025 in. Water outlet seats to be in alignment within 0.025 in.

3—Top of valve stems to be in alignment within 0.005 in.

#### OPERATION 8. Fit manifolds and valve action.

1—Assemble valve actions to motor.

2—Examine rocker arms and try clearance in bearing pins; also look for cracks and machine defects.

3—Turn the camshaft over with special socket wrench to try all valve actions.

#### OPERATION 9. Magneto timing and wiring.

1—Time motor from No. 1 cylinder and mark gears. Make out timing slip and place it with assembly operation

2—Fix name plate.

3—See that all wires are properly insulated. Note conditions of terminals.

#### OPERATION 10. Fit lower half, gear case covers, magneto covers.

1—Reverse motor on stand and rewash it.

2—Make general inspection to see that all is clean before pouring in oil. Oil must be absolutely clean and of specified grade.

3—Clean lower half of case and splash pans. Assemble lower half to upper half. All nuts on flange to be snugly pulled up.

4—Assemble thrust bearing and clamp. Try clearance between oil slinger and inside radius clamp, which should not be less than 0.010 in. all around. See that all fillister head screws are wired.

5—Fit gear case cover to motor. See that screw holes are not tapped oversize and threads not stripped. Clearance between gear case opening and crankshaft gear journal should be between 0.006 and 0.008 in.

#### OPERATION 11—Fit intake pipes, water pump, carbureter.

1—Assemble intake water pipe. See that all nuts on cylinder nipple joints are fastened tight. All rubber connections to be tightly fixed to prevent water leakage.

2—Assemble pressure pump and tachometer drive to motor. See that all fixture screws have lock washers and are snugly pulled up.

3—Assemble intake gas pipe, intake "Y" and carbureter, carbureter supports, brace, etc., to motor.

4—Try lever of butterfly throttle for opening and closing and tension of spring. Try lever of air intake. Try slow speed screws. See that carbureter is fitted and wired up properly and all parts are intact.

5—Assemble hot water pipes to motor.

6—Assemble oil feed pipes to motor.

7—Fix ignition tubes to manifold and set cables.

#### III—Overhaul and Test

1—After an engine has been overhauled or assembled it should have a limber run, in order that all new parts installed can work freely.

2—New engines generally are limbered by power other than their own at about 300 r.p.m., until the motor can be turned over freely by hand.

While thus being limbered motors should be inspected from time to time to note the following:

- (1) Cylinders overheating.
- (2) Overheating of water pump shaft bushings.
- (3) Knocks from piston pins.
- (4) Noisy valve actions.
- (5) All working parts to be well oiled.

3—Oil pressure is adjusted to a suitable figure at about 300 r.p.m. This is done at this time for the sake of convenience.

4. When the engine is run under its own power at 1400 r.p.m. the oil pressure should be between 45 lb. and 75 lb. The best results are usually obtained when the pressure is about 65 lb.

5—Engines having had a limber or belt run should then be given a limber run under their own power for 5 hr., starting the first hour at 900 r.p.m., the second hour at 1000 r.p.m., the third hour at 1100 r.p.m., the fourth hour at 1200 r.p.m. and the fifth hour at 1400 r.p.m.

6—Inspection must be made from time to time to note if the motor is running smoothly.

- (1) No oil leaks.
- (2) No water leaks.
- (3) Magnetos are working properly.

(Continued on page 10)



# Getting Skilled Men by Making Them

Turning Bath Attendants and the Like Into Skilled Machine Operators—What the Training Department of the Norton Grinding Co. Is Doing to Counteract Present Labor Conditions



*General view of the training department of the Norton Grinding Co., which shows clearly that, so far as equipment is concerned, it is just a regular machine shop*

FOR more than 2½ years, at the plant of the Norton Grinding Co. in Worcester, Mass., they have been training employees for special work in a school established for the purpose. They do not call it a vestibule school, and as the term is generally used to indicate that part of a plant where new employees receive a brief and sometimes superficial introduction to the mysteries of regular shop work, the designation "training department" employed by the Norton Grinding Co. is, in their case, more truly descriptive.

Each new employee who enters the training department receives special attention. There is no prescribed course or schedule of hours, days or weeks which govern the particular kind of instruction that is given or the length of time that a student-employee remains in the school. The chief object is to give the men a knowledge of fundamentals and a high degree of skill in a limited field. Just how long it takes an individual to acquire this skill depends entirely upon the natural aptitude of the man himself. Some students remain in the school for 2 and 3 weeks only, and others are there for as many or more months.

While no attempt is made to produce expert machinists, many of the graduates who had a natural gift for mechanics to begin on have shown a remarkable capacity to learn and have attained astonishing proficiency by the time they have finished their training.

The necessity for this school or training department

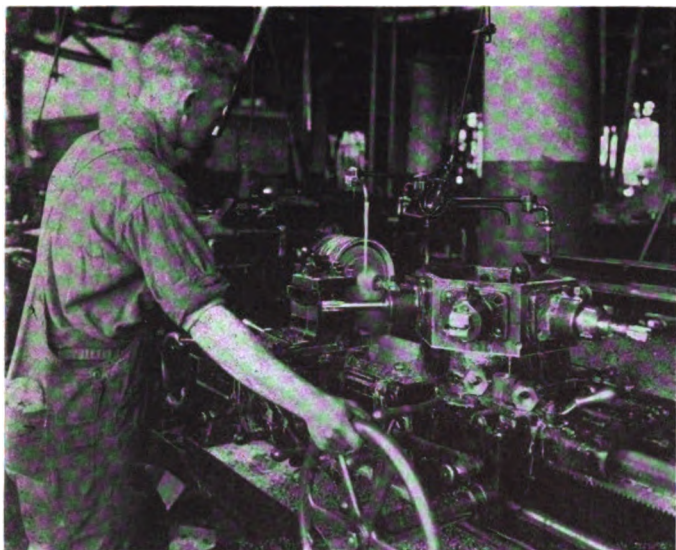
was made evident during the latter part of 1915, when it became more than ever difficult to obtain men who had previously been trained to the required degree of skill and the increased production demanded by war work made it impossible for the regular foremen to give their time to the breaking in of green help. In December of that year the training department was started and since that time over 300 men and boys have passed through it. The present rate of graduation, as it may be termed, is about five per week.

## Training Is Thorough

Only a little more than one-third of those who go through the school are retained in the employ of the Norton Grinding Co., not because the school fails to turn out a satisfactory product but because the men are, to a large extent, lured away to employment in other establishments. Several of the younger men who have gone through the school, some having had more than 4 months' training, have been accepted by the Navy as second class machinists. This fact alone would indicate that the training is thorough and that it is possible, under the system of instruction employed, to turn out mechanics of considerable ability.

The training department is located in a gallery in one of the mills of the Norton Grinding Co., and is 23 ft. wide by 264 ft. long, having an area of 6072 sq. ft. It has its own tool vault, washroom and toilets.





*A graduate of the training department. After 8 weeks' training he is operating a Warner & Swasey turret lathe, setting up his own machine, and earning about 45 cents per hour*

The machine equipment consists of 17 lathes, 2 vertical milling machines, 3 horizontal milling machines, 1 hand mill, 3 universal grinding machines, 1 shaper, 3 upright drills, 2 sensitive drills, 1 floor grinder, 2 arbor presses, 1 straightening press, 1 gas furnace and 130 ft. of benches.

This equipment was gathered from the various departments throughout the plant and, before the inauguration of the present system of training, was used in these departments for the purpose of instructing beginners. It is evident, therefore, that the training department does not add to the total floor space of the plant. It is in charge of one chief instructor and four assistants.

#### Regular Shop Work Used for Training

The school serves as an "odd job" department, and the instructors may commandeer work from any department in the plant if they happen to be short of that kind of work for instruction purposes. The cost of doing such work is not considered even when it amounts to several times as much as when done under regular production methods. It is considered a good investment to furnish the training department with whatever it needs in the way of regular work, as the cost of any particular job done there, no matter what it may be, is returned many times through the development of skilled employees.

Beginners in the training department are paid a regular wage according to age and previous experience. Men who have done such work as driving grocery wagons or have engaged in similar occupations are paid at the rate of 35 cents per hour. Boys of from 16 to 20 without previous experience are paid from 17 to 20 cents per hour.

As we have said, there is no definite length of time during which student-employees remain in the training department. In some cases it happens that only a few days are necessary to give those of natural intelligence and ability an amount of training sufficient to produce in them a high degree of skill. In other cases, they are in the school for several months. It is estimated that the average period of training is about 3

Foremen throughout the plant have instructions not to employ any unskilled help on production jobs. That is, they must not attempt to teach any beginners themselves how to operate machines or how to assemble them without first taking the matter up with the chief instructor of the school. This method insures the men in the school obtaining the opportunities that arise to get into the shop and at the same time does not prevent any foreman from getting into the school any one in whom he is interested.

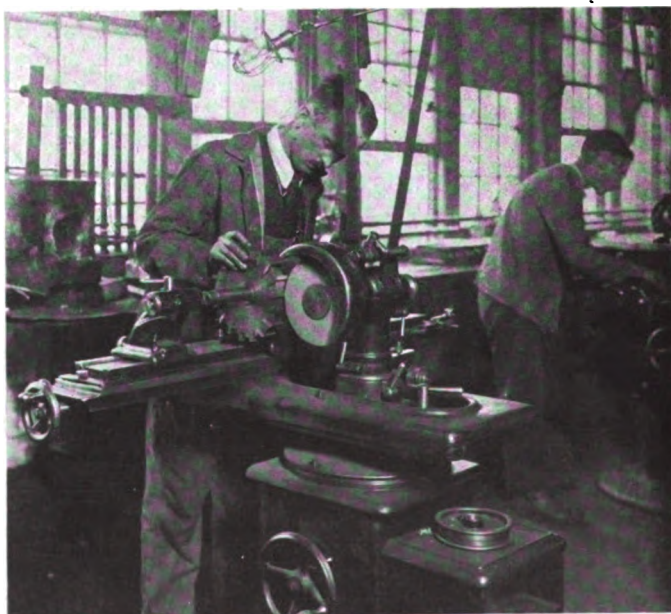
As opportunities in the shop arise, the chief instructor of the school takes the men he thinks best fitted to fill the jobs. He does not lose touch with these men immediately after they leave the training department, for it is a part of his work to watch them for a period of several weeks to see whether they are really suited for the work to which they have been put, and it is said that this plan has saved a number of good operators who started out on the wrong line and were eventually diverted to some other kind of work more congenial to them.

The cost department of the plant is notified as each man is sent from the school to the shop, and a special record is made of his work for the 6 months following in order to determine what his earnings are. In this manner an excellent idea is obtained of the value of the men who have gone through the company's training department and how they compare on regular shop work at long-established piecework prices with skilled men who have come through other channels.

It has been found that all but a very few have easily earned up to their day work rating, the average, in fact, being 10 cents per hour over this rating.

#### Some Transformations

It will be interesting to note one or two of the transformations which have been effected in graduates of the training department. A most interesting example of what can be accomplished in such a school is the present foreman of tool makers on the night shift. Incidentally it may be said that he is regarded by the company as being one of the best tool makers they have on their payroll. He had had absolutely no machine shop experience before he entered the training department.



*After 7 weeks' training this man, who had previously been a teamster, has a regular job in the production department sharpening milling cutters*



ment in December, 1915. He had been employed by a firm making paper bags.

A teamster who had also had 2 years' experience in a boiler factory, after 7 weeks in the school, is now in the shop sharpening milling cutters.

A designer in a corset shop, after 5 weeks in the training department, is operating a Brown & Sharpe universal grinder.

Another graduate who had no machine shop experience prior to entering the training department, after 8 weeks' training, operates a Warner & Swasey turret lathe, setting up his own machine, and earns 45 cents an hour or more.

A former attendant in a Turkish bath, after 2 weeks' training, is now in the production department operating a No. 3 Cincinnati horizontal milling machine, and the foreman in charge of the department says that he is a better man than he has been able to get directly through the employment department at the present time.

### The Reasons for a Training Department

A large number of men whose only experience had been in some branch of industry entirely foreign to the machine shop, after a few weeks' training have made milling cutters, machine reamers, arbors and other similar pieces under the supervision of the instructors.

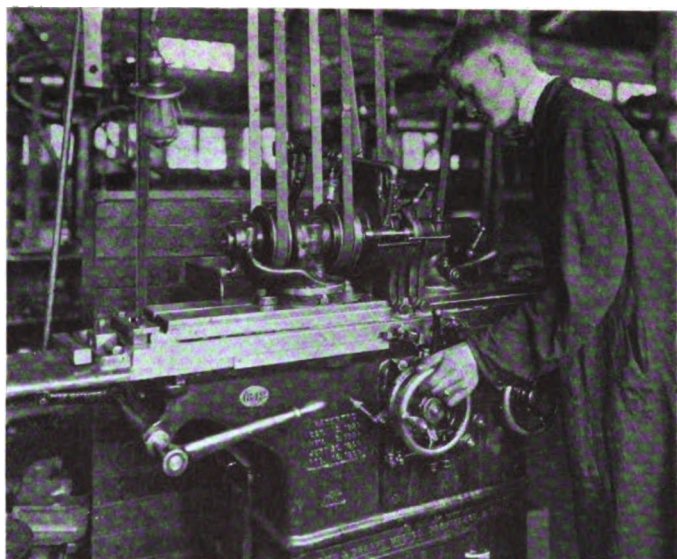
The considerations which led the Norton company to start its training department as stated by John C. Spence, the superintendent in charge, are:

1—Few men have the faculty to teach. Oftentimes the best workman is the poorest teacher. Hence it is easier to find one teacher and let him do the bulk of this work.

2—The press of output prevents a foreman from giving proper attention to beginners even if the foreman happens to be a good teacher.

3—It does not pay to have a high class executive foreman spend time on a beginner any more than a professor of mathematics in a college could afford to put his time into first grade work. In fact, in most cases, he would probably lack the real qualifications for first grade work, i.e., patience and human insight.

4—Unless the schooling is centralized, the corpora-



*Formerly a designer in a corset shop, this graduate of the Norton Grinding Co.'s training department after a 5 weeks' course is operating regularly a B. & S. universal grinder*

tion cannot readily carry out a fixed policy with regard to teachings other than mechanical, i.e., questions pertaining to honesty of product, citizenship, etc.

5—The influence on the future attitude of these men toward each other and toward industry depends largely on the impression made upon them at the start. This should be controlled as far as possible.

6—In a school, the beginner is sure of a variety of work, whereas the tendency in the shop is to give the beginner such a dose of whatever simple work he can do that he will not disturb the foreman again for some time, or as the boys say, enough to "hold him for a while."

7—The training probably costs less in the school than in the shop, although apparently not, as the true cost in the shop is almost always buried in departmental expense. It is there just the same.

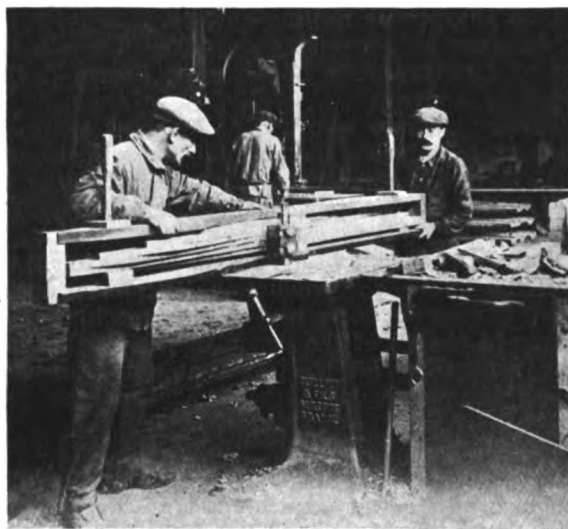


*A group of student-employees who are being trained for positions in the production department of the Norton Grinding Co. After a few weeks' training they will become expert operatives*

# Manufacture of Airplane Propellers



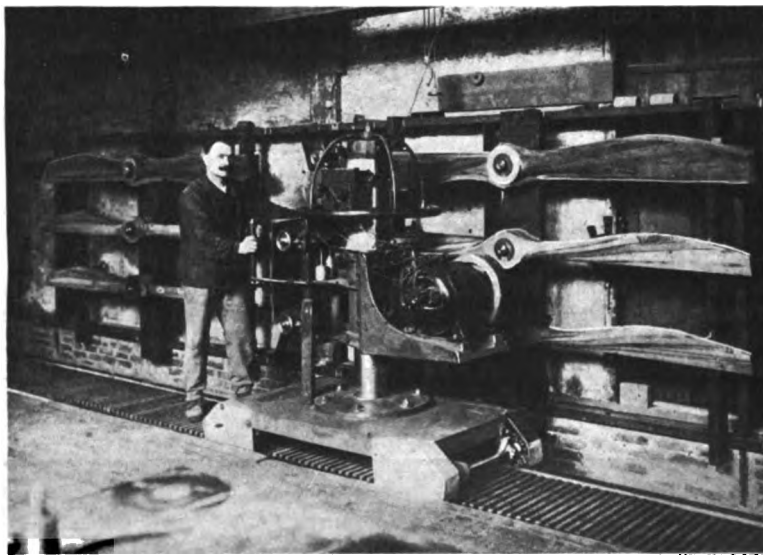
*The wood of which the propellers are made is first steamed in these special steaming boxes to make it sufficiently flexible to be easily bent to the required shape*



*This operation shows the press used in holding the thin wood laminations together during the process of fastening*



*The propellers are first sawn roughly to shape with a band saw, the final cut being made by machine*



*This is the machine that trims the rough-sawn propellers to their final shape. Three propellers are trimmed at once*



*In this operation the hubs are centered and fastened in place*



## As Carried On in a French Factory



*Before the propellers are finally polished they are accurately measured*



*Final inspection department, where propellers are subjected to minute scrutiny for imperfections in construction and finish*



*Putting the final touches to a 20-ft. propeller for a naval dirigible*



*Finishing department, where the propellers are varnished and polished*

*Putting on the copper tips, this being one of the last operations completed*





## Complete Inspection Procedure for Airplane Engines

(Continued from page 4)

(4) Take reading of water at inlet and outlet. Intake should be about 110 deg. and outlet 140 deg. F.

(5) Take reading of oil pressure.

(6) Look for oil leaks at thrust bearing and clamps.

(7) Oil leaks at magneto drive shaft oil deflector and crankcase joints.

8—At the end of 5 hr. run, valve clearance must be adjusted to proper valve.

9—Remove oil from sump and replace with clean oil. It is then ready for 5 hr. full power run.

10—Start engine and run 15 min. to warm up—then open up to full power 1400 r.p.m.

11—On this run very careful inspection must be maintained.

(1) Take readings of oil pressure, temperature of water inlet and outlet.

(2) Note overheating of cylinders.

(3) Note proper working of magneto.

(4) Take readings of torque in lb. and static thrust in lb.

12—At the end of 5 hr. full power run, the following defects may appear:

(1) Oil leaks at thrust bearing clamp ring, due to a poor gasket or loose thrust bearing clamp bolts.

(2) Oil leaks at thrust bearing clamp ring, due to not having enough clearance between ring and thrust bearing clamp. Nothing less than 0.010 in. to be tolerated.

(3) Oil leaks at magneto drive shaft.

(4) Inspect for water leaks on all cylinders, water connections and water pump packing glands. Observe carefully brazing of cylinder water jackets at bottom and top, as the brazing sometimes opens.

(5) Valve actions that are out of alignment will be noisy. Weak intake push rod springs will also cause noisy valve action.

(6) Inspect intake and exhaust push rod yoke pins for wear.

(7) Check valve clearance.

(8) Inspect manifold for cracks at flanges, air leaks at manifold gaskets, elbow gaskets, and carbureter gaskets. Air leaks at these points will make engine run uneven and prevent throttling down to low speed. The engine will also overheat.

(9) Carbureter should be checked up for the settings.

(10) Check oil consumption and temperature.

## IV—Overhaul Inspection

## 1—CYLINDER INSPECTION.

(1) Inspect cylinders for score in bore.

(2) Cracks in cylinder head at port holes and around studs. Dents in water jackets.

(3) Test valves with gasoline for tightness.

## 2—INSPECTION OF CONNECTING ROD AND PISTON ASSEMBLIES.

(1) Inspect connecting rod bearings for cracks, scores and porosity.

(2) Inspect pistons for cracks around pin bosses, supporting ribs and skirt. Piston must be free of scores.

(3) Piston pin lock set screw should be tight and wired.

(4) Test piston pin for bearing fit.

## 3—CRANKSHAFT INSPECTION.

(1) Inspect crankshaft main and pin bearing for checks, scored bearings and thrust bearings. Shaft must be clean inside and out.

## 4—CRANKCASE INSPECTION.

(1) Test all studs for tightness in crankcase.

(2) Inspect case very closely for cracks at cylinder stud bosses, bearing cap stud bosses and all supporting members and flanges.

(3) Main bearings must be free from cracks, scores and porosity—bearings countersunk for attaching screws and screws must be kept tight.

(4) Camshaft assembled in crankcase. See that shaft has end play of 0.002 in. to 0.006 in. Other clearances are explained in assembly inspection. All bearings must be tight in case and locked with retaining screws.

Camshaft gear tight on shaft and locked.

Inspect all cams, as checks may have developed.

## 5—LOWER CRANKCASE.

(1) Inspect for cracks at all corners and at oil pump.

(2) See that oil strainer is well soldered at top and bottom, also that supporting strips are well soldered.

6—Inspect gear covers for cracks and porosity.

7—After crankshaft has been fitted in case, it should be free from tight spots and turn freely by hand. All main bearing stud nuts to be securely cottered.

8—Inspection from here on is the same as in the first assembly.

9—Inspection of 1 hr. final test is same as in 5 hr. full power test, except that all readings are taken at 15 min. intervals.

Engines that have had one or two bearings replaced must have a 1 hr. limbering run and a 1 hr. test.

## 10—Final inspection of engines after 1 hr. test.

(1) All nuts to be cottered, except lower cylinder tie-down nuts which are locked with special washer lock.

(2) All screws to be locked with wire.

(3) Lower crankcase must be dropped on all motors that have had three or more bearings replaced. Inspect oil sump.

(4) Rocker arm lock set screws to be locked with wire. Engine to be cleaned and all steel parts covered with oil before shipped.

## 11—OVERHAUL OPERATIONS.

(1) Tear down motor.

(2) Wash and return.

(3) Grind valves.

(4) Clean piston and connecting rod assembly.

(5) Fitting crankshaft and connecting rods.

(6) Replace cylinders, lower pan and cotter up.

(7) Replace manifolds and valve actions.

(8) Replace water pump, carbureter, water pipes finish for test.

Return from test for final adjustment for shipping.

# Airplane Nomenclature

## Names of the Different Types of Planes Used in Warfare and of Their Principal Parts, Together with Expressions for Features of Airplane Design

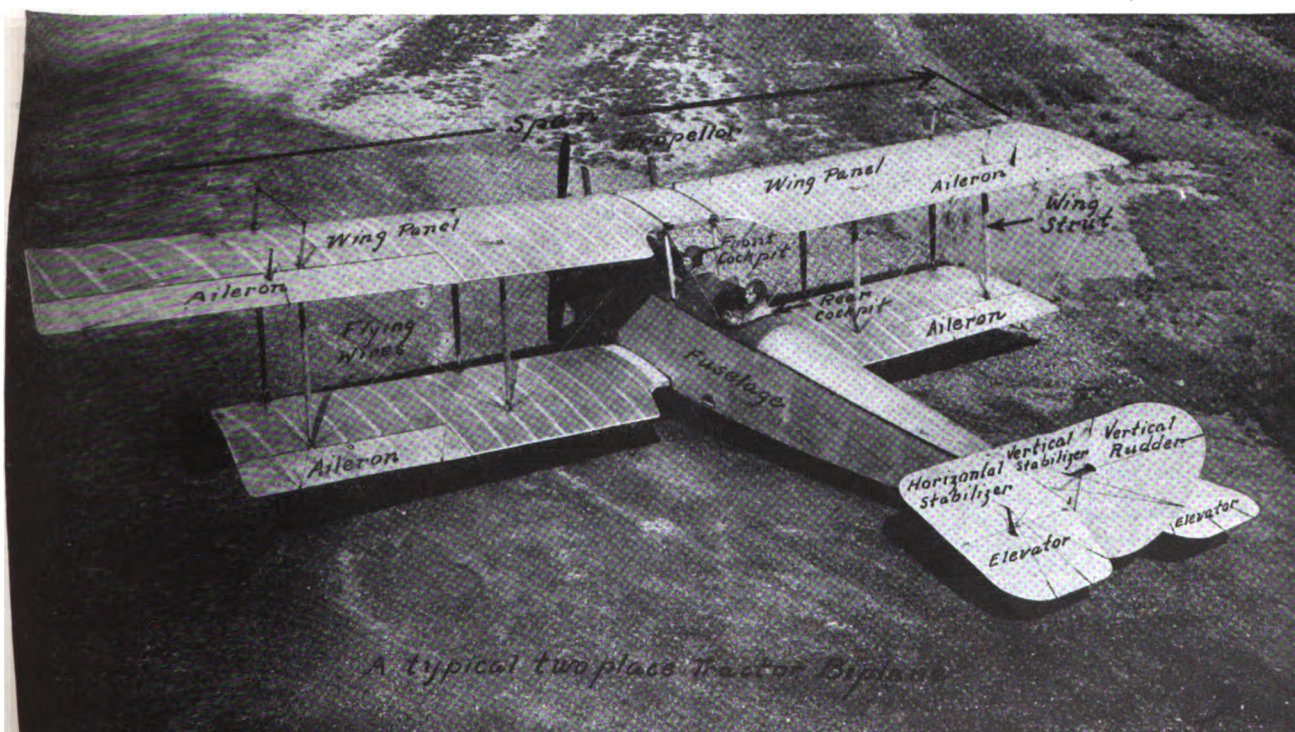
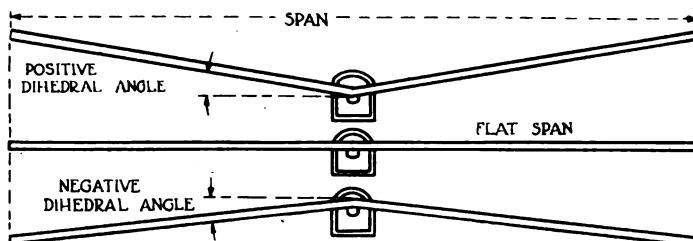
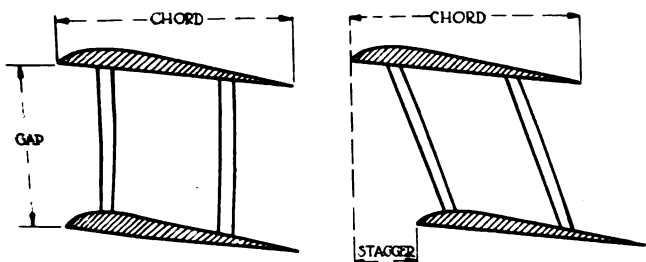
**T**HE illustrations shown on this and the following pages are reproduced from F. L. Faurote's paper on Airplanes of To-day read before the Society of Automotive Engineers at Dayton recently. Familiarity with the terms used in aeronautics will enable the reader better to follow discussions on aircraft topics. For the purpose of illustration, Mr. Faurote used the standard training machine known as the JN-4D. This machine is a bi-plane of the tractor type, a two seater primary training plane equipped with a 90-hp. eight cylinder aircraft engine.

The illustrations also show the different types of airplanes defined by Mr. Faurote in his paper reprinted in AUTOMOTIVE INDUSTRIES last week. Mr. Faurote divides military airplanes into five classes, viz., combat machines, reconnaissance and photograph machines, battleplanes, bombers, flying boats and hydroplanes.

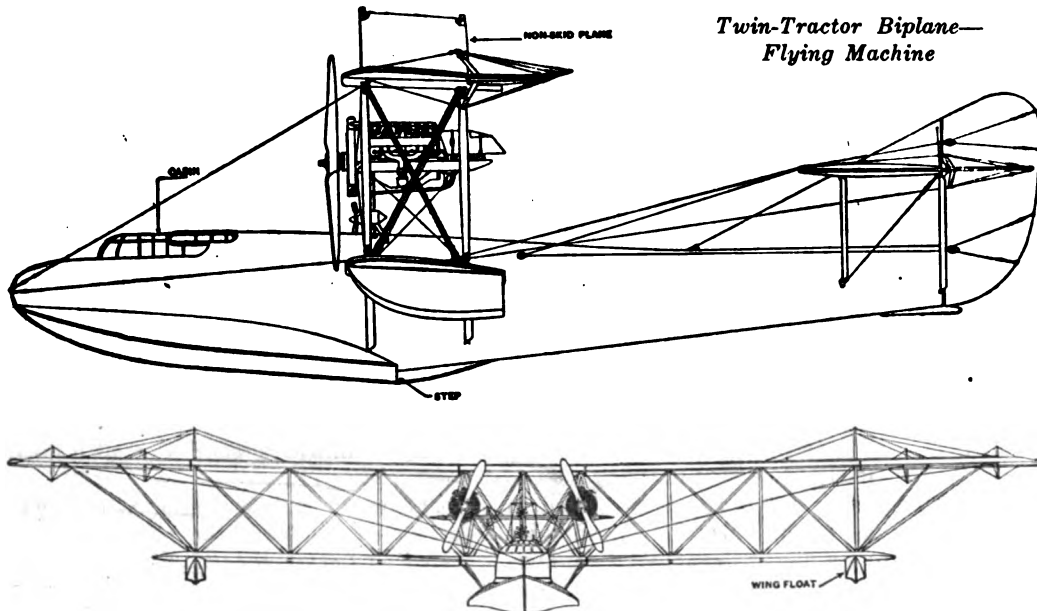
Mr. Faurote's plan of writing the names of the parts on a large sized photograph of the complete plane has much to commend it. In this way the relation of the

part named to the whole plane is at once made evident. General characteristics of the design, such as span, gap, chord, angle of incidence, dihedral angle, stagger, etc., are illustrated by diagrams in a very clear manner. While to not a few of our readers the terms illustrated and described are household words, to others they are new, and as at the present time practically every one is interested in aircraft and aircraft literature, this brief contribution to the subject of aircraft nomenclature should be of general interest. One cannot well begin the study of any technical science without a good knowledge of its nomenclature.

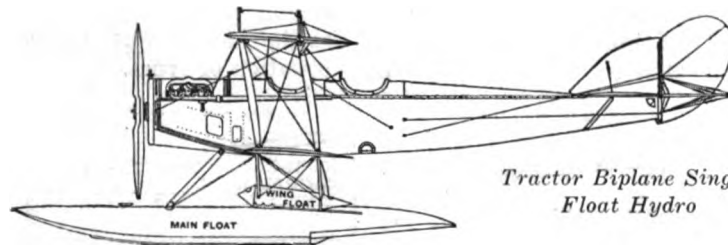
The rapid strides which have been made in aircraft development during the past four years are well illustrated by the number of different types evolved. In military operations quality of equipment is a very important factor, and in order to secure high quality for any particular purpose, that one purpose must be kept in view to the exclusion of everything else. This leads to multiplication of types.



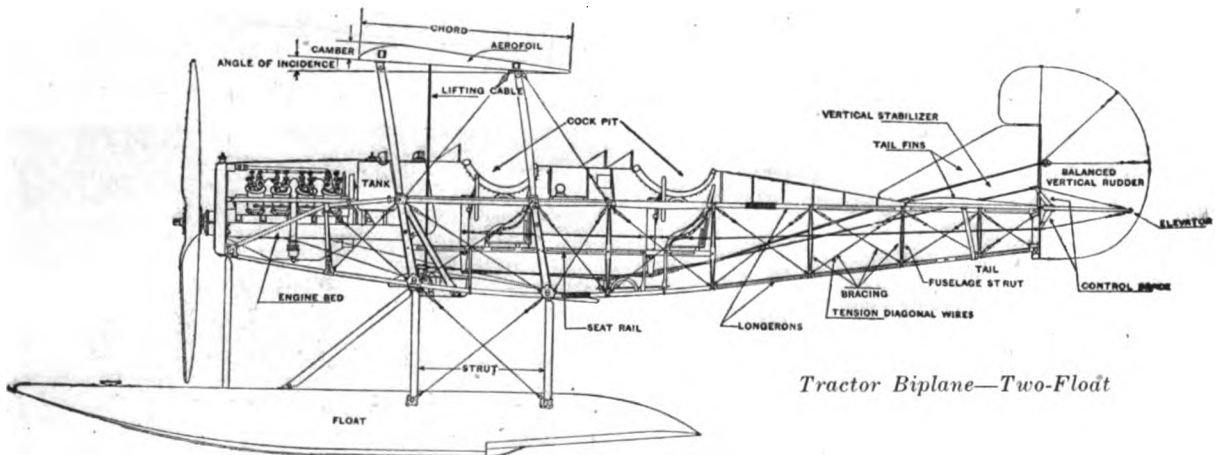
# Airplane



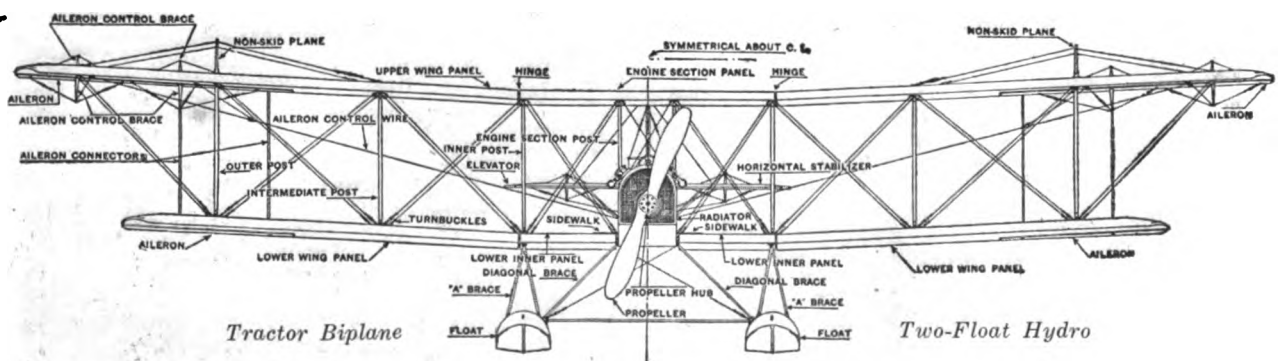
*Twin-Tractor Biplane—  
Flying Machine*



*Tractor Biplane Single  
Float Hydro*



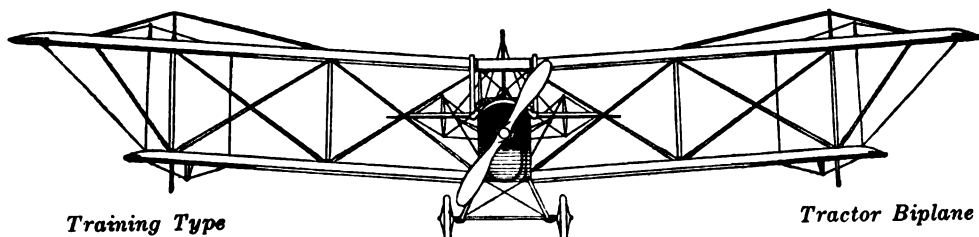
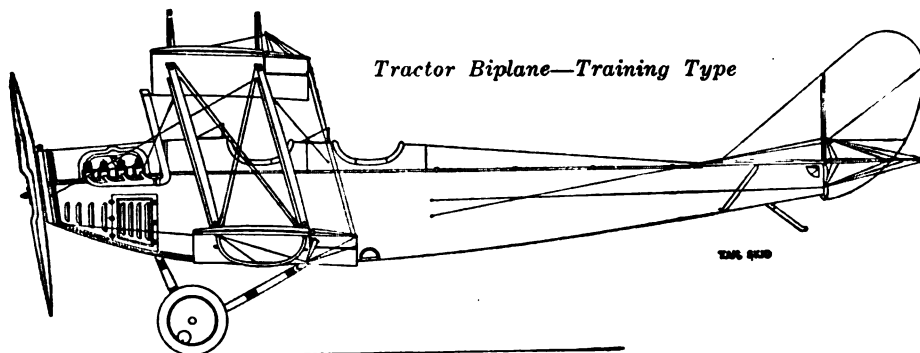
*Tractor Biplane—Two-Float*



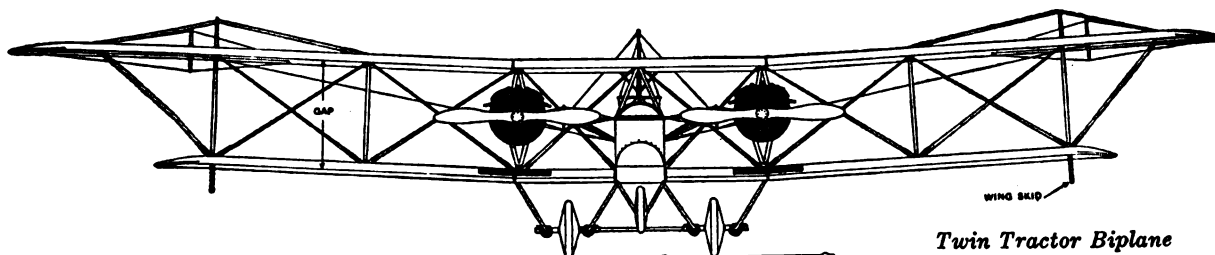
*Tractor Biplane*

*Two-Float Hydro*

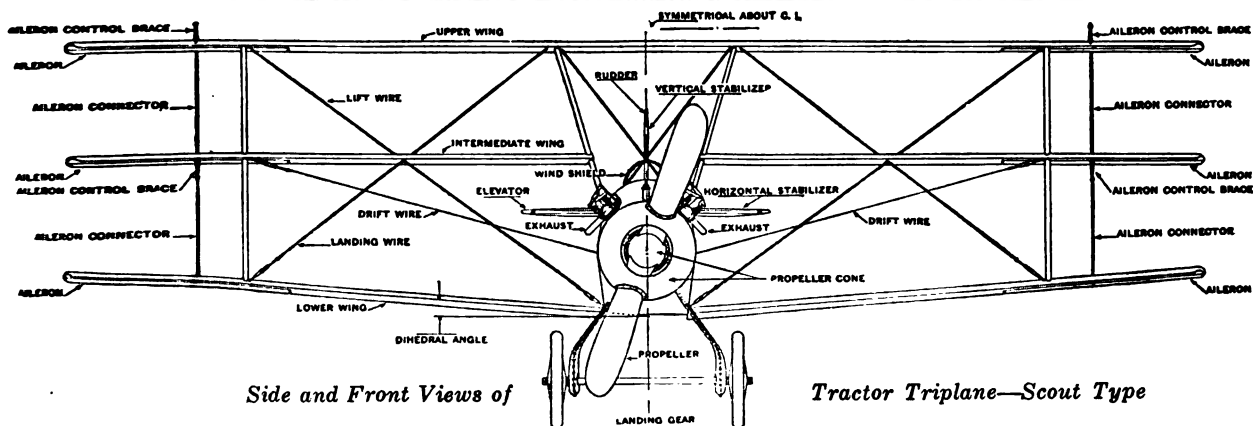
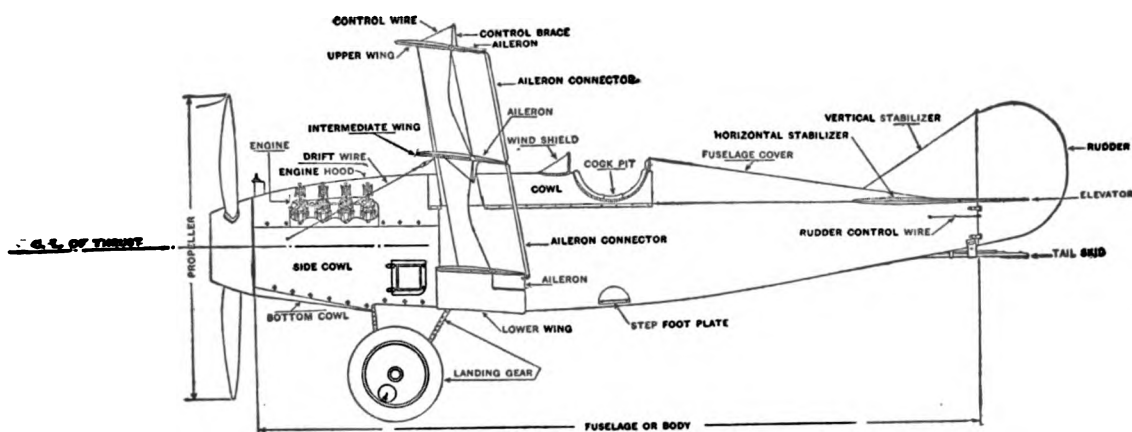
## omenclature



Tractor Biplane



Twin Tractor Biplane



Side and Front Views of

Tractor Triplane—Scout Type



# War Airplanes of To-Day

## A Comprehensive Collection of Photographs and Descriptions of the Scout, Reconnaissance, Battle and Bombing Planes and Flying Boats in Use in the World War

**I**N his paper, "Airplanes of To-day," which was read before the summer meeting of the Society of Automotive Engineers, Fay Leon Faurate of the Curtiss Aeroplane & Motor Corp. illustrated and described in detail the various types of airplanes in use to-day by the warring powers in Europe and in the training schools in America.

Several of the types which Mr. Faurate took up have already appeared with complete descriptions in past issues of *AUTOMOTIVE INDUSTRIES*. On the following pages we are reproducing illustrations and descriptions of those planes which have so far not been treated fully

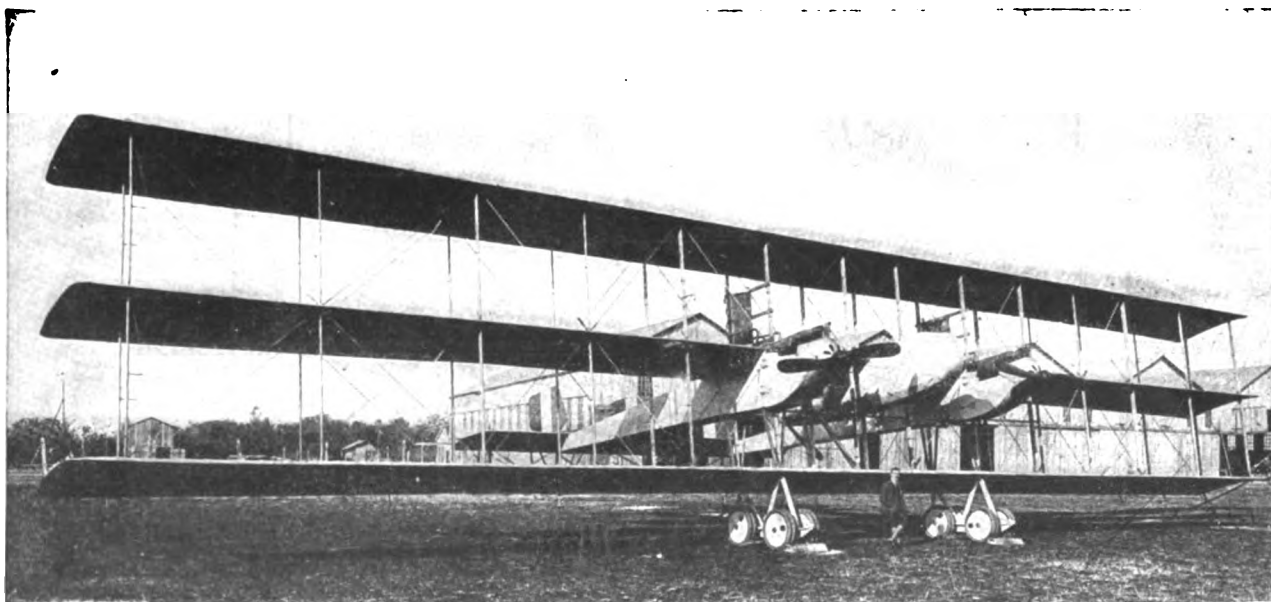
in this publication. The latest types of French, British, Italian, German and American planes will be found in the unusual collection of photographs here presented.

The planes shown are arranged in general classes according to the purpose for which they are designed. The pursuit and scouting planes come first. These machines have speeds of from 125 to 135 m.p.h., can carry up to 450 lb. and will climb at the rate of 10,000 ft. in from 8 to 12 min.

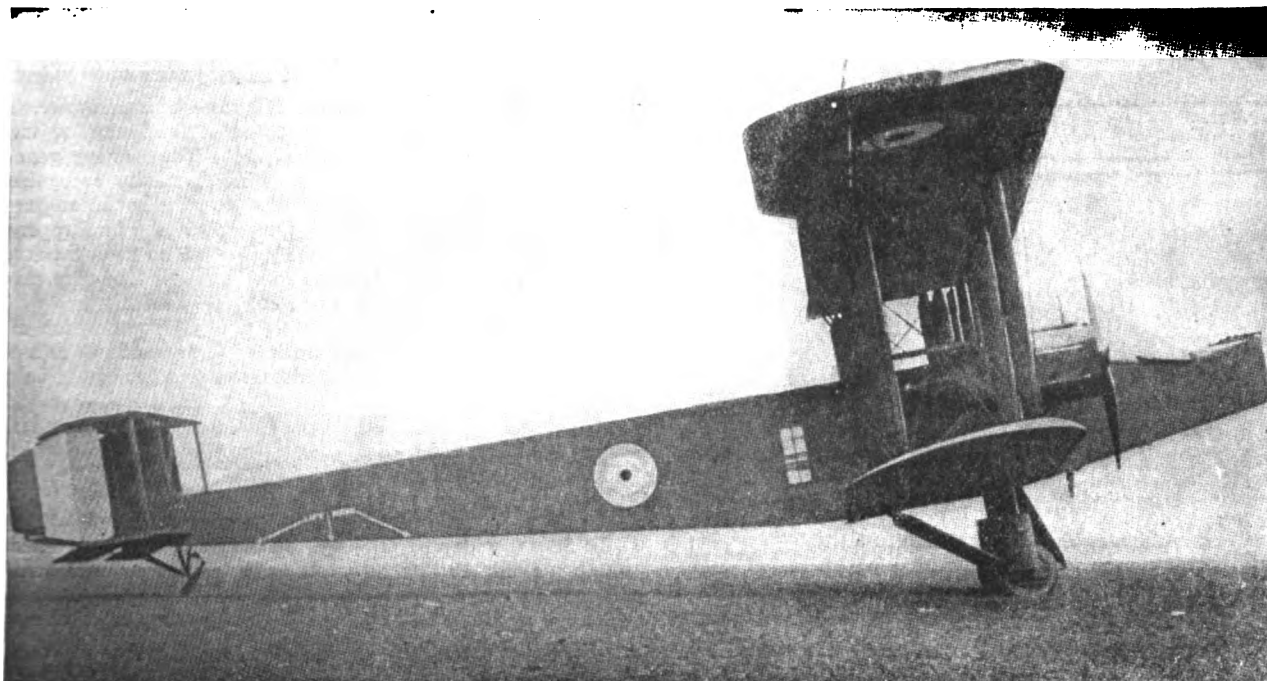
Following these small, fast machines come the reconnaissance and photographing machines, which are slower and are intended chiefly for observation work in con-



*Large Curtiss flying boat*



*The big Caproni triplane. Next to the large Curtiss triplane boat, it is the largest triplane that has been built and successfully flown*



*A side view of the Handley-Page bomber*

nection with artillery and general reconnoitering. They have wing spreads of from 40 to 60 ft. and are capable of making from 80 to 100 m.p.h. They are two or three seaters and their climbing speed is about half that of the pursuit and scout planes.

In the third group are the battleplanes, usually equipped with one large or two medium sized engines and a number of machine guns, sometimes even mounting small cannon. They carry two or three passengers and can attain speeds of from 70 to 85 m.p.h.

The bombing planes, which come next, are, so far

as general type goes, similar to the reconnaissance and photographing planes, but somewhat larger. Their radius of operation is from 500 to 1000 miles and their speed from 75 to 100 m.p.h. They have a wing spread of from 45 to 90 ft. and can climb at the rate of 1000 ft. in approximately 4 min.

The author's last classification is flying boats and hydroplanes, which are made in a great variety of types and sizes. They are used for coast patrol work and for naval observation. They are capable of relatively high speed, making from 90 to 100 m.p.h.

## Pursuit and Scout Planes

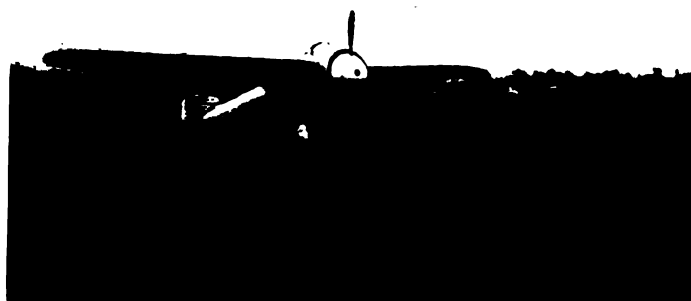
### BRISTOL TRACTOR MONOPLANE

Small one-seater machine. Span, 30 ft. 9 in.; chord, 5 ft. 11 in. Overall length, 20 ft. 7 in.; height, 9 ft. 6 in. Driven by 110-hp. Clerget that uses about 6 gal. of fuel per hour. Air endurance, about 3 hr. Total flying weight, about 1320 lb., of which 410 lb. is useful load.

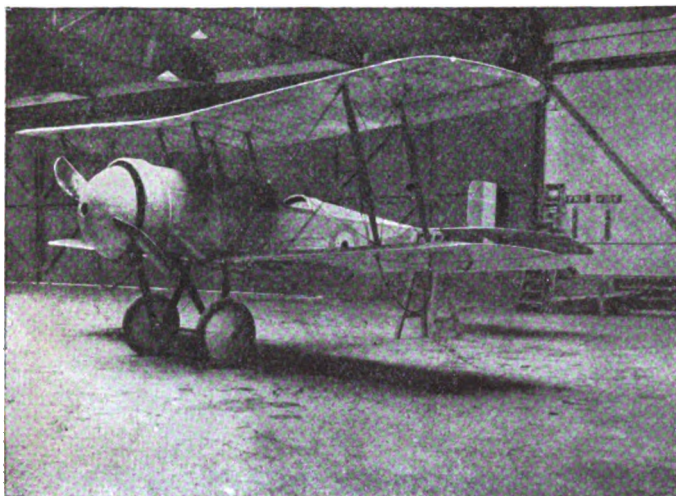
This machine requires a clever pilot to fly it, although it is comparatively easy to land. It is nose-heavy and has a

tendency to turn to the right with the engine on. This model is credited with a speed of 128 m.p.h. at 5400 ft. and 110 m.p.h. at 15,000 ft. It will get off the ground in less than 100 yards, and can be stopped, with the engine off, in a little more than the same distance. It will climb about 16,000 ft. in 20 min.

To the eye it presents a pleasing appearance and offers a good example of stream-lined monoplane construction. The



*Front and side views of the Bristol monoplane (English)*

*Bristol scout plane (English)*

dihedral is 4 deg. and the tail plane has a small negative angle of incidence.

#### BRISTOL SCOUT MODEL D TRACTOR BIPLANE

Powered with an 80-hp., air-cooled Clerget, this one-seater is credited with a speed of about 95 m.p.h. It weighs about 1100 lb. and has a wing spread of 24 ft. 5 in. Length, 20 ft. 5 in.; height, 9 ft. 8 in. Its wings have a dihedral of 3 deg., angle of incidence of 2 deg., stagger of 1 ft. 4 in. Its aspect ratio is 5.5; chord, 4 ft. 6 in.; gap, 4 ft. 4 in.

The Bristol Scout is also equipped with 100- and 110-hp. Clerget engines. It is a very easy machine to fly, not at all tiresome, and lands easily. It will climb 10,000 ft. in 26½ min. Its weight is 1099 lb.

#### MORANE PARASOL WITH 170-HP. GNOME ENGINE

This is the only monoplane now in use on the French front, but on account of its good visibility and quick maneuvering ability, it is particularly well liked by many pilots. Span, 21 ft.; gross weight, 1400 lb., and useful load, 500 lb. Its maximum speed is 136 m.p.h. at sea level. It will climb 16,000 ft. in 16 min. It carries two machine guns and gasoline for 1¾ hr. A jack-seat for the gunner is operated by a crank with which he can raise and lower himself. The plane is of steel construction (two-thirds of the fuselage). There are no wires; the bracing is of steel. It has a monocoque

body, a pointed nose and small tail. It is light, speedy, sensitive and very trim.

#### MORANE THREE-PLACE TRACTOR

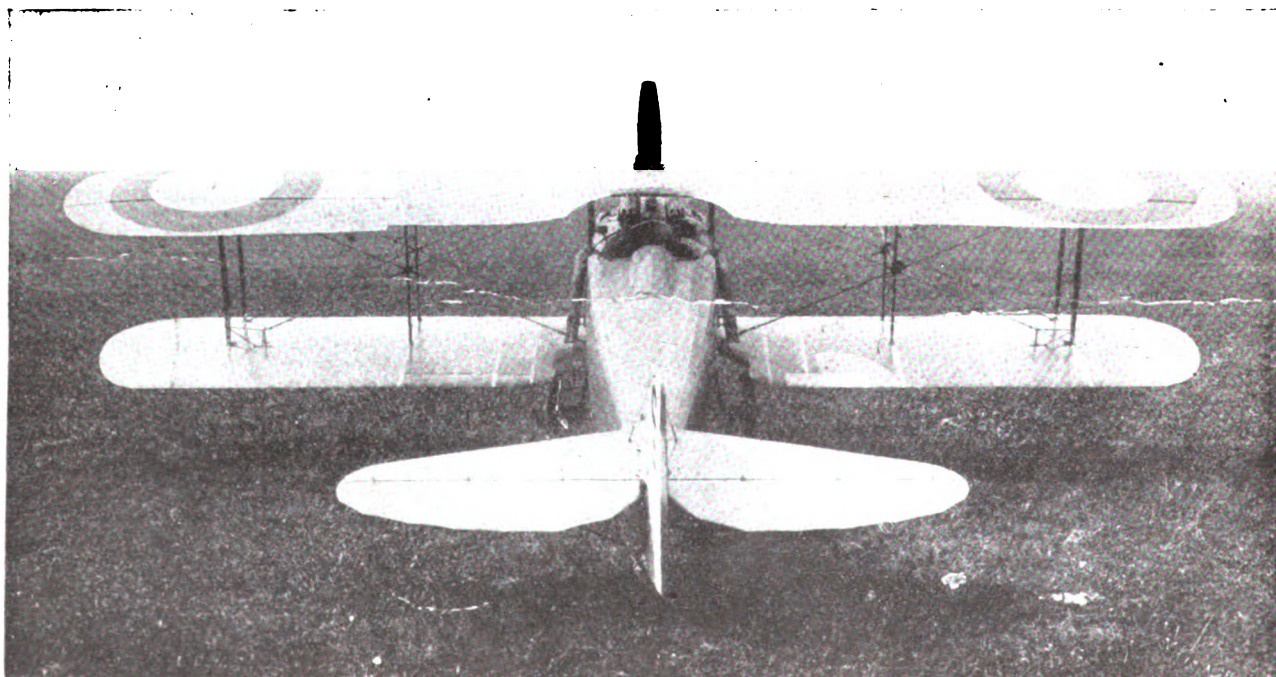
Two rotary Rhone engines or Hispano-Suiza engines. There are two pairs of vertical struts and two pairs of inclined struts on either side of the fuselage. The landing gear is of a double M shape, and the machine is easily recognized by its fish-like fuselage. Its nacelles, in which the engines are carried, are mounted in V-shaped supports. The upper wing has a slight overhang, no dihedral and no sweepback. The German A.E.G. and Gotha are very much like this machine and many of their features are copied from it.

The propeller is equipped with propeller-pot which aids in cutting down the head resistance of the machine. The planes are cut away for visibility. The elevators are of the balanced type.

The under-carriage structure has an M type of truss, and looks something like the Fokker and Halberstadt—which are German imitations of it.

#### TWO-SEATER POMILIO WITH 6-CYLINDER, 200-HP. FIAT ENGINE

Is 38 ft. wide, 10 ft. high, 30 ft. long and will make 120 m.p.h.; climb 13,120 ft. in 22 min. Two sets of struts on either side of body. Double set of V-shaped struts from fuselage to upper plane. Very narrow but high cowl. Apparatus for release of bombs just below rear cockpit. Movable machine-gun mounted on a rotating ring in rear cockpit.

*Morane Parasol (French)**Rear view of Spad*





*Two views of the Thomas Morse S4C (American)*

The ailerons on the upper plane increase in chord as they leave the trailing edge of the main plane. The trailing edges of the lifting and controlling surfaces are fluted.

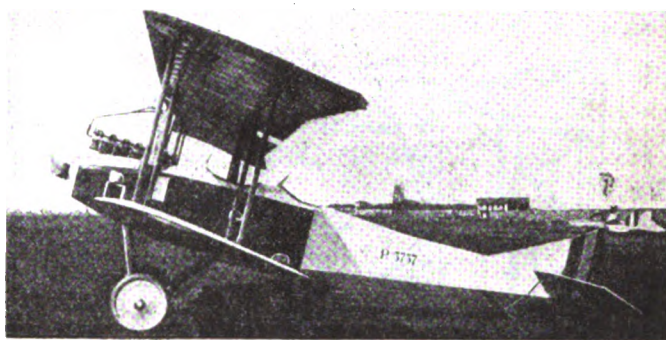
#### SPAD FRENCH PURSUIT BIPLANE

The Spad is a single-seater, combat or pursuit biplane, with a 150 to 200-hp. Hispano-Suiza engine. It has a speed of from 120 to 130 m.p.h., and is an excellent example of good streamline design. The panels are of veneer construction, and the beams are made up of an I-beam section with two side pieces wrapped on with fabric. It is a remarkably good example of wood construction, veneer and aluminum being used in a wonderful manner. The French apparently do not like balanced units, but prefer a machine having the sensitiveness that unbalanced units give. It is said that they are much easier to maneuver in battle, can make turns and dive with greater facility. The Spad is so wonderfully made that even bad smashes do not seem to have much effect upon its structure. It has a 25-ft. spread and a 5-ft. chord. The chord is slightly greater than that of the Nieuport. The fuselage is very short.

The machine is very light in construction—almost an engine with wings. The gross weight is 1500 lb., and it carries a useful load of 450 lb. It will climb 10,000 ft. in 9 min. Two years ago with a 150-hp. engine it attained 118 m.p.h.; last year with a 200-hp. engine it reached a speed of 131 m.p.h.

#### S4C SINGLE SEATER (THE THOMAS MORSE CO.)

This is fitted with 100-hp. Gnome or LeRhône 80-hp. engine. It has a wing spread of 27 ft.; length over all, 18 ft.; total weight, with LeRhône engine, 1300 lb. It has a climbing



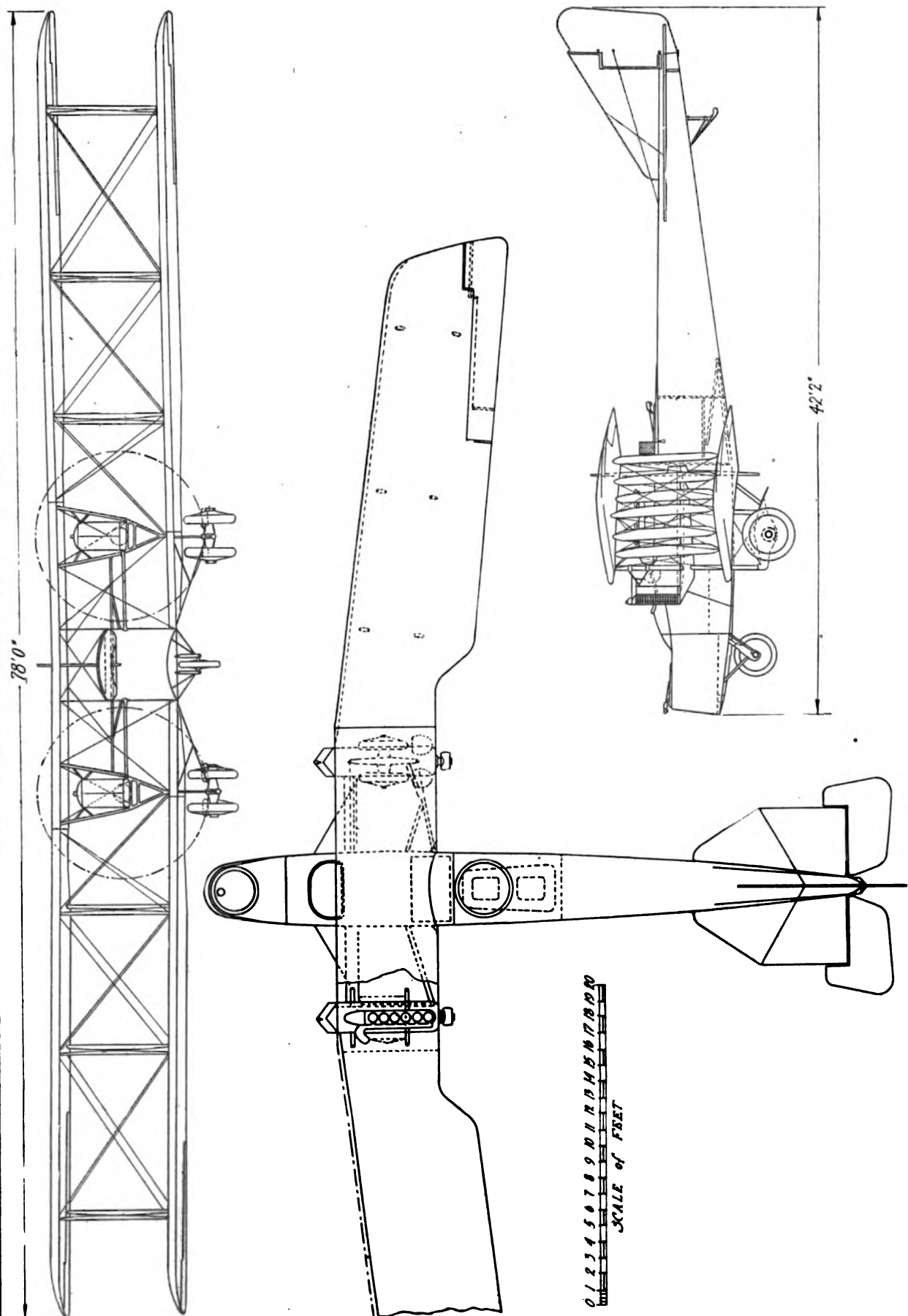
*Pomilio (Italian)*

speed of 9500 ft. in 10 min. with the Gnome, and 8500 ft. in 10 min. with the LeRhône. It has a high speed of 105 m.p.h. with the rotary and a high speed of 95 with LeRhône.

*(To be continued)*



*Body construction of Spad (French)*



*The Friedrichshafen bomber—Front, top and side views*

# Friedrichshafen Bombing Plane

## Details of One of the Latest Designs of German Long Range Bombers

**A**MONG the German types of large bombing biplanes the Gotha is probably the best known; but two other types have been used by the Germans in long-distance bombing flights recently, the Friedrichshafen and the A. E. G. The former is supposed to be the product of the Zeppelin Works located on the shores of Lake Constance and at other places in Germany. It is believed that Friedrichshafens, together with Gothas, took part in the most recent raid on London, and the Aircraft Production Department of the British Ministry of Munitions has issued considerable interesting material concerning this machine.

One of the Friedrichshafen bombers was downed at Isbergnes during the night of Feb. 16 by a direct hit on the right-hand engine from an anti-aircraft gun. The machine when hit was traveling at a height of from 8000 ft. to 9000 ft., and thereafter covered a distance of about 6 miles before landing in a fairly good manner. It would seem to have been of very recent construction, for on the tail appeared the date "14/1/18." On other parts, however, different dates were marked, so that possibly it may have been a somewhat older machine that had been repaired. From data painted on the side of the body, it is to be gathered that the weight of the machine, when empty, was 5929 lb., its useful load 2717 lb., and its permissible total weight 8646 lb.

The general arrangement of the machine is illustrated in the accompanying drawing. Its full complement consisted of four persons, the pilot, a fore-gunner, an after-gunner, and a bomber. The number of the crew carried by this type of machine is, however, known to vary, two only being sometimes carried. The cockpits for the crew intercommunicate in such a way that the men can easily change places.

The machine may be described as consisting of a central section to which are attached the main planes and the forward and rearward portions of the fuselage. This central section comprises the main cell or cabin of the body, wherein are carried the tanks and bombs, and also embraces the engines and the central portions of the upper and lower planes. The central portion of the body measures 4 ft. wide by 4 ft. 3 in. high, and is of box formation. It is carried out in ply-wood, strengthened by longerons and diagonals, and stiffened transversely by ply-wood bulkheads. The bulkhead furthest forward serves as an instrument board, and behind it are placed two seats side by side for the pilot and his assistant. The pilot has a fixed upholstered seat, while his assistant is provided with a light steel tubular folding seat having a webbing back-rest. Beneath these two seats is placed the lower main fuel tank. Behind the pilot's cockpit the body is roofed over with ply-wood. The rear part of this roof is detachable, so as to give access to the second main fuel tank at the rear end of the main body portion. At each side of the cabin or covered passage-way thus formed are racks for small bombs. These racks are each capable of holding five 25-pounder bombs. Beneath the nacelle are two large racks formed of tubular frames and fitted with cradles of steel cable and trip gear. Each of these racks is believed to be capable of supporting a 600-lb. or 700-lb. bomb. The large racks

are readily detachable, for the bombs carried are evidently varied to suit the radius of action over which the machine has to operate. The bomb sight is of the ordinary German non-precision type.

The machine is driven by means of two 260-horsepower six-cylinder Mercedes engines. The engines of the Friedrichshafen bomber show only a few changes in the design, that of chief interest being the fitting of a rudimentary form of silencer to the end of the exhaust pipe. Following are the principal dimensions of the machine:

Span, ft. ....	78
Maximum chord .....	7 1/2
Gap, ft. ....	7
Dihedral angle in the vertical plane, deg. ....	1 1/2
Dihedral angle in the horizontal plane, deg. ....	6
Total area of main planes, sq. ft. ....	924.4
Area of upper main planes without flap, sq. ft. ....	480
Area of lower main planes without flap, sq. ft. ....	454.4
Load per square foot, lb. ....	9.24
Weight per horsepower, lb. ....	16.6
Upper wing, area of flap, sq. ft. ....	21.6
Upper wing, balance area, sq. ft. ....	1.8
Lower wing, area of flap, sq. ft. ....	16
Lower wing, balance area, sq. ft. ....	1.56
Tail planes, total area, sq. ft. ....	57.6
Elevators, sq. ft. ....	32
Balance area of one elevator, sq. ft. ....	1.7
Area of fin, sq. ft. ....	20
Area of rudder, sq. ft. ....	19.2
Balance area of rudder, sq. ft. ....	3
Maximum cross section of body, sq. ft. ....	19.2
Horizontal area of body, sq. ft. ....	133
Vertical area of body, sq. ft. ....	131.2
Length overall, ft. ....	42

## A German Aircraft Speed Meter

**A**SPEED meter for aircraft was described some time ago in the *Elektrotechnische Rundschau*. The mechanism consists of an iron rod or track laid horizontally and in the direction of the aeroplane's length. On this rod is a heavy iron ball, which is normally held at the center of the track by a spring at each end of the latter. When the aeroplane is accelerated the iron ball moves backward from the center of the track; when the machine is retarded the iron ball moves forward. The second part of the mechanism is a horizontal disc rotated at constant speed by clockwork. On this disc rests a small wheel, which is mounted on and can slide along a square shaft. By means of a prong or fork the iron ball moves the small wheel to one side or other of the center of the rotating disc. The direction of rotation of the small wheel (and of its square shaft) and its speed of rotation are thus determined by the direction and extent of displacement of the iron ball, i.e., by the degree of acceleration or retardation of the aeroplane. The square shaft is geared to a recording dial, which indicates the net total revolution of the small wheel at any time. This is proportional to the speed of the aeroplane with regard to the earth. The recording dial may be calibrated accordingly. If the instrument is working properly the speed dial comes back to zero at the conclusion of each flight.

The idea involved in this device is not altogether novel. The theory underlying it is fairly simple and can be worked out without resorting to the methods of the calculus, if we confine ourselves to constant accelerations. In practice, the accelerations with which the device has to deal are in general not constant, and the instrument has to exercise an integrating function. At first sight it might be thought that the inertia of the ball would introduce a disturbing effect, for under a sudden acceleration the ball would overshoot its true position. It would, however, subsequently vibrate with decreasing amplitude about its true position.



# Heavy Oil Engines for Automotive Purposes\*

## Difficulties of Handling Heavy Fuel in Carbureters—The Diesel's Principle, Its Advantages and Shortcomings—Junkers Type Double Piston Engines

By P. L. Scott

THE necessity of developing the heavy oil-burning engine for automotive purposes cannot be too strongly emphasized. The demands for automotive power for the farm, for freight carrying and trucking of all kinds, for the automobile for both passenger and business purposes, for the small power boat, and for the airplane, are increasing by leaps and bounds. We have not enough suitable gasoline to supply even our present requirements, and we have almost no engines capable of successfully burning heavier distillates. The supply of such heavier distillates is comparatively vast, and the heavy oil engine will use this supply much more economically than the gasoline engine uses gasoline.

### Oils as Gasoline-Engine Fuels

The present type of gasoline engine does not burn with success (and by success we mean good combustion at all loads) kerosene, or even a mixture of gasoline and kerosene in which the proportion of kerosene is high; nor do many of these engines burn kerosene well even at full load. This is because kerosene will not volatilize at ordinary temperatures and pressures, and low-grade gasoline, now very common, volatilizes only partly under normal conditions. Volatilization is essential if the oil is to be mixed with the air by any of the present forms of carbureter. The vaporization of the heavier oils can be assisted by heating, but even then is not sufficient to produce a complete and homogeneous mixture of oil vapor and air. If gasoline and kerosene are placed side by side in two receptacles exposed to the air, the gasoline will disappear by evaporation long before the kerosene. Attempts to apply heat frequently fail of their object because the heat does not sufficiently aid in volatilizing the oils, and, more

important, because it decreases the weight of oxygen drawn into the cylinder of the engine. The amount of power is dependent upon the amount of fuel that can be burned, and the amount of fuel that can be burned is dependent in turn upon the amount of oxygen that can be drawn into the cylinder at each charging stroke. Heating of the air decreases its density, consequently reduces the amount of oxygen and correspondingly cuts down the power output.

Many have expressed the opinion that the next logical step to meet the fuel situation is the design of an engine especially suited to the burning of kerosene or of the lower petroleum distillates and the lighter and possibly "middle oils" resulting from the by-product distillation of coal, and not an attempt to adapt engines designed for a volatile oil to the use of relatively non-volatile oils.

### Burning Low-Grade Liquid Fuels

The author believes that with a heavy fuel engine some means other than carburetion must first be provided for the most intimate mixing of the fuel and the air, and that some means of igniting this mixture other than an electric spark is necessary. A heavy oil cannot be successfully mixed with air in a carbureter, and a spark cannot successfully ignite a mixture in which the oil is not to a considerable extent vaporized. Carbureters fail to form an intimate mixture of heavy oils with air because the heavy oils do not volatilize sufficiently well, and the mechanical division of the oil secured in the carbureter is never sufficiently fine to form a combustible mixture. Heat applied to the carbureter in order to assist in volatilizing the oil results in heating the air, and thereby reduces the output of the engine. An ordinary electric spark will usually fail to ignite a mixture of heavy oil and air because the source of heat is too localized

\*Paper read at the S. A. E. summer meeting.

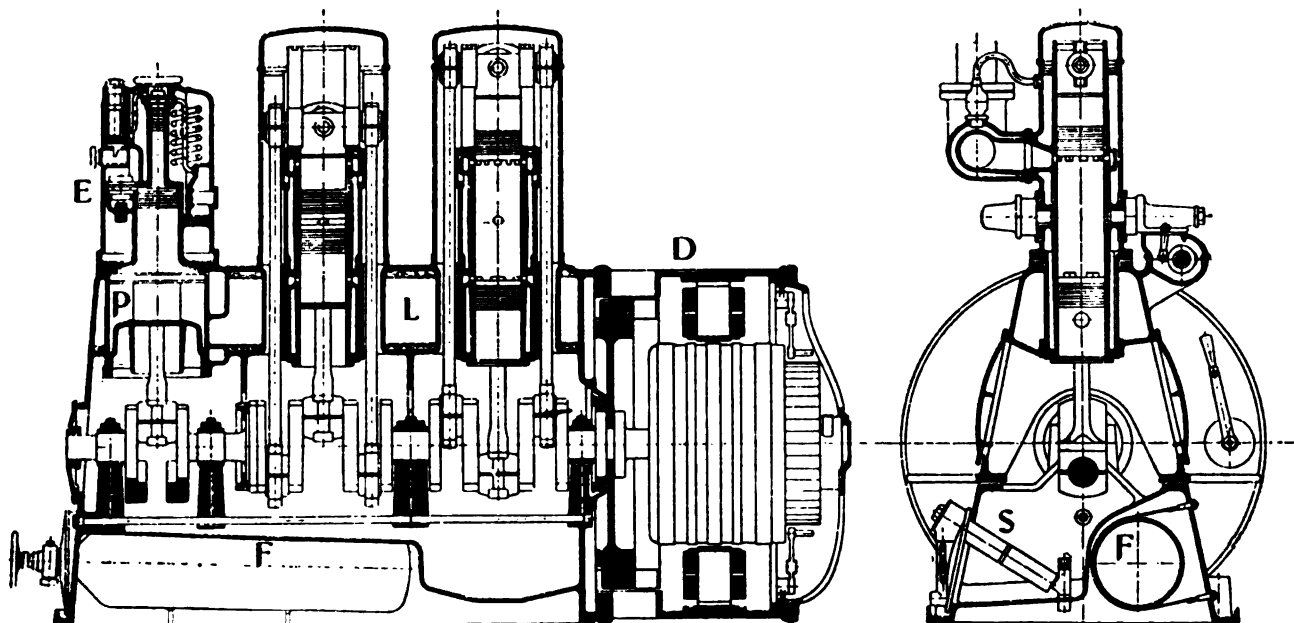


Fig. 1—Small double piston, two-stroke cycle A. E. G. oil engine direct-connected to generator

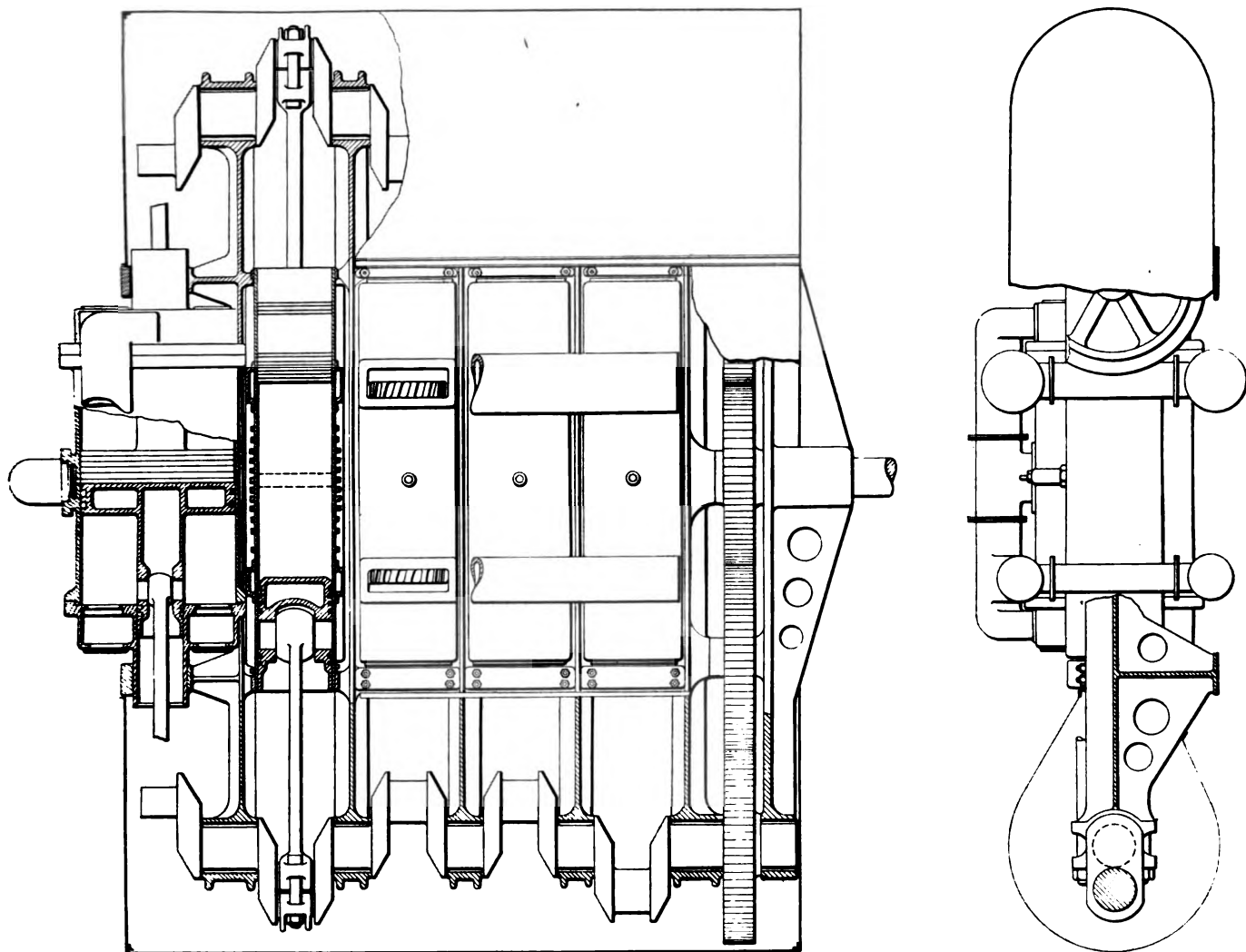


Fig. 2—Junkers aeronautic four-cylinder two-piston engine, with cranks at opposite ends geared together

and the flame propagation is much slower than in the case of a readily volatilized vapor mixed with air. Further, as the compression used is increased the resistance to passage of the spark is decreased, owing to the increased density of the air.

#### Injection and Ignition

The alternative is to use purely mechanical means for dividing and mixing the oil with the charge of air. In the Diesel engine this mixing is successfully accomplished by using highly compressed air, delivered by a compressor attached either to the engine or driven separately, to blow the oil into the cylinder at the moment when combustion is desired. The pressure in the cylinder is from 400 to 700 lb. per sq. in. and that of the injection of air is from 50 to 100 per cent higher. The proper quantity of oil for one cycle is delivered to the fuel valve during each stroke and at the right moment is forced by this air pressure through passages and holes of various shapes and sizes into the cylinder. A certain amount of the air escapes from the valve with the oil.

This method has one great advantage. The oil and the air, under a pressure considerably higher than that in the cylinder, become thoroughly mixed during the passage through the valve, so that when the pressure is suddenly decreased, say from 800 lb. in the valve to 500 lb. in the cylinder, the oil, already well divided, is subjected to a violent explosive action that tears the small drops apart and produces a finer division, thus rendering the fuel readily combustible. Further, combustion is readily started because each particle of fuel is provided initially with a small amount of air in close contact with it.

This system has several disadvantages. An air compressor is an unwelcome piece of apparatus, doubly so for high pres-

ures and for high speeds; and is not to be thought of for speeds required for automotive engines. When the pressure is suddenly decreased on the entrance of the injection air into the cylinder, the expansion causes a decided refrigerating action upon this air, which is in closest contact with the oil. This action will actually prevent combustion when too much air escapes through the valve. From 5 to 10 per cent of the indicated horsepower is required for the operation of the air compressor. Therefore, although producing an excellent spray, air injection cannot be considered for high-speed engines required in most automotive applications.

Surface ignition engines, at least the smaller sizes, have no air compressor, but inject the oil directly under pressure ranging from 1000 to 3000 lb. or more per square inch. In nearly all designs the oil is forced through an extremely small hole, a few thousandths of an inch in diameter. This gives a fairly good spray, but not one so finely divided that the fuel burns when brought into contact with air at temperatures resulting from the compression pressures used. Further, such sprays are subject to "dripping," that is, the formation of drops of appreciable size before or after injection, or often in the spray itself. This causes excessive carbonization and poor combustion. Therefore, hot surfaces are introduced into the cylinder and the oil allowed to impinge upon or pass near these surfaces. This causes a partial distillation of the oil and furnishes the additional heat necessary for combustion. These conditions tend toward operation on the Otto cycle and the compression pressures, therefore, are kept relatively low to avoid excessive end pressures.

The "direct-injection" system has many merits. With it the air compressor is eliminated, thereby doing away with an expensive and troublesome piece of apparatus and saving 5 to 10 per cent of the indicated horsepower. This saving is

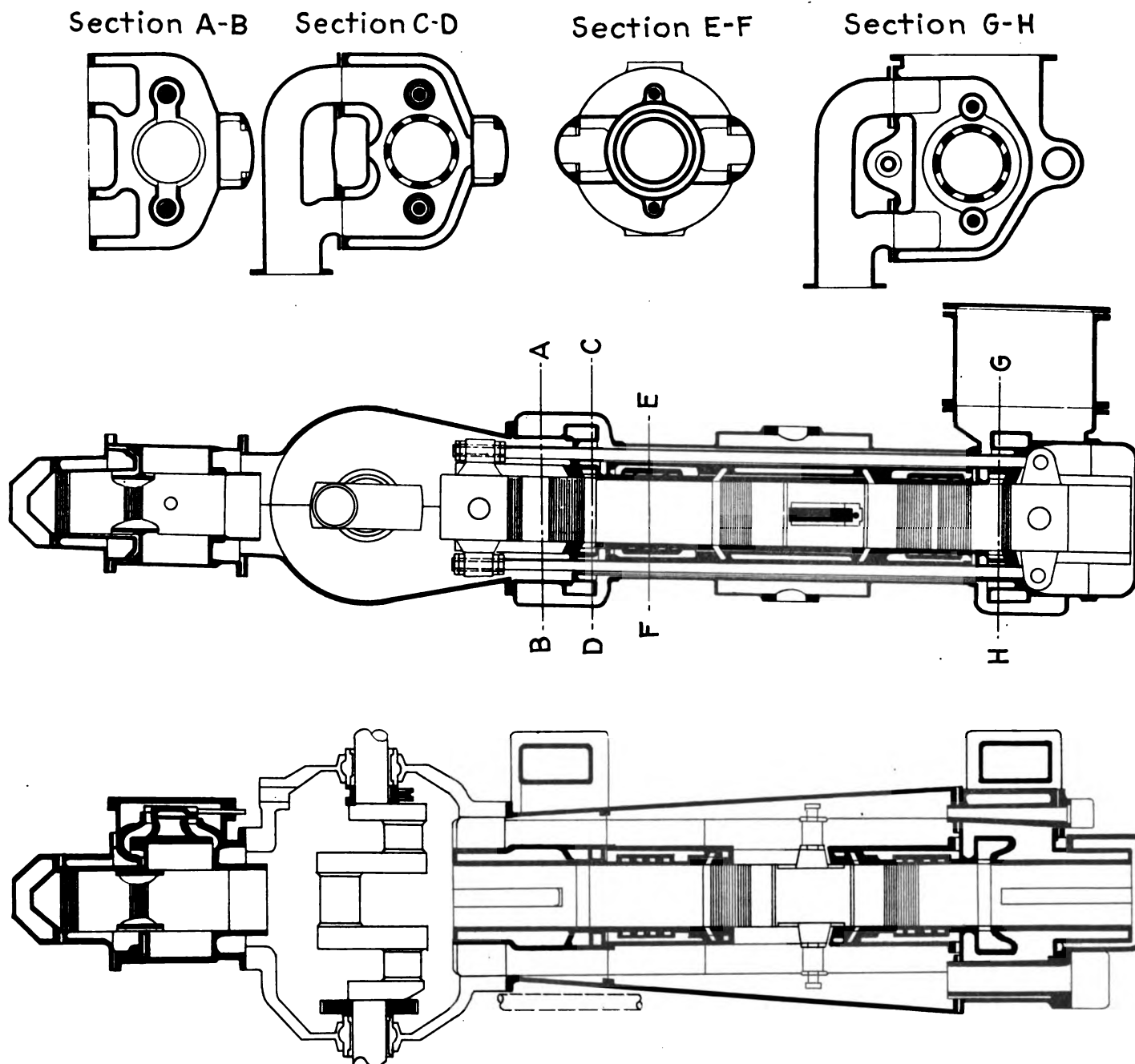


Fig. 3—Oil engine of tandem construction for farm tractors

net because a high-pressure oil-pump is required whether there is an air compressor or not. The system eliminates the refrigerating action of the compressed air. So far it has had the serious drawback that the fuel spray produced does not burn nearly so well as the "air injection" spray, but in this respect some real improvements are being made and practical success is being obtained.

We must work along the line of direct injection in order to develop the heavy oil burning engine for automotive purposes. Enough progress has been made to assure us that it can be done without great difficulty. The author has observed a successful test of an oil pump pumping benzine at 450 atm. (6390 lb. per sq. in.) at about 800 r.p.m. A more recent development has operated well at 7000 lb. and 1150 r.p.m. High pressure in the oil pump at high speed is an essential requirement for successful direct injection.

Assuming that we can succeed in this mechanical mixing of oil and air, we must next devise a means for igniting the mixture. This can be accomplished either by compressing the air to such an extent that the temperature attained will cause ignition, or by permitting parts of the combustion chamber to reach such a temperature that action similar to

that in surface ignition engines occurs. The two methods may be combined, in which case the results are the best. If hot surfaces are used, care must be taken not to allow the incoming air to flow over them, since this will have the same disadvantages as heating the air in the carbureter, namely, reducing its density. Most of the heat necessary under these conditions should be secured from the air. The attempt to burn a heavy oil by mechanical injection into highly compressed air makes the time element of combustion important; much more so than with engines in which the fuel is to a certain extent vaporized and is more intimately mixed with the air, so that combustion is virtually instantaneous, or explosive when the mixture is ignited by an electric spark. This means that the speed of mechanical injection engines must, at least at the beginning of their development, be slower than is customary with present gasoline engines, because the burning of oil under the conditions of direct injection is slow as compared to the burning of gasoline vapor in air.

It is well to speak here of the distinction between the explosion and the combustion engine, as engines burning heavy oils are essentially of the combustion and not of the

explosion type. All engines intended to burn the lighter hydrocarbons are, from the nature of the fuel, most easily designed to operate on the Otto cycle. The fuel volatilizes readily and can be drawn into the cylinder with the air and compressed, provided the compression pressure is not too high, and the mixture then ignited. The rise in pressure due to the chemical reaction is almost instantaneous and is the so-called constant volume, or explosive, combustion.

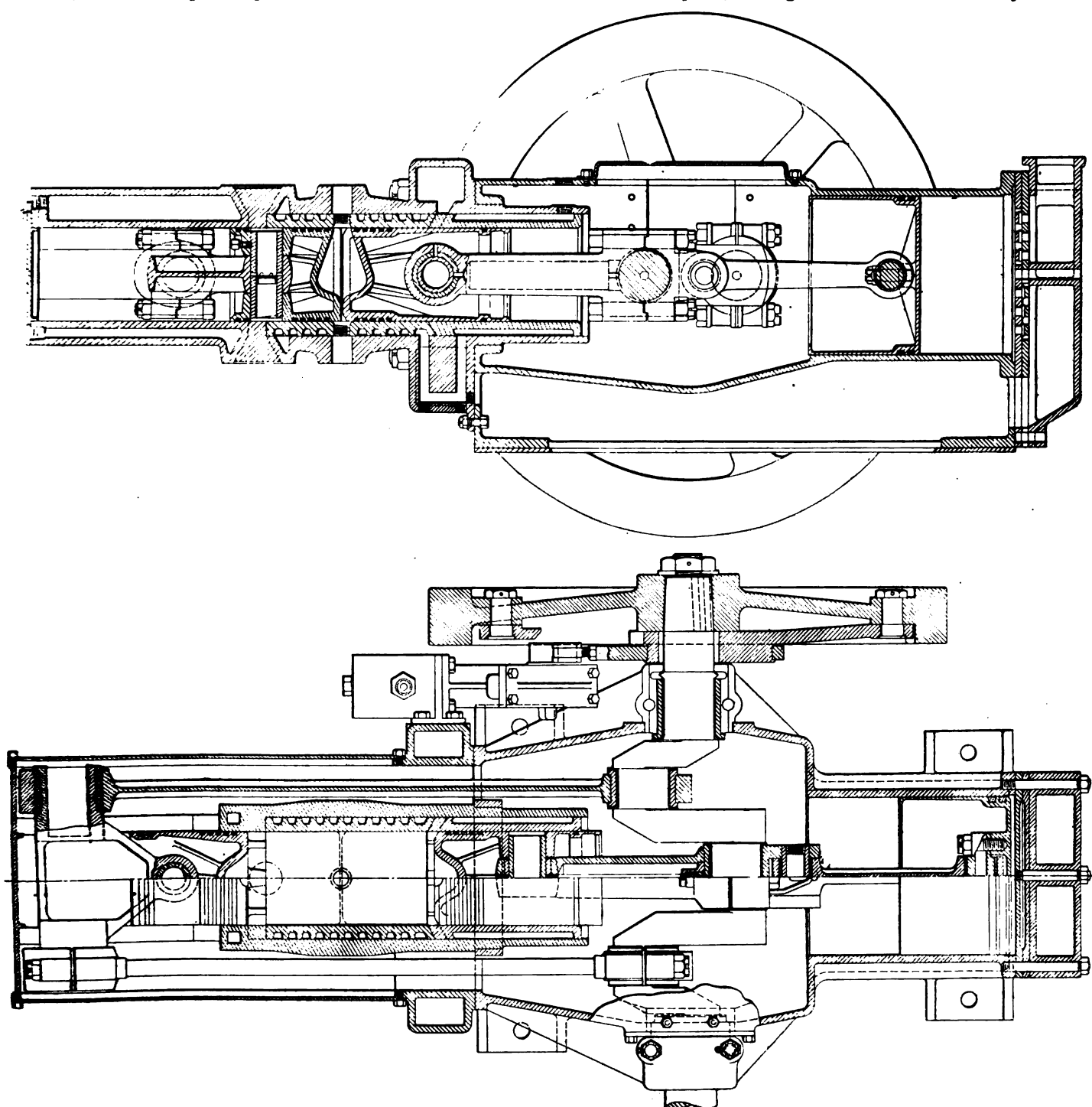
The heavier oils, however, will not mix so intimately with air, and the heat of the air must be relied upon to a great extent to aid in the union of the fuel and the oxygen; consequently combustion is never so rapid, but approaches the constant pressure conditions found in the Diesel cycle. A mechanical condition prohibiting the use of the Otto cycle for heavy oil engines of the proposed type is that the comparatively high compression pressure necessary would produce prohibitive explosion pressures.

The development of direct injection in large engines has conclusively proved that heavy oils, even residues, can be sufficiently finely atomized by mechanical means to burn successfully with compressions as low as 250 lb. per sq. in., provided the combustion space is allowed to remain warmer than in ordinary practice. Direct injection has proved far more successful in small than in large sizes.

The author has experimented with a spray nozzle which in its present design will atomize a 28-deg. Baumé oil finely enough for the particles to remain suspended in the air for ten minutes. Such a mixture will ignite explosively upon the application of a match flame, which is a small and localized source of heat.

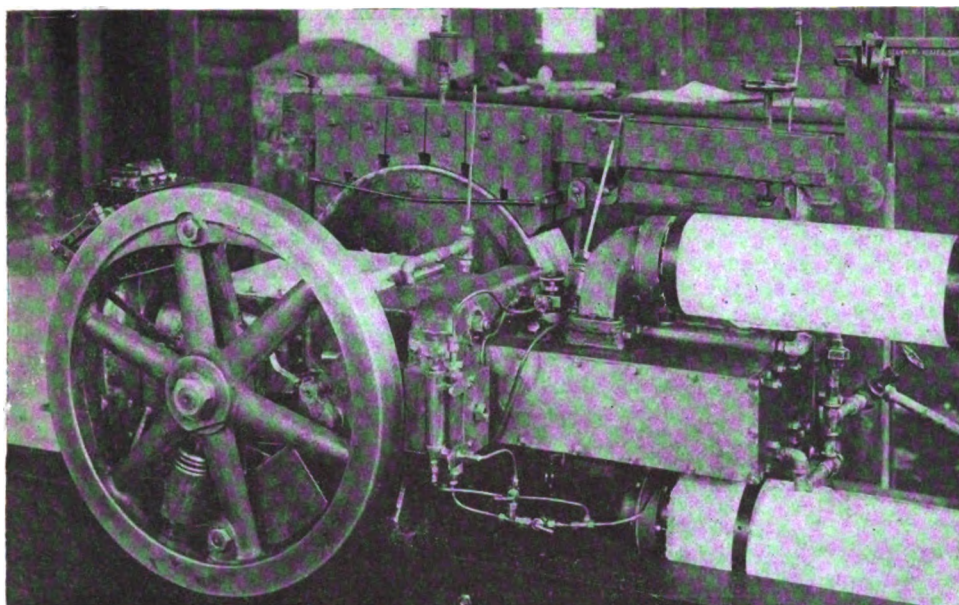
Bearing the foregoing considerations in mind, we see that the design of injection engines will differ radically from that of the usual type of gasoline engine.

In the first place, the engines will be of considerably slower



Figs. 4 and 5—Details of a portable injection oil engine with a single horizontal working cylinder and an air compressor cylinder on the opposite side of the crankshaft





On left: Fig. 6—Photographic view of the engine illustrated in Figs. 5 and 6. Below: Fig. 9—Pistons, connecting rods and crank in the firing position

rotative speed than is possible with gasoline engines. With better design we can secure higher speeds, but satisfactory operation at 1000 r.p.m. would now be considered a creditable attainment. We must, therefore, for the present make up our minds to use slower speeds. The slower speed engine will naturally be larger and heavier than the gasoline engine to which we are accustomed, particularly when operating on the four-stroke cycle; but we must remember that the first gasoline engines were truly clumsy affairs when compared with present designs. The engines will not need to be much heavier for strength to carry the high compressions because the maximum pressure will not be much greater, although the mean effective pressures will be higher. But the cylinder and piston design will be more difficult, since the mean temperatures will be considerably higher. Because of the slower speed and probable increase in size and weight there will doubtless be a reversion at first to engines with larger and fewer cylinders. It will probably be more economical to build two-cylinder than four-cylinder engines of this type. Further, a small cylinder for an engine of this type requires such a small quantity of oil that the fuel pump design and governing are difficult.

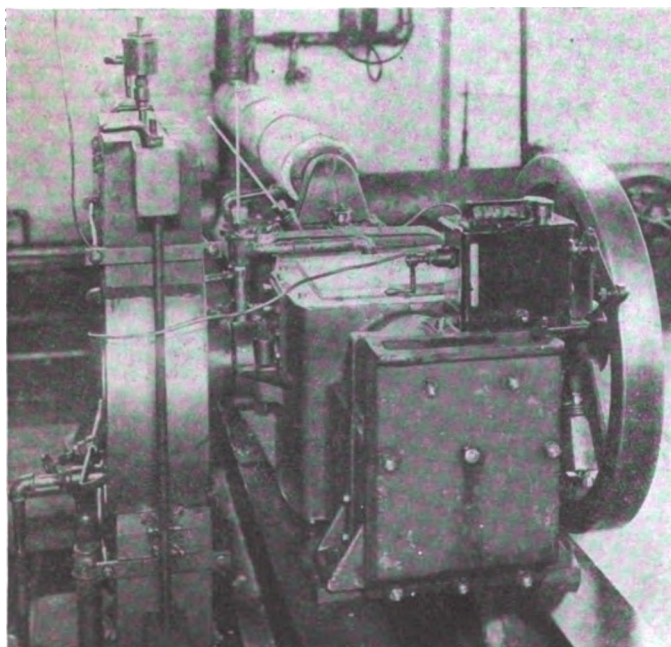


Fig. 7—Another view of the engine

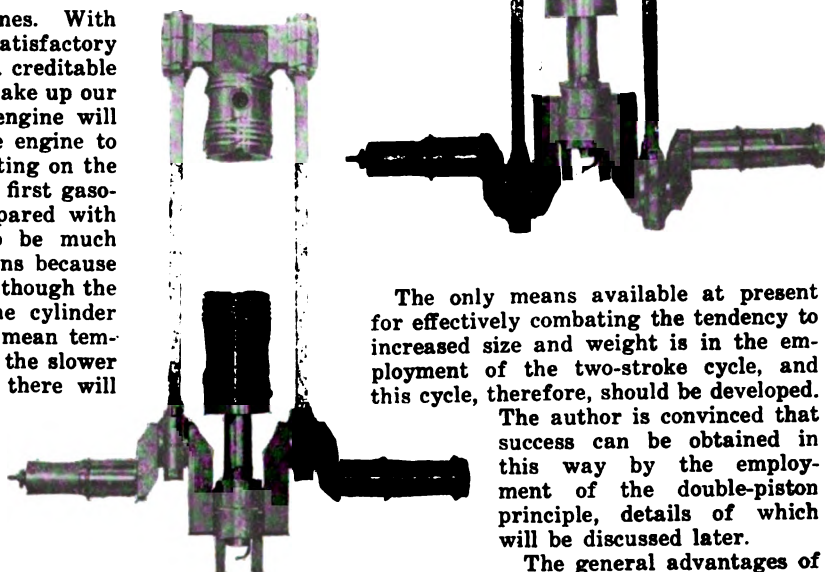


Fig. 8—Pistons, connecting-rods and crank, showing great length of stroke

The only means available at present for effectively combating the tendency to increased size and weight is in the employment of the two-stroke cycle, and this cycle, therefore, should be developed.

The author is convinced that success can be obtained in this way by the employment of the double-piston principle, details of which will be discussed later.

The general advantages of heavy-oil engines for automotive purposes can be summed up as follows:

They will be simple in construction, since the spark-plug, magneto and carburetor will be dispensed with, these

being replaced by fuel pump and valve, less complicated and more reliable elements.

They will burn much cheaper fuels and will have a much lower fuel consumption than the present gasoline engines.

The consumption of gasoline engines varies from 0.5 to 1.5 lb. per b.h.p. per hr. or higher, depending upon such factors as the compression ratio, quality of carburetion and load. If we take the average gasoline consumption as 1 lb. (air-plane engines not considered) and the cost of gasoline as 25 cents per gallon, the fuel cost is  $3\frac{1}{2}$  cents per b.h.p. per hr. High-speed Diesel engines have burned from 0.45 to 0.7 lb. per b.h.p. hr. of fuel. Six-tenths of a pound may be taken as an average. At a fuel cost of 7 cents per gallon this is equivalent to 0.6 cent per b.h.p. hr. for fuel to operate such engine, or about one-sixth that for the gasoline engine. On this basis it would seem to be a necessary step in the conservation of our natural resources to encourage the development of the heavy-fuel type of engine.

Injection engines will be as flexible or more so than gasoline engines, and more economical at reduced load and speed, since the high compressions advisable for normal speed will insure compressions at low speed always well above the burn-



ing point of the oil, and since the trouble arising from changes in the efficiency of the carbureter at varying speed due to the varying suction will be entirely eliminated. The characteristics of the fuel injection depends on the shape of the cam for driving the pump and is constant for all speeds. There is a well-authenticated report of a single-cylinder engine of the injection type in this country which has run at speeds from 160 to 1600 r.p.m., a truly creditable performance.

Such engines will have the disadvantage of larger size and weight in their initial development stages, and cylinder and piston trouble and lubrication difficulties will probably be experienced, owing to the much more severe heat conditions. Further, some time will undoubtedly be required to educate the public to such a radical change in the type of motive power. However, the design of the heavy-oil engine represents a simpler and far more exact problem than that of the gasoline engine, and this should make rapid development possible.

The author has been experimenting recently with an injection engine of which the general arrangement is shown by the Figs. 1 to 6 inclusive.

This engine was designed along lines which were known to have been proved successful in other engines. The next step in the development is shown in Fig. 10.

From data already at hand, combustion at high speed in such a construction is known to be possible.

The present engine has but a single cylinder, 5-in. bore, 10-in. stroke, and is expected to develop 40 hp. at 700 r.p.m. It is 55 in. over all and 22 in. wide over the crankcase, or 31 in. over flywheel and driving gear.

By comparing the figures showing the piston at inner and outer dead center (Figs. 8 and 9) the long stroke compared to the short crank is readily noted.

The vertical construction shown has two cylinders of 4-in. bore and 6-in. stroke, and will develop 35 hp. at 800 r.p.m., or 44 hp. at 1000 r.p.m.

These figures are for compressions of 700 lb. per sq. in. and 115 lb. per sq. in. brake mean effective pressures.

The vertical-type construction is 28 in. long, 24 in. high and 10 in. through the engine.

Both these engines can be built to carry 50 per cent overload.

The present engine has, at the time of this writing, been on the test block a week, and has performed as follows: Starting on first trial on fuel oil, 600 r.p.m. on fuel oil and 700 r.p.m. on kerosene, with ability to go faster, 13 hp. at 400 r.p.m., and an hour's continuous run without trouble.

## Rolling Resistance of Tractor Wheels

By E. F. Norelins, M. E.

THIS is written as a discussion on the article by Amos F. Moyer, published in the May 16 issue of AUTOMOTIVE INDUSTRIES.

The writer has not had an opportunity to study in detail the various formulæ which Mr. Moyer has derived, showing the relation between the wheel functions. The relations of these functions, brought out are very interesting, as brought out by actual tests and theoretical formulæ, however, are very interesting.

Without doubt, work of this kind will be of considerable value in enabling tractor engineers to compare results obtained with different methods of drive, without actually making field tests. Of course, it is understood that in order to get the correct foundation for this theory, it would also be neces-

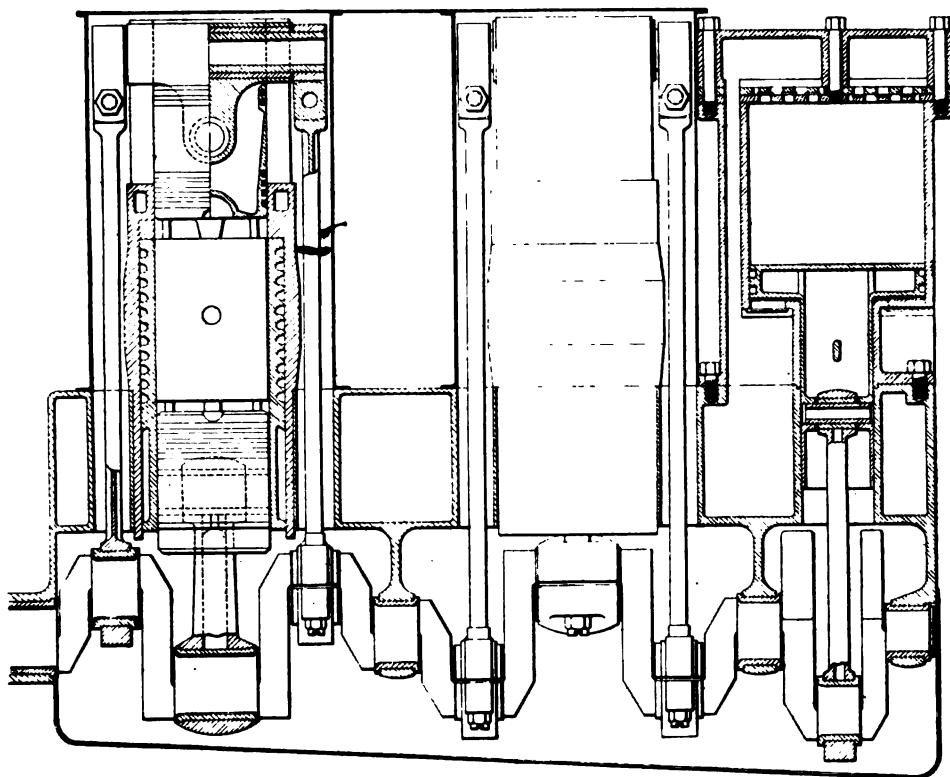


Fig. 10—A two-cylinder vertical type of portable engine

sary to make some preliminary tests. With a proper foundation, however, it would be possible to develop the relation between different functions so that engineers would be able to make valuable use of them.

In connection with the derivation of the relation between these functions, there is a quite different method of analyzing the forces involved. Referring to Fig. 1 of Mr. Moyer's article and using the same letters representing certain functions, it may be assumed that the ground pressure under the wheel must be normal at all times to the surface of the wheel, and that the bearing value of the soil  $n$  is proportional to the depression of the soil. To make the problem clear, we will fill the half segment surrounded by the lines  $a$  and  $b$  and the circular portion of the wheel with a liquid, whose density per cubic inch equals  $n$ , which is the same as the bearing value of the soil referred to above. This liquid will produce pressures on the inside of the rim exactly equivalent to the exterior pressures under the assumption of ground conditions that were made in Mr. Moyer's article. And, therefore, all forces which previously were transmitted from the ground to the rim of the wheel will be balanced by the interior pressures caused by this liquid. The value of  $P$  would now be equal to the horizontal components of the pressure of the liquid on the rim which is equal to the pressure of liquid on the element  $d$ . The unit pressure at the lowest point of the wheel equals  $dn$ , therefore,

$$P = \frac{1}{2} d^2 F n \quad (1)$$

The weight supported by the wheel rim is equal to the weight of the liquid which has been put into the rim, or,

$$W = A F n \quad (2)$$

where  $A$  represents the area of the half segment of the circle below the ground which was filled with the liquid.

In equations (1) and (2) we have values for  $P$  and  $W$ . The value of  $P$  agrees with equation (6) by Mr. Moyer, which, as far as the wheel is concerned, is dependent upon the depth of depression and the face, and, as can readily be seen, is correct, as the work that is done with a certain depth of depression of the wheel and ground conditions, is dependent entirely upon speed of motion ahead. From the above, a value of  $G$ , the equivalent grade, can be determined:

$$G = P/W = d^2/2A \quad (3)$$

The above gives a very interesting analogy and a very simple method of analyzing the various forces and functions in wheel resistance.

# Medical Problems of Air Service

## The Human System Cannot Adjust Itself Rapidly Enough to Change in Atmospheric Conditions During Swift Climb

IT is rapidly being realized that there is a distinct need for the establishment and maintenance of a special department of the medical service for the aviation branches of the armies of the allies. This need develops from the fact that there is a set of medical problems involved in aviation work distinctly different from those of the other branches of the service and that these problems extend into branches of physiology not commonly investigated by the average army medical man.

The physiological problems which are to a large extent, if not absolutely, peculiar to aviation work are those which result from the rapid changes in barometric pressure to which the aviator is subjected, the special demand for clear and accurate vision and the nervous strain created from the conditions under which he does his work.

In an address before the British Parliament recently Sir Watson Cheyne, dealing with the medical aspects of aviation, pointed out that the human being was constructed to live upon the earth, and his mechanisms are consequently adjusted and linked together for living under conditions as they exist on terra firma. He was not built with the idea that he should live in the water or very high up in the air.

In high altitude flying two important conditions differ from those encountered at low altitudes. They are the differences in atmospheric pressure and in the density of the air. The latter is especially important, as with the decreased density the proper amount of oxygen is not available.

### Rapid Change in Atmospheric Conditions

While it is possible for people to live at sea level or 5000 or 6000 ft. above it and to go from one altitude to the other without great discomfort when the transition is not too rapid, the aviator with the fast climbing planes of to-day reaches two or three times these heights within a few minutes after having left the earth. Mountain climbers spend a day or two in reaching a height of 10,000 ft. and the human mechanism has time to adjust itself in those cases to the changing conditions.

As the aviator mounts he comes into air that does not contain as much oxygen as is necessary and in order to take in a sufficient amount he begins to breathe faster and his heart beats quicker. In some cases, at a considerable height, the heart will fail, the man will lose consciousness and may actually faint. This fainting may not in itself be fatal, but it is possible, of course, that the aviator may not recover consciousness until it is too late to regain control of his machine.

To counteract the lack of oxygen in the rarefied air, aviators are now provided with oxygen for inhalation. There is found to be a decided difference in the heights to which they go before they are required to make use of the oxygen supply.

The average length of flying life of the army aviator is very short owing to the large percentage of invaliding through loss of flying nerve. Flyers are exposed to a severe strain which comes from many sources and affects most of the senses in ways which are different from those with which in normal life they have become more or less accustomed. Furthermore, the aviator experiences a most intense loneliness when flying over the enemy's lines at high altitude, and this feeling is even worse when flying over the sea.

Other causes of nervous strain are the extra work made necessary by the fact that spells of fine flying weather must be used to the greatest advantage, and the constant strain caused by the anti-aircraft guns of friend as well as foe.

It has been found that when as a result of these and other causes a pilot develops a tendency to estimate his chances and to lose confidence in the powers of himself and his ma-

chine he should be given a leave of absence, and it is quite necessary that this leave should be given before there are signs of insomnia and tremor, or otherwise the aviator may never fully recover so that he will again be fit for flying work.

The virtues of chewing gum as a nerve stabilizer are commended by one authority who holds that, while aviators are mostly temperate in the use of alcohol, they smoke altogether too much, especially cigarettes, and he therefore feels that gum chewing should be more widely encouraged.

The tragic side of over-straining the nervous system through continuous high-pressure aviation work was shown by W. F. Bradley, Paris correspondent of AUTOMOTIVE INDUSTRIES, in the second installment of the life story of Captain Georges Guynemer which appeared in the June 6 issue of AUTOMOTIVE INDUSTRIES. The approach of the end of the career of France's greatest ace was indicated in the following paragraph: "Persistent ill luck followed Guynemer during the last few weeks of his life. After bringing down fifty-one machines he was recommended to retire and occupy himself with the construction of airplanes. Further, the doctors stated that he was wearing out his nervous system, and counseled a complete rest. But the fever of activity burned within him to such an extent that not only did he refuse to go to the rear, but he declined the opportunity given him to rest for a while. Shortly afterward he went out alone one day and never returned."

Air service, besides developing the physiological problems due to rapid barometric changes and nervous strain, also brings out unique problems of vision, and these problems form the basis of some of the strongest arguments in favor of the establishment of a distinct medical branch for the aviation forces. It is essential that the vision of the aviator should be investigated by methods which, although well known to experts, are so technical in character that the average medical man cannot avail himself of them.

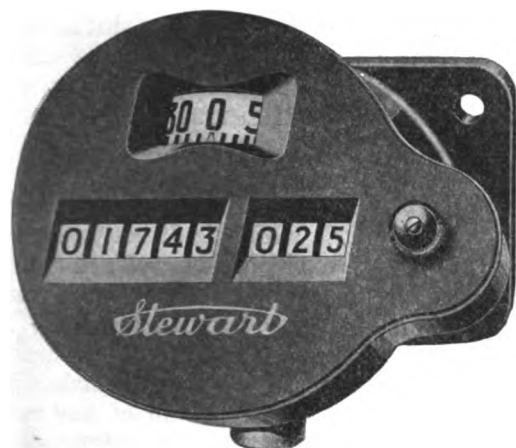
### Problems of Vision

As the British *Medical Journal* points out, many authorities have given us "much information respecting the differing sensitivities to various stimuli of the foveal and extra-foveal retina. The Purkinje phenomenon is a familiar example, as is its development into the complex phases of so-called recurrent vision. The special responsiveness of the extra-foveal retina to stimuli of feeble intensity and its relation to the perception of moving stimuli render the activity of this part of the visual field extraordinarily important for estimating movement and for vision under feeble intensities of light. The rare but well-defined condition of night blindness exhibits the disadvantages of pure foveal vision to an extreme degree."

All of this pertains to a branch of pure physiology upon the use of which many lives and the results of important military operations may depend.

In selecting airplane pilots it is quite necessary to determine whether they have true binocular vision, which is most important, especially in flying at high speed and for the rapid connection of sight and action. It is often discovered that one eye is not used at all. The man with this deficiency should not be permitted to enter the air service as a flyer.

It is felt by the advocates of a separate aviation medical department that the medical man of this branch of the service should stand in about the same relationship to the aviator as the trainer does to the athlete. He should have the authority to say whether or not a man should fly at any particular time and to determine when the man should be given leave. The average army medical officer is not considered to be qualified for such responsibilities.



## New Stewart Products

**S**EVERAL new products have recently been announced by the Stewart-Warner Speedometer Corp., Chicago, of which an industrial model vacuum system and a truck speedometer are of particular interest to engineers and manufacturers.

The industrial model vacuum system, known as Model 146-A, has a heavier tank and is built stronger than the previous models. It is specially designed for use on trucks and tractors and with stationary engines. The capacity is much larger and the flow of gasoline is faster. This new model is made in two sizes, one with a round shell of 3½ pints capacity and the other with a D shaped shell of 5 pints capacity.

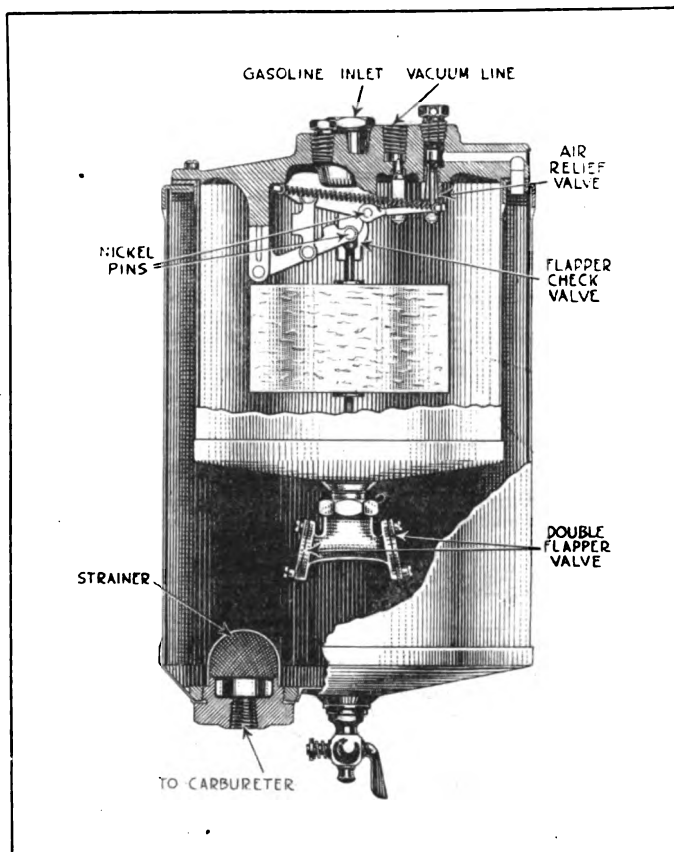
This model has a flapper check valve in the gasoline line at the top of the tank which prevents the gasoline from flowing back when the suction ceases. This keeps the gasoline line always full, so that the instant the float chamber empties the filling process begins.

The air vent is made of the Venturi type to insure rapid emptying of the inner chamber into the lower chamber. The inner chamber has a double flapper valve which allows this chamber to be emptied in half the time that would be required with a single flapper valve.

A cork float is used in this model. The cork is heavily coated with Acco coating to prevent it from getting loaded with gasoline.

A removable strainer in the gasoline outlet leading to the carburetor catches any sediment in the gasoline and keeps it out of the carburetor. The tank is supplied with a petcock at the bottom to draw off gasoline for cleaning and priming purposes, or water which may have gotten into the gasoline.

The Stewart Model 131-M truck speedometer was designed for Government use, the object in view being to produce a speedometer which would withstand the severe jolts and



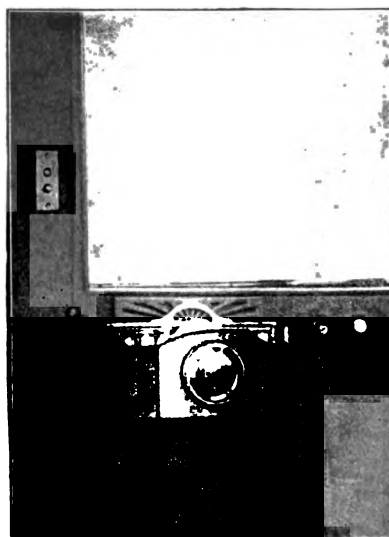
vibration to which the instrument is subjected on a truck. It consists of a Model 131 speedometer enclosed in an aluminum shell which takes up the jolts and shocks when driving and protects the instrument from breakage due to carelessness in loading, etc.

The instrument has a 30-mile rotating speed dial, a 100,000-mile season and a 100-mile trip register, with a reset knob set parallel to the face. The face of the instrument is set at an angle, which makes the figures very easy to read from the driver's seat. Model 131-M is attached to the dash by four wood screws.

## Vanity Case Type of Dictograph

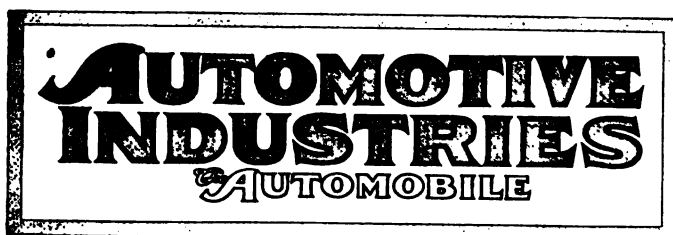
**T**HE General Acoustic Co., New York, for a period of a little over a year has been manufacturing an instrument enabling the occupants of a closed car to readily communicate with the driver. A new type of this device, known as the vanity case type, has just been brought out. All that is visible inside the car is a small transmitter plate and two push buttons. One button operates the buzzer which notifies the driver; the other button is depressed while talking. As soon as the pressure on this button is released, the circuit of the dictograph is opened and the driver cannot hear anything that may be said inside the rear compartment.

There is nothing to be put to the mouth while talking. One simply talks in a natural tone and from a natural position toward the transmitter plate, and the sound reaches the chauffeur without any action on his part. The Packard company of Detroit installed a dictograph in a special way, drawing the upholstery over the transmitter plate, so that all that is visible is four small openings corresponding to the openings in the plate. We understand, however, that practically all of the bodies which are being built locally for the Packard company of New York are fitted with the vanity case type.



*The Motor Dictograph and its appearance when installed in an automobile's vanity case*





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## Labor Turnover

**A**S a result of our present abnormal industrial activity the demand for factory labor is far greater than the supply. Workmen are well aware of this condition, and they often "throw up their jobs" for what seem trivial reasons. The "Men Wanted" sign is up at nearly every factory employment office and the newspaper advertising columns are full of "Help Wanted" ads, so they know they will have no difficulty in securing employment elsewhere. Moreover, as many concerns are making every effort to draw labor from other plants, it is no wonder that factories where the working and other conditions are unpleasant are losing men as fast as they can hire them and have an amazing "turnover."

One of the reasons why workmen often leave the crowded war-industry centers is lack of proper housing facilities. On a recent occasion when the subject was discussed a manufacturer remarked that most of the beds in workmen's boarding houses in

his neighborhood had to serve for double shifts, and another said he could go one better in that he knew of a case where a rooming house with eight rooms accommodated ninety men. Men may bear up with such conditions for a while, but they soon tire of them and look for a chance somewhere else.

There has recently been a remarkable increase in the interest in welfare work, which is directly related to the subject of "turnover." This welfare work is aimed at making the working conditions so agreeable to the workman as to tie him to his job. It seeks to protect the health of the men while at work in the factory by providing proper safeguards. It also aims to look out for the well-being of the men during their hours of freedom, by providing suitable housing accommodations and opportunities for wholesome entertainment. It seeks to protect the families of employees by encouraging the formation of benefit associations and protecting the men against loan sharks.

In the past such extensive welfare programs have been carried out only by a small number of very large firms and they have been generally looked upon either as a form of advertising, a form of philanthropy or both combined. It seems, however, that we are rapidly reaching a point where every large industrial employer will have to resort to this means in order to keep his turnover within bounds. A large turnover means operating at low efficiency, because it means operating largely with green hands all the time. In many of the old-established plants the working force divides into two distinct groups—those who have been definitely bound to the firm and who stick in spite of tempting offers from outside, and the floaters.

## Catering to the New Demand

**O**NE of the great lessons which we Americans shall learn from the war is the lesson of economy, of "carefulness in outlay," of "freedom from extravagance" as the word is defined in the dictionaries. We shall gradually, in fact we are already, unconsciously acquiring habits of thrift. We are beginning to realize that it is as necessary to save our material resources as it is to save our money. We are beginning to appreciate what waste means and how the wasteful methods and practices of ourselves and others increase the burden which we help to bear.

Extravagance is rapidly becoming old fashioned—out of date. We are giving more and more thought to getting what we should for what we pay. We are acquiring, without realizing it, an abhorrence for wastefulness and inefficiency.

This new point of view, this changed attitude of the American public, will modify all its actions and activities. Buyers will be governed by new considerations. They will not go about with yard-sticks of efficiency nor measure up their purchases according to definite standards of economy. They will not, as a matter of fact, realize that they are buying in a manner differing from the way in which they formerly bought. But the seller must know that they

are. He must adapt his methods and his merchandise to the new demand.

Automobile manufacturers will do well to consider now how this changed buying attitude is going to affect them, how they must meet it with altered products and with modified selling policies. Many, as we know, are already taking it into account in planning their post-war program. More must do so, and eventually will.

### The Call for Efficiency

The demand for economy and efficiency in operation will become stronger day by day and will be one of the chief considerations of the designer of post-war models. Buyers will be interested more in miles per gallon than in body lines and as much so in miles per dollar of tire expense as in hill-climbing abilities. They will inquire more deeply into replacement cost and will more carefully consider depreciation. They will exercise that "carefulness in outlay" which is true economy.

But this does not mean that the demand will be only for low-priced, light-weight cars. In fact, neither price nor weight has more than an indirect bearing on the matter. The inefficient low-priced, light-weight car will be no more popular than the inefficient high-priced heavy vehicle. There will always be a demand for the qualities which the "big car" has. But those who seek these qualities will choose them where they find them accompanied by the more desirable quality of efficiency. For this class of buyers luxury and economy must be brought together.

## No Restrictions on Truck Manufacturers

AT the recent convention of the American Drop Forge Association at Buffalo, T. C. Powell of the U. S. Railroad Administration appeared as a representative of the Priorities Board to explain the present system of priority rulings.

This is naturally a most important matter to the drop forge concerns, as all of their product is subject to priority ratings. Probably the most important statement made by Mr. Powell, from the automotive standpoint, is that motor trucks intended for other than military purposes are regarded as essentials by the government, and their production will not be interfered with. This, of course, does not mean that materials, fuels, etc., used in motor truck manufacture will not be subject to government control, but it does mean evidently that in establishing priority ratings, motor truck manufacturers will be fully taken care of.

The statement referred to was made in direct reply to a question by a manufacturer of gears for motor vehicles, tractors, etc., and should be reassuring to truck manufacturers, some of whom, we understand, have been in dread of a cutting off of their supplies by the Priorities Board. In view of the urgent need for transportation facilities and the great services that are being rendered by motor

trucks in transporting essential materials and commodities, this view of the Priorities Board is a thoroughly sound one.

## Industrial Trucks in Manufacturing Plants

SOME ten years ago it dawned upon the dockmaster of one of the large transatlantic lines that muscle power had become too slow and too expensive for handling freight on docks and in consequence an order was given for the first lot of electric industrial trucks ever placed in service. Since that time the industrial truck has almost ousted the hand truck from steamship piers and railroad yards and it is now making its way into manufacturing plants. Electrical energy can be purchased at a couple of cents per kilowatt-hour less than 1 per cent of what has to be paid for human muscular energy, hence the advantage of using electric power wherever possible is obvious. Of course, human labor cannot be entirely dispensed with; but the drudgery can be taken out of the work and labor can be made ever so much more productive.

The great possibilities of the industrial truck have been well shown by its development on steamship piers. The original truck has even been largely succeeded by tractors which haul five or more trailers on which the freight is carried. A start has been made in employing female labor for driving these trucks and coupling up the trailers. If it were not for the use of these electric trucks and tractors the handling of heavy freight would probably be about the last line of work in which female labor would replace male labor. However, operating these electric trucks and hooking on the trailers to the tractors is work well within the physical limitations of woman. All of the necessary safeguards are provided, and the truck or tractor automatically stops if the operator should be thrown from his seat. Operation of the trucks is a very simple matter, and a new driver can be broken in in a day or two, though it is to be expected, of course, that his skill will increase with further experience.

In automobile, truck, tractor and aircraft factories, and especially in those departments where the heavier work is done, overhead cranes or hoists and monorail installations are usually found. The industrial truck covers a field that cannot well be served by the hoist or crane, which latter is limited to the reach of its track. These trucks can be used for transferring material from one department to another and the tractors are also adapted to moving completely assembled vehicles from one department to another, as from the assembly floor to the paint shop.

Not that the use of industrial trucks in automobile plants is an absolutely new idea. Many of our largest plants are using these trucks. However, this application is comparatively new and is in the ascendancy, and now that a large number of new plants are going up for war work and others are being adapted to new uses the subject merits having attention drawn to it.

# Latest News of the

## Concentrate on Nine Tire Sizes

Remainder to Be Eliminated During 2½-Year Period—Plan Well Received

NEW YORK, July 1—The finally completed program of the War Industries Board to eliminate all but nine standard sizes of pneumatic tires and concentrate on straight-side types, except in two cases, is viewed with nothing but jubilation by both tire manufacturers and tire dealers. The nine sizes which are to be made will provide plenty of variety to equip all sizes and styles of passenger vehicles and also light delivery vehicles.

It is the plan of the War Industries Board gradually to eliminate a great number of odd sizes for which there has been little call and for which substitute sizes and types are readily available. Thus, for example, some 10 sizes in little demand are to be discontinued Nov. 1, 1918; four more will be eliminated Nov. 1, 1919, and nine more on Nov. 1, 1920. There seems no reason why this gradual elimination should impose hardships on either tire makers, tire dealers or the owners of cars. Following are the sizes that are to be continued without change:

### Class A

(Plain and non-skid treads)

Size	Rim
30 x 3½.....	ClIncher
32 x 3½.....	SS
31 x 4.....	ClIncher
33 x 4.....	SS
34 x 4½.....	SS
35 x 5.....	SS
36 x 6.....	SS
38 x 7.....	SS
40 x 8.....	SS

The following sizes are to be discontinued Nov. 1, 1918:

Size	Rim
30 x 3½.....	SS*
32 x 3½.....	QD*
32 x 3½.....	Cl*
33 x 4.....	QD*
33 x 4.....	Cl*
35 x 4.....	SS*
29 x 4½.....	SS*
32 x 4½.....	QD*
33 x 4½.....	QD*
36 x 4½.....	QD*
36 x 4½.....	SS†
34 x 4½.....	QD*
37 x 4½.....	SS*

\*Non-skid. †Plain tread.

The following sizes are to be discontinued Nov. 1, 1919:

Size	Rim
33 x 4½.....	SS†
36 x 4½.....	SS*

35 x 4½.....	QD*
37 x 5.....	QD*

\*Non-skid. †Plain tread.

The following sizes are to be discontinued Nov. 1, 1920:

Size	Rim
30 x 3.....	Cl†
32 x 4.....	SS†
34 x 4.....	SS†
32 x 4½.....	SS†
33 x 4½.....	SS†
35 x 4½.....	SS†
33 x 5.....	SS†
35 x 5.....	QD*
37 x 5.....	SS*

\*Non-skid. †Plain tread.

Although the number of sizes and types to be eliminated is considerable, the list has been carefully worked out and for each size or type done away with there remains one which can be substituted for it. Thus, for example, where a QD size is eliminated a straight side size remains, and this can be used on QD rims by the addition of a bead filler strip. Similarly, where a size has been eliminated in both straight side and QD, it is quite possible to use what heretofore has been termed an oversize.

The effect of the standardization on nine sizes will be to reduce very greatly the machinery required in tire making. Tire makers will be able to concentrate on a few sizes and turn these out in correspondingly greater quantities. The action should operate to eliminate shortages in certain sizes which have become prevalent of late.

On the side of the tire dealer the action is excellent. It permits him to stock only nine standard sizes instead of a much greater number that always has been necessary heretofore. It is estimated that by the time for the elimination of certain sizes car owners will have anticipated to a sufficient extent to permit the change being made without difficulty.

Although nothing specific has been said about it, it is understood that the order is to apply to both fabric and cord tires.

That the move to standardize sizes is quite agreeable to car manufacturers is evidenced by the fact that both the National Automobile Chamber of Commerce and the Society of Automotive Engineers have signified their approval of the plan.

### White Heads Transport Operations

WASHINGTON, July 2—Walter White of the White Co., Cleveland, has been appointed in charge of operations for the Motor Transport Service under Col. F. Glover. Mr. White takes the place vacated by the transfer of Lieut.-Col. James Furlow to the general staff; he will have charge of the operation of army trucks in this country.

## Exports of Gasoline Increase

April Figure 4,500,000 Gal. Ahead of Last April—France Biggest Buyer

NEW YORK, July 2—During the month of April the United States exported four and one-quarter million gallons of gasoline more than it did during April, 1917, and for the 10 months ending April, 1918, as compared with a similar period in 1917, the increase was nearly 25,000,000 gallons. Of the 20,862,303 gallons exported in April, 1918, France received nearly one-third, with the United Kingdom next taking approximately one-fourth, and Canada and Cuba next with about one-seventh each. Following are export statistics for April, 1917 and 1918, and for the 10 months ending April, 1918:

	April, 1918 Gal.	April, 1917 Gal.
France .....	6,177,083	5,267,106
Italy .....	1,588,900	4,712,638
Unit. King.....	4,527,365	
Canada .....	3,324,560	1,274,684
Panama .....	54,104	100,950
Mexico .....	38,658	57,374
Cuba .....	3,086,913	35,895
Argentina .....	10,000	598,971
Brazil .....	111,100	547,850
Uruguay .....		50,000
Venezuela .....	157,185	132,452
Australia .....	448,400	600,750
New Zeal .....	657,810	1,884,194
Philip. Isl.....		100,000
Brit. So. Af.....		339,450
Other countries....	670,235	901,756
Total .....	20,862,303	16,604,130

### Ten months ended April, 1918-1917:

France .....	48,646,118	52,056,033
Italy .....	26,651,703	12,318,071
Unit. King.....	56,818,949	48,252,299
Canada .....	23,207,667	17,525,387
Panama .....	1,210,309	792,367
Mexico .....	952,433	449,955
Cuba .....	6,037,323	1,207,811
Argentina .....	2,139,586	2,025,294
Brazil .....	4,666,648	4,658,965
Uruguay .....	400,020	193,400
Venezuela .....	436,985	675,337
Australia .....	6,839,215	6,123,320
New Zeal .....	6,008,459	5,747,054
Philip. Isl.....	1,496,604	2,187,580
Brit. So. Africa.....	2,414,240	3,081,930
Other countries....	9,624,375	15,862,561
Total .....	197,550,639	173,157,267

### Major Wall Now a Lieutenant-Colonel

WASHINGTON, July 2—Major W. G. Wall, who was chief engineer of the National Motor Vehicle Co., Indianapolis, has been promoted and is now a Lieutenant-Colonel. Col. Wall has just returned from the American Expeditionary Forces in France where he was investigating motor equipment, including tractors and tanks.



# Automotive Industries □

## To Close Washington M.A.M.A. Office

Work to Be Continued by War Service Committee in Charge of A. W. Copland

NEW YORK, July 2—It is altogether likely that the Washington office of the Motor and Accessory Manufacturers' Association will be closed in the near future. At the last meeting of the association a resolution was introduced placing in the hands of manager L. M. Bradley the matter of closing the office, or keeping it open if in his discretion sufficient need for such service remains. Although nothing definite has yet been decided upon it is probable that the office will be closed the end of this week.

The closing of the office will not mean the abandonment of the work which it has been carrying on, however. This is to be continued under the active supervision of A. W. Copland, who is chairman of the association's War Service Committee and who is at present in charge of the Washington office.

The establishment of the Washington office, which is housed in the Ouray Building, was done with the object of assisting members and the government in war work. Since the establishment of Regional Purchasing Departments, however, much of the work done by Mr. Copland and his assistants now is being done by the government. Furthermore, many of the M. A. M. A. members who were in line for government work have received it, so that the need for the Washington office is passing rapidly.

President Stiger is to call a conference of the War Service Committee of the association for Friday of this week at which future work of the committee will be discussed and decided upon. This meeting is to be held in Detroit.

### Two Lincoln Men Out

DETROIT, July 2—Rex Johnson, production manager, and Glenn Johnson, purchasing agent of the Lincoln Motors Co., have resigned. W. W. Goss, of the Condon-Carpenter Co., Providence, has been appointed in the place of Glenn Johnson.

### Grant Heads Kerosene Equipment Co.

DETROIT, July 1—At a stockholders' meeting of the Kerosene Equipment Co., a Delaware corporation, the following officers were elected: President, George D. Grant, president of the Marx Brass Works, Detroit, and director of the Grant Motor Co., Cleveland; vice-president, J.

W. Racklycoft; secretary, R. J. Sherman; treasurer and general manager, E. E. Schwarzkopf. Announcement of the appointment of a sales manager will be made shortly. The officers, with Frederick C. Billings, president of Billings & Spencer, Hartford, Conn., make up the board of directors. The company has started production of its carbureters in its plant at 74 East Fort Street.

### Two Tire Companies Raise Prices

NEW YORK, July 2—Two tire companies, the Lee Tire & Rubber Co., and the Endurance Tire & Rubber Co., have increased prices of their tires beginning July 1. Lee tires are up 5 per cent and Endurance 10 per cent. There does not seem to be a general disposition to raise prices on the part of the other large companies, but one or two have expressed the opinion that increases may be looked for in the near future. The new prices follow:

Size	Lee Old Price	New Price
30 x 3.....	\$15.70	\$16.50
30 x 3½.....	20.00	21.00
32 x 3½.....	23.50	24.70
31 x 4.....	31.00	32.55
33 x 4.....	33.05	34.70
34 x 4.....	34.25	36.00
34 x 4½.....	45.55	47.85
36 x 4½.....	48.40	50.85
35 x 5.....	55.90	58.70
37 x 5.....	59.15	62.10
	Endurance	
30 x 3.....	\$20.35	\$22.40
30 x 3½.....	26.15	28.75
32 x 3½.....	30.25	33.25
31 x 4.....	38.90	43.90
33 x 4.....	42.65	46.90
34 x 4.....	44.00	48.40
34 x 4½.....	53.30	64.10
36 x 4½.....	61.90	68.10
35 x 5.....	69.85	76.85
37 x 5.....	74.00	81.40

### Find Emerson Motors Guilty

NEW YORK, July 2—The Emerson Motors Co., Kingston, N. Y., and four of the brokers who sold its stock have been convicted by a jury in the Federal District Court of using the mails to defraud. President George A. Campbell, his son George Campbell, who is treasurer, George B. Gifford, a director, and Will H. Stetson, a promoter, were found not guilty. All of these individuals, as well as the Emerson company, were tried on an indictment of 13 counts, 12 for using the mails to defraud and one for conspiracy.

### Wright-Martin Production 25 a Day

NEW YORK, July 2—The Wright-Martin Airplane Corp. is reported to be producing engines at the rate of 25 a day, this being an increase of 5 a day over the production a month ago. It is expected that the new plant in Long Island City will be ready for operation soon and that production will be brought up to 50 engines a day before the end of the year.

## Some Steel in Sight for Cars

Steel Mills Urging Automobile Plants to Contract for Future Deliveries

NEW YORK, July 2—Although the steel situation is still in a more or less unsettled condition, some ray of hope is seen by those who have been watching developments with a discerning eye. Now that the President has approved the agreement made by the Price-Fixing Committee of the War Industries Board with representatives of the iron ore, pig iron and iron and steel interests, an air of comparative quiet reigns; prices are not to be altered until Sept. 30, 1918.

It is still impossible for anyone to know with any degree of accuracy, the quantity of steel that will be required by the government in the filling of war orders, for ships, etc. And though the steel makers are quite frank in their statements regarding the impossibility of making shipments at the present time, it is understood on excellent authority that they are urging automobile makers to engage in contracts for future deliveries.

It is stated that within the next 90 days the government will find that it cannot absorb the entire output of the mills and that it will be forced to permit deliveries to non-war industries in order to obviate the possibility of trouble in the various steel plants.

### Sale of Paige Denied

DETROIT, July 1—The rumor that the General Motors Corp. is about to purchase the Paige-Detroit Motor Car Co. is unfounded according to H. M. Jewett, president of the latter company. The Paige company has been approached a number of times in the past by the General Motors Company with offers to sell and the recent visit to the east of Mr. Jewett who sought an interview with W. C. Durant of the General Motors caused an over-zealous newspaper correspondent to write a story to the effect that Jewett's visit was prompted by a desire to go through with the deal. As a matter of fact, the conference between the two men dealt only with the steel situation.

### Turnbull Sales Handled at Defiance

DEFIANCE, OHIO, June 27—The truck sales division of the Turnbull Motor Truck Co. has been transferred from Fostoria, Ohio, to the factories at Defiance.

## Federal Trade Commission Finds Many Companies Made Huge Profits

Fixed Price Plan Helps Swell Dividends—War Work Profiteering Found—Steel Profits Without Precedent—False Reports of Gasoline Shortage Circulated

WASHINGTON, June 29—Large profits are made by low cost concerns under the governmental fixed price for the whole country plan.

The outstanding feature on the score of profit is the trade tendency to increase and maintain prices against the forces of competition.

Considerable profiteering due to the necessities of the Government exists.

Steel profits, due to the Government price fixing, are without precedent.

Reports of gasoline shortage have been circulated for the purpose of maintaining the high prices and heavy profits which gasoline producers are enjoying.

These and other important findings are announced to-day by the Federal Trade Commission in a report to the President of the United States Senate.

The Federal Trade Commission is operating to secure information on the present range of profits in various industries through three activities:

a. Cost finding by the Commission for the War Industries Board, Food Administration, Fuel Administration and other executive departments which have called upon the Commission for this work.

b. Industrial surveys undertaken by the Commission at the direction of the President or upon its own initiative.

c. Enforcement of the law against unfair methods of competition.

### Many Industries Reviewed

Under these activities the Commission has had recent view of many industries handling basic materials including steel, copper, zinc, nickel, sulphur, lumber, coal and petroleum and its products. It has also had daily contact with the tendencies of the trade and revealed through numerous complaints filed for the application of remedies under the powers of the Commission.

The outstanding revelation, states the Commission report, which accompanied the work of cost finding, is the heavy profit made by the low cost concerns under a Governmental fixed price for the whole country. The Commission states that it has reason to know that profiteering, due to advantages taken of the necessities of the times as evidenced in the war pressure for heavy production, exists. Some of this profiteering, it is said, is attributable to inordinate greed and bare-faced fraud.

"In the case of basic metals, as in steel, when the Government announced a fixed price, it was made so high that it would insure and stimulate production. This has resulted in giving a wide margin of profits. Under the device of cost plus a margin of profit, these profits are necessarily great in the case of the low cost mills. Thus while the market was pre-

vented from running away, as it would have done undoubtedly if it had not been regulated by a fixed price, the stronger factors in the industry are further strengthened in their position and enriched by profits which are without precedent."

Following is the important part of the text of the Federal Trade Commission report:

"The experience with steel, shows that a high stimulating fixed price, while stabilizing an ascending market, produces an economic situation which is fraught with hardship to the consuming public and with ultimate peril to the high-cost companies through increasing the power of their low-cost competitors.

### Petroleum Market Surveyed

"In this connection a survey of the petroleum field shows that the market, when under the control of dominating factors, such as Standard Oil, can be one of huge profits without the device of the high fixed price. No price for the public has been fixed upon petroleum and its products by the Government.

"Unlike the situation in steel, flour and coal, there has been as yet no Government interference with the law of supply and demand except in the instances of Government purchases.

"Under that law large profits may eventuate through the bidding up of prices by anxious buyers. And, moreover, even in the absence of this element, prices may be forced up by spreading false and misleading information concerning the condition of supply and demand.

"Reports, for instance, have been circulated that the supply of gasoline was endangered for the purpose of maintaining the high price of that product and the heavy profits from it. At different stages of the oil industry different products of petroleum have yielded the heavy profits. Kerosene was once the chief profit producer. Gasoline followed and superseded it as the chief producer of profits.

"Enormous profits are now being made in fuel oil, with the advantage to the refiner that the high price of the product meets no popular challenge. Gasoline is maintained at its present high price and procures heavy profits for the low-cost refiners.

"Payment of extraordinary salaries and in some instances bonuses to executives of corporations have been found by the Commission during its investigations. An illuminating example of high remuneration, charged to the expense account, is that given by the American Metal Co., Limited, of New York, the chief dealings of which are in zinc. Ap-

pendent are the salaries and tantieme (French—an interest, commission of proportional amount) of some of the chief officials.

B. Hochschild, Chairman of Board of Directors ..... \$179,663.36  
C. M. Loeb, President ..... 364,326.73  
Otto Sussman, Vice-President ..... 221,596.04  
J. Loeb, Vice-President ..... 147,930.69  
Sol. Roos, Manager St. Louis office. 148,580.69  
M. Schott, Manager Denver office. 136,553.12

"In addition to the information above given, the Federal Trade Commission occupies an advantageous position where it is possible to view certain tendencies in trade which bear upon the problem of profiteering.

### Can Prevent Unfair Methods

"Under the law the Commission has power to prevent unfair methods of competition and it is daily in receipt of complaints which it investigates and, if it has reason to believe that an unfair method has been used, arraigns the party complained against for a hearing of the issue. It has developed that, outside legitimate increases in price due to higher costs and other economic elements, certain members of trade have preyed with avarice upon the consumers.

"Another trade practice has developed in which the consignee refuses goods after shipment because the market has fallen, and vice versa the consignor refuses to ship on a rising market. These instances, which in the knowledge of the Commission have not been numerous, have been handled by the Commission in connection with the Food Administration and its power of revocation of license.

"Still another trade practice which has increased the price of supplies to the consumer has been that of commercial bribery, upon which subject, this body recently addressed the Congress, suggesting remedial legislation.

"Again, the trade tendency of manufacturers maintaining the resale price of wares has contributed to holding high the general price level and in instances has increased profits without question. The action of the courts and the Federal Trade Commission in prohibition of this policy is becoming generally known to the trades and will, in our opinion, work a correction by opening up some of the closed channels of competition.

### General Trade Excellent

"In submitting the subjoined memoranda on the industries under consideration, the Commission expresses the opinion that general trade, as the Commission has opportunity to view it, is in a high state of prosperity. With some exceptions that condition has continued for several years past. Many of the industries are making unusual profits, some are showing outrageous ones. In an hour of national service and self-sacrifice, profiteering may be defined not only as the taking of an exorbitant profit, but should include a refusal to share in bearing the burdens of war in the form of a reduction in profits when the profits have been large in pre-war times.

## Steel

"In 1917, the steel companies made abnormal profits in the period prior to the Government price fixing policy, and a number have continued to make unusually heavy profits since that policy was inaugurated. In finding costs in this industry for the War Industries Board, the Commission divided the steel makers into four groups:

"(1) The fully integrated mills.  
"(2) The mills which start with the manufacture of pig iron.

"(3) The mills that start with steel furnaces.

"(4) The mills that make rolled products from purchased semi-finished steel.

"The United States Steel Corp. is included in Class 10. Its profits expressed in terms of the total amount invested in the business shows net earnings as follows:

1912.....4.7%	1915.....5.2%
1913.....5.7%	1916.....15.6%
1914.....2.8%	1917.....24.9%

"The figures, as to the net income of the Steel Corp. as shown by the company for the years 1912, '13, '14, '15, '16, and '17 before deducting Federal Income and Excess Profits Tax in 1917, follow:

1912.....\$77,075,217	1915.....\$97,967,962
1913.....105,320,691	1916.....294,025,564
1914.....46,520,407	1917.....478,204,343

"The Federal Income and Excess Profits taxes of the Steel Corp. for 1917 were \$233,465,435, which leaves from net income \$244,738,908, of which about one-tenth was applicable to interest on bonds of the corporation and the rest available for dividends and surplus.

"From information in possession of the Commission, mills in Class 2 appear to have made heavy profits in 1917. Recently, mills in Class 3 made objection that the Government prices were too low for them. A special examination of their profits by the Federal Trade Commission showed that in almost every case these objecting mills were enjoying unusual returns.

"The following table of percentage of return on investment in ten mills in Class 3 will show the profits in 1917:

	1917 Per Cent
Allan Wood Iron & Steel Co.....	52.63
Allegheny Steel Co.....	78.92
American Tube & Stamping Co.....	40.03
Central Iron & Steel Co.....	71.35
Eastern Steel Co.....	30.24
Forged Steel Wheel Co.....	105.40
Follansbee Bros. Co.....	112.48
Nagle Steel Co.....	319.67
West Penn Steel Co.....	159.01
West Leechburg Steel Co.....	109.05

"Mills in Class 4, which buy the semi-finished steel and convert it into the more highly developed steel products, have enjoyed substantial profits.

## Copper

"Very large earnings have been made in the copper industry on the whole, although it should be noted that they have been due in part to an unusually heavy demand for this metal, which is used almost exclusively for war purposes directly and indirectly.

"The Commission's figures show that 21 companies, including a large proportion of high-cost companies, made profits in 1917 which ranged from 1 per cent to 107 per cent on their investments. The average profit was 24.4 per cent. Probably over 70 per cent of the production is marketed at profits over 20 per cent on investment.

"These same companies show an average profit of only 11.7 per cent in 1913, which may be considered to be a normal year. Thus the average profit in the industry has more than doubled. The range of profits in 1913 was from 1 to 56 per cent.

"The profits used in these computations do not include Federal income or excess profits taxes, and, therefore, represent sums actually retained by the companies for addition to surplus or dividends.

"There does not appear on the whole to have been any concerted action in this industry in putting prices up in the first instance. The war scramble among the Allies shot the prices of copper and other metals to almost unheard of levels. But there are certain strong interests among the producers and marketers which predominate in certain stages of production, and these appear to have taken steps to maintain prices at unnecessarily high levels.

"In the first place, the smelters, and notably the American Smelting & Refining Co., have continued to hold in force certain deductions for risk of carrying copper bought from mines, which risks have ceased to exist. These deductions were put in force during the early period of the war, before price was fixed by agreement with the War Industries Board.

Their present maintenance amounts to profiteering at the expense of the miners, especially the small producers. On the other hand, some of the larger and richer mines have contracts entered into before the war running for periods as long as 20 years, which are extremely advantageous to them and which are now causing some refineries to operate at a loss.

## Zinc

"Most of the evidence in the Commission's possession indicates no unusual

profits in the zinc industry, with the exception of the operations of the New Jersey Zinc Co.

"The following net earnings and dividends are shown for the New Jersey Zinc Company according to published statistics; 1916, profits, 72.5 per cent, dividends 76 per cent; 1917, profits 56 per cent, dividends 46 per cent. The Federal Trade Commission's figures as to these same net earnings and dividends are available only for 1916, and indicate profits of 95.9 per cent, with dividends of 76 per cent.

"These large earnings do not indicate excessive profits on metallic zinc. The company's profits on common spelter are very low, and on Grade A spelter while high are due to the fact that it possesses a natural monopoly of a certain high grade ore, the product of which cannot sell for less than the zinc produced by competitors. In fact, the whole explanation of the New Jersey Zinc Company's large profits lies in its possession of an ore body of unusual richness and purity.

## Petroleum and Its Products

"The data secured by the Federal Trade Commission for 106 refining companies for the first quarter of 1918, supplemented in certain cases by returns for the second six months of 1917, indicate that the average profit in the oil industry is about 21 per cent on the investment.

"This is a considerable increase over the rate of profits indicated for pre-war years, as the Commission's gasoline report indicates an average profit for the years 1913, 1914 and 1915 of 15 per cent on the investment. In 1917 over 50 per cent of the estimated production was produced by companies having a profit of over 20 per cent on the investment. Rates of profits ranged from losses up to 122 per cent.

"The profits of the Eastern refiners have been relatively larger than those on the Pacific Coast. The situation in the East is due to the fact that, while gasoline prices have been but slightly advanced, the prices of other products have been increased greatly, especially the price of fuel oil. The public knows little about prices except the price of gasoline, and to a less extent kerosene. Formerly

(Continued on page 41)

## Profits of Petroleum Refiners For 4 Years

	1913	1914	1915	First Quarter 1918	1918 (Estimated)
Atlantic Refining Co.....	16.4	—3.7	21.7	*15.0	30.0+
Standard of Indiana.....	36.5	14.5	36.0	*21.7	43.3+
Standard of New Jersey.....	9.7	7.8	20.6	*9.1	18.2+
Standard of New York.....	21.2	8.1	16.0	*6.6	13.3
Standard of Ohio.....	23.4	13.8	23.9	*14.3	28.6+
Standard of Kansas.....	91.6	1.0	17.9	*25.6	51.3+
Magnolia Petroleum Co.....	19.2	16.5	14.2	4.4	17.6
Standard of California.....	16.8	12.5	10.6	6.5	25.9+
Continental Refining Co.....	1.6	—7.8	3.3	1.2	4.7+
Empire Oil Works.....	4.4	—3.1	5.6	17.6	70.4+
Penn American Refining Co.....	35.3	13.3	12.3	15.8	63.1+
Cosden & Co.....	..	30.6	—50.7	5.9	23.5
Muskogee Refining Co.....	8.7	6.9	18.8	6.2	24.8+
National Refining Co.....	24.9	8.0	20.4	2.3	9.2
The Texas Company.....	17.1	13.3	12.7	*13.3	26.7

\*Six months period, July-December, 1917.

†Last six months of 1917.

‡Estimate based on figures for last six months of 1917, or first quarter of 1918.



## New York Dealers Join N. A. D. A.

More Than 100 Enroll in Growing Organization—Movement Spreading Rapidly

NEW YORK, July 1—More than one hundred dealers of New York, Brooklyn, the Bronx and towns north and east within 100 miles enthusiastically rallied to the support of the growing National Automobile Dealers' Association at a meeting at Reisenweber's this noon. More members were secured than was believed possible. Brooklyn joined its twenty-one members in a body.

At the meeting President F. W. A. Vesper of the National explained in a 45-minute talk the work the association has done and is doing at Washington and elsewhere to safeguard the rights of the dealers and was followed by Executive Secretary E. E. Peake, who told of the need for greater numerical strength.

The 5000-in-90-days membership campaign has started with good results. At a meeting in Pittsburgh Thursday night 208 dealers of that section joined. In Harrisburg Friday night 40 joined. A meeting is being held in Philadelphia this noon at which it is expected the Pittsburgh and New York meetings will be duplicated.

From the East the campaign will move west for a few days with meetings in Cleveland, July 9, Indianapolis, July 10, and Minneapolis, July 12. Later there will be another group of eastern meetings including Newark, N. J., Boston and several New York state cities.

Advices from the N. A. D. A. headquarters in St. Louis state that applications are pouring in from all sections. Meetings and organization plans are being perfected, in addition to the cities mentioned, in Clinton, Iowa; Fort Dodge, Iowa; Des Moines; Joplin, Mo.; Richmond, Va.; Waterloo, Iowa, and San Antonio, Tex.

The war conservation plan worked out by President Vesper and the War Service Committee, a feature of which is the closing of service stations and salesrooms nights, Sundays and holidays, is sweeping the country.

### Fix Acid Prices

WASHINGTON, June 29—Prices for sulphuric and nitric acid have been fixed following conference between the manufacturers and the War Industries Board. The following maximum prices per ton of 2000 lbs. were agreed upon and approved by President Wilson, taking effect at once and expiring Sept. 30, 1918:

Sulphuric Acid—60° Baumé, \$18; 66° Baumé, \$28; 20 per cent oleum, \$32; f.o.b. at makers' works in sellers' tank cars. In carboys in carload lots, ¼ cent extra per lb.; in carboys in less than carloads, ½ cent per lb. extra; in drums, any quantity, ¼ cent per lb. extra.  
Nitric Acid—42° Baumé, 8½ cents per lb. b. makers' works in carboys.

A schedule of maximum prices will be issued later after completion, relative to mixed acids.

The above maximum prices were agreed upon for the public as well as the Government. Deliveries made after Sept. 30 will be subject to any revision in price which the Government makes after that date.

### Automotive Electric Meets July 10-13

NEW YORK, July 1—The semi-annual meeting of the Automotive Electric Association is to be held at the Lake Placid Club, Lake Placid, N. Y., July 10 to 13 inclusive. Aside from routine business the following papers are to be presented: "Standardization in Problems in the Starting and Lighting Industry," by B. M. Leece; "Size and Performance of Batteries in Relation to the Size of Engines for Work to Be Done," by C. F. Gilchrist, chief engineer Electric Autolite Corp., Toledo.

### Regal Sold at Auction

DETROIT, June 28—The machinery, equipment and property of the Regal Motor Car Co. was sold June 26 by the Security Trust Co. acting as receiver for the company. The total assets of the company were listed by the receiver as \$1,137,140.82. In this was included some machinery, which was later sold to the Government for \$41,000, about 5 per cent in excess of its inventoried worth. The balance was sold to Maurice Rothchild, one of the largest creditors, for \$500,000. The sale has not been confirmed by the court as yet. A petition has been filed requesting that an investigation into the company's affairs be made first and that a new receiver be appointed. It is charged that the Security Trust Co. is both receiver and trustee for the bondholders, the majority of whom are Maurice Rothchild and J. B. Livingston, who petitioned for the receiver. This is the basis for the request that a new receiver be appointed.

### \$50,000 Prize For Atlantic Flight

WASHINGTON, July 1—A prize of \$50,000 to be awarded by the Government of the United States to the aviator or aviatrix who is first to fly across the Atlantic to England by any reasonable direct aerial route is proposed in a joint resolution introduced in the House yesterday by Representative Lunn of New York.

### Garabed Proves a Failure

WASHINGTON, July 1—"Garabed," the free energy invention of Garabed Giragossian, is a failure according to the report of the scientists appointed to investigate the machine. The committee appointed announces that it does not believe the principles of the inventor sound, or his devices practical, or that they could result in development of free energy.

## Advises 8-Hour Day for Government

War Labor Policies Board Also Suggests Time and a Half for All Overtime

WASHINGTON, June 29—An 8-hour day wage rate, with overtime at the rate of time and one-half for all mechanics and laborers employed by the Government, was recommended by the War Labor Policies Board to-day. The board further recommended that mechanics and laborers employed upon construction work should be paid in the same way. It found, however, that while a uniform application of wage provisions as ordered by President Wilson in March on all Government work would tend to eliminate labor trouble, it would at the same time interfere with and hamper Government departments in securing supplies needed in the prosecution of the war. The board also decided that a conference should be held in the near future to determine to what extent during the period of the war the adoption of the basic 8-hour day principle of determining wages is feasible.

### Government May Take Aircraft Plants

WASHINGTON, July 1—The Senate Aircraft Investigating Committee, according to rumors here, will recommend that the Government take over all aircraft factories and run them under direct official supervision. Discoveries by the committee in some of the factories visited, it is said has brought the belief that in no other way can aircraft production be put on a basis which will enable it to catch up reasonably soon with the rest of the army. There are also rumors of profiteering by some of the concerns having aircraft contracts with the Government. The committee's report is expected to be made after Congress returns from the summer recess about Aug. 15.

### Cadillac Advances Prices

DETROIT, July 1—The Cadillac Motor Car Co. has advanced the prices of all its models, effective to-day. The old and new prices follow:

	New	Old
Open models.....	\$3220	\$2970
Brougham, 5 passenger.....	4090	3840
Victoria.....	3615	3365
Town limousine.....	4360	4160
Town landaulet.....	4510	4310
Landaulet.....	4490	4290
Limousine.....	4395	4195
Chassis (125 in.).....	2690	2490
Chassis (132 in.).....	2770	2570
Chassis (145 in.).....	2810	2610

### Two New Redden Units

CHICAGO, July 1—The Redden Motor Truck Co. has enlarged its line by the addition of two new products, one a universal truck maker, which has been designed to fit any make or model of passenger car, regardless of the kind or location of the transmission mechanism, and a four-wheeled trailer.

## To Use Motor Trucks Instead of Tubes

### President Vetoes Pneumatic Conveyor Contracts for Postal Service in Large Cities

WASHINGTON, June 29—President Wilson's vetoing of the annual Post Office Appropriation Bill on the ground that it provided for the continuing of the pneumatic mail tube systems in New York, Chicago, Boston, St. Louis and Philadelphia is a noteworthy endorsement of the motor truck, as the President's objections to the continued use of the mail tubes are based on the reports of experts who stated that the purpose of the tubes could be more satisfactorily accomplished by the use of surface motor transportation.

As a result of this action by the President, the mail tubes which connect the post offices and railroad terminals and the main offices with branch stations in the cities named will cease operation on July 1 unless arrangements are made in individual cases to continue their use temporarily while changes in the distribution system can be effected.

The new plan will call for a much extended use of motor trucks, and the number in the service of the Government in post office work will consequently have to be increased materially.

Provision was made in the vetoed measure for a sufficient number of motor trucks to take care of the additional burden which would be imposed upon surface transportation with the discontinuance of the use of the mail tubes, and this clause of course remained in the new bill eliminating the use of the tubes, which was immediately put through after the President had vetoed the original one.

In his veto message President Wilson said:

"At the time that they (the pneumatic tubes) were installed, they may have had some value as a postal facility, but that was before the volume of mail had reached the enormous proportions which it has to-day, and before the development of the use of motor vehicles. These developments have made the tubes practically obsolete, quite unnecessary, and, in fact, a hindrance to the efficient operation of the postal service. . . . The Post Office Department has found it necessary, because of the unreliability and the inefficiency of the tubes, to divert a large quantity of mail formerly dispatched by their use to autos, wherever close connections are required. It has been found that late closings of the mails can be accomplished, and a closer connection assured by this means. I am informed that this is true even in the congested sections of New York City.

"I am informed that during the last 10 years many efforts have been made to extend the present system of pneumatic tubes, but that these extensions have been invariably advised against by the departmental commissions of the

postal experts, who investigated the matter, and that the reports of these experts invariably called attention to the development of the automobile as a factor which would have to be considered at the close of the present rental contracts."

### Manternach Heads American Welding

CLEVELAND, July 1—J. C. Manternach has been elected president and general manager of the American Welding & Mfg. Co., Warren, Ohio, which was formed early this year, with \$200,000 capital. Other officers are: Vice-president and general superintendent, C. W. Gressle, up to June 1 last and for more than 20 years connected with the Standard Welding Co. and later the Standard Parts Co.; treasurer, Dan A. Gieger, president of the Western Reserve National Bank; secretary and counsel, F. D. Templeton; master mechanic, J. L. Greer, formerly of the Trumbull Steel Co.; foreman of base and band department, Charles G. Smith, who held a similar position with the Standard Welding Co. The first unit of the company's plant, consisting of a one-story brick and steel structure, 100 x 260, is nearing completion, and it is planned to have the plant in full operation by Sept. 1. The company will produce S. A. E. bands, bases for solid tires, gear and chuck ring blanks, bands and wheels for tractors and steel tires for government artillery and escort wagons. The initial capacity will be about 500 base bands and 1000 S. A. E. bands per day. This will be considerably increased. Mr. Manternach has been manager of the rim and tube division of the Standard Parts Co., Cleveland, which position he left July 1, after having served the company for 8 years.

### Production of Spruce and Douglas Fir

WASHINGTON, June 28—According to what are called "preliminary final figures" on 1917 lumber production, just issued by the Forest Service of the U. S. Department of Agriculture, the reported production of Douglas fir last year was 5,327,720 thousand feet. This was 96 per cent of the computed production. The reported production of spruce was 975,913 thousand feet, as against a computed production of 1,125,000 thousand feet. The reported production in this case was only 86 per cent of the computed.

Incidentally it may be mentioned that the total lumber cut for the country for 1917 was approximately 10 per cent less than the production in 1916. This is attributed principally to the largely decreased private building operations, the scarcity of labor in connection with small operations, transportation difficulties, curtailment of demand on the part of wood using industries, and a more or less general dislocation of lumber distribution through ordinary channels of trade. A considerable portion of the total quantity produced was utilized in meeting the exceptional demand for Government construction and other war emergency projects, including ship material.

## Maximum Prices for Lumber Set

### Government Price Fixing Committee Establishes Figures for Fir and Pine

WASHINGTON, D. C., June 28—Maximum prices for two classes of lumber, fir and yellow pine, have recently been determined by a price fixing committee appointed by the President. The establishment of maximum prices on fir is of considerable interest to the aircraft industry, inasmuch as it has recently been found that Douglas fir is a satisfactory substitute for spruce in the manufacture of aircraft.

The action of the price-fixing committee was taken after consultation with loggers and lumber manufacturers of the Pacific Northwest, and of the South respectively. The price of fir lumber for aircraft use is to remain the same as now in effect. The price of fir ship timbers to the Emergency Fleet Corporation is to remain the same as that determined upon by the price-fixing committee on March 18, 1918.

Prices of all other items of fir lumber are to be based on the West Coast price list of May 1, 1915, plus additions on certain items enumerated on a discount sheet issued on Feb. 15, 1918.

### Prices Apply to All Mill Purchases

In an explanatory note accompanying the announcement of the new prices, by the Bureau of Public Information, it is stated that Douglas fir lumber prices apply on lumber manufactured in the Pacific Northwest, and represent an average increase of approximately \$2.75 per thousand board feet over the former list of prices for Douglas fir sold to the Government. The prices as now established are f.o.b. mill and apply to all purchases of Douglas fir for mill shipment.

The yellow pine prices apply on lumber manufactured in the southern states enumerated in the ruling. These prices represent an average increase of approximately \$4.80 per thousand board feet over the former Government list. The prices now established for yellow pine are likewise f.o.b. mill and apply to all purchases of yellow pine for mill shipment. Mill prices charged to the commercial trade for yellow pine prior to the date of the new ruling averaged considerably higher than the price fixed for Government purchases. This new ruling will not result in any higher prices than were formerly paid by the commercial trade for yellow pine, although it does mean a higher price for the Government. In the case of Douglas fir the new prices will result in a very slight, if any, average advance to the commercial trade.

### Ford Tractor Increases Capital

Henry Ford & Son, Dearborn, Mich., have increased their capital stock from \$1,000,000 to \$5,000,000.

## For Efficient Use of Freight Cars

### Government Issues Regulations for Proper Loading of Cars and Routing

WASHINGTON, June 27.—To utilize freight cars to the maximum the United States Railroad Administration has issued instructions as follows:

1. Consignments may be made for the same or for separate destinations. If for 2 or more destinations, intervening consignments must be to agency stations directly intermediate to the final destination.

2. Each consignment must be properly marked, showing consignee and destination, and loaded in manner best calculated to facilitate the unloading of each consignment with the least possibility of confusion, error, loss, or damage.

#### Bills of Lading and Waybills

3. Bills of lading and separate waybills must be made so as to distinguish each consignment as if loaded in a separate car. Waybills must plainly indicate that car contains 2 or more separate shipments and should be plainly indorsed "car contains more than one load, stop at ——— for partial unloading."

4. No diversion or change of destination or reconsigning in transit will be allowed, except where, under published rules, it may be in the same direction and over the same route as in the initial shipments after previous shipments have been unloaded. Movement to final destination will not be considered a reconsigning.

5. Switching or lighterage charges, if any, will be assessed for delivery at each destination, according to current switching tariffs. No switching or lighterage charge will be made against shipper or consignee for return of car to carrier at one destination for its continued journey beyond. The inbound carrier will absorb such charge, if any.

#### Agent to Supervise Unloading

6. Agent must supervise unloading and make careful check on quantity and condition of consignment for his station. He must see to it that load remaining in car is rearranged, if necessary, to protect it from damage. He must note on waybill that part of load, for his station, has been removed. He must see that car is promptly reported for movement to next destination.

7. When shipments are for the same destination, notice of arrival and demurrage will be handled as follows:

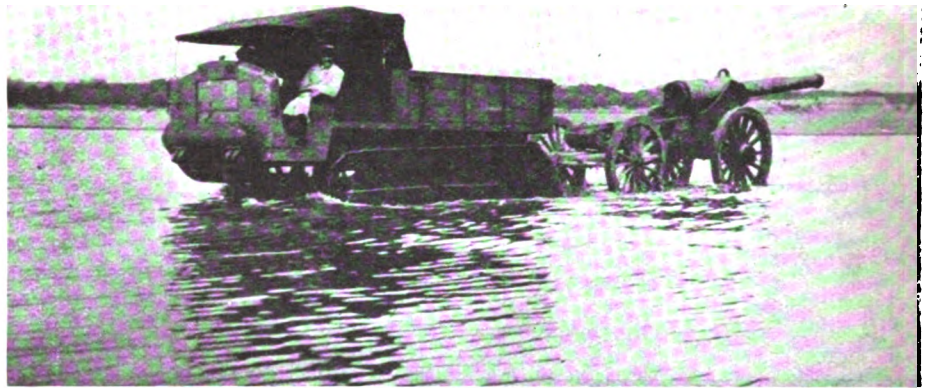
(A) Where two or more consignments take bulk track delivery all consignees will be promptly notified of arrival of car, that simultaneous unloading may be accomplished.

#### Payment of Demurrage

Consignees responsible for detaining car beyond free period must pay the demurrage charge. In the event that more than one consignee fails to remove contents within free period, demurrage will be collected pro rata.

(B) Where one consignee takes bulk track delivery and another private track delivery, each transaction will be independent of the other and demurrage will be charged accordingly.

8. Double or triple loading of consignments billed "shipper's order" will not be permitted unless the name and address of the party



*Type of track-laying artillery tractor which is being produced in France at the plant of the Schneider company*

or firm to be notified are shown on the original shipping instructions and the location of such party or firm is at the billed destination of the consignment.

#### Cadillac to Continue Present Type

DETROIT, June 29.—The Cadillac Motor Car Co. will continue its present type of chassis and body styles this year.

#### Ryan's Office Moved

WASHINGTON, June 27.—The office of John D. Ryan, Director of Aircraft Production and chairman of the Aircraft Board, was moved from the Munsey Bldg. to Wing 8, second floor, Building "D," Fourth Street and Missouri Avenue, N. W.

The Aircraft Board has been assigned offices in the Fourth Street wing of the same building. The Bureau of Aircraft Production is now located in the Fourth Street end. The removal of the offices of the Director of Military Aeronautics to the Sixth Street or western end of Building "D" brings the two main branches of the Army Air Service under one roof.

The Washington office of the Aerial Mail Pilots and the Washington Aviation Examining Board are also now located in the Sixth Street end of this building. Offices have also been assigned to the British, French and Italian Aviation Missions in the same section of the building.

#### Parts Sent as Baggage

DETROIT, June 29.—Because of the inability to get all the required material from the east, much of which is sent by express, the Cadillac Motor Car Co. has found it advisable to send a number of men from its purchasing department to bring back the desired parts. These men obtain the parts and pack them into trunks and return with them, marking the trunks as baggage. Only small parts, such as hinges, door handles and accessories, can be carried in this way. The method is expensive, but was the only way the company could secure the needed parts.

## All Australian Zinc For England

### Great Britain Contracts for Entire Output of Concentrates —Nine-Year Period

WASHINGTON, June 27.—The Australian Government has contracted to sell to the British Government the whole output of zinc concentrates in Australia for the period of the war and 10 years thereafter. On his previous visit to London the Prime Minister contracted for the sale to the Imperial Government of 100,000 tons of zinc concentrates and 45,000 tons of electrolytic zinc and spelter for 10 years.

The new arrangement contemplates the British Government taking the stocks of zinc concentrates on hand Dec. 31, 1917, less a definite percentage reserve, and thereafter 250,000 tons per annum for the period of the war, and 300,000 tons annually for the 9 following years.

Provision is also made for supplying the requirements of the Australian zinc refining works and the fulfilling of Japanese contracts during the period covered by the British contract. It is also hoped to extend the contract to take in copper and lead. Under normal conditions the Australian output of zinc concentrates, averaging from 46 to 48 per cent zinc, is about 400,000 tons a year.

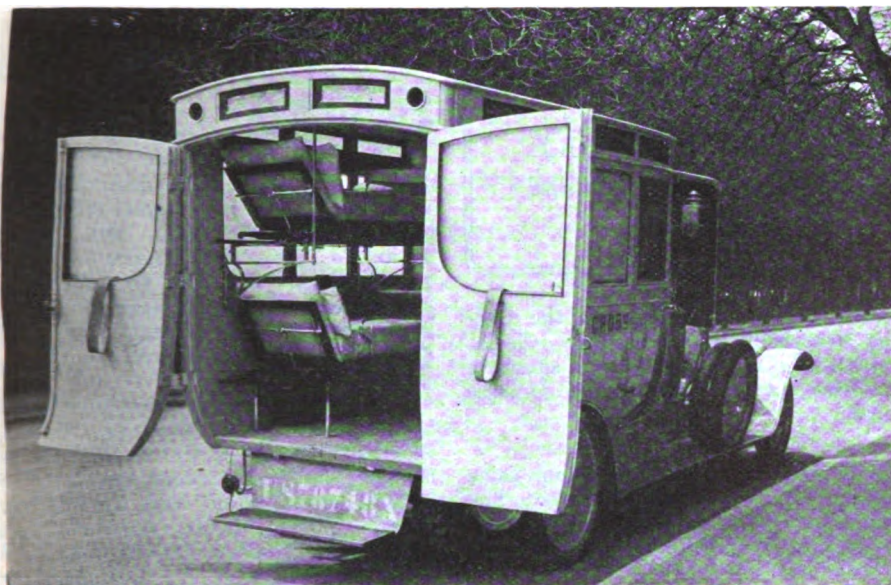
#### Hayes to Handle Fender Sales

DETROIT, June 29.—The Hayes Mfg. Co. will handle the sale of the Hayes crown fenders for Ford cars and Hayes electric light bulb cases, which were formerly handled by the Onguard Auto Necessities Co., New York. The personnel of the Onguard company remains unchanged.

#### G. M. C. Moves Patent Department

DETROIT, June 26.—The General Motors Corp. will move its patent department from Detroit to 1764 Broadway, New York City, about July 1.





*View of the sleeping car for war uses developed by two American Red Cross officers. Note position of the berths*

## Design Sleeping Car For War

American Red Cross Officers Develop Two-Berth Machine on Renault Chassis

By W. F. BRADLEY

PARIS, June 8—One of the minor but at the same time serious problems to be faced by all military men in the zone of advance is that of sleeping accommodation. For several miles back of the lines towns and villages are so packed with troops that the most meager accommodation has to be accepted with gratitude. In France it is the custom for a special traffic regulating committee to make a census of all available accommodations in the zone through which troops will have to pass. Every house, every shed and every building is inspected, and a board attached to the walls showing how many officers, men and horses can be accommodated in each.

This means that when troops enter a town they know exactly how many of their number can be lodged in each and every building, and unless that number of troops is already in possession they have only to take up their quarters.

The automobile services, by reason of the fact that they are always on the move, are most interested in these general arrangements and are most frequently obliged to accept any makeshift quarters which may present themselves. Some truck drivers, knowing from experience that the quarters officially allotted to them may be anything but desirable, have made arrangements to transform their vehicles into bedrooms by the use of hammocks slung from the bows. Except in cold weather, fairly comfortable quarters are secured in this way.

Two American Red Cross officers, who

have had sufficient experience with conditions in France to realize the precariousness of relying on sleeping accommodation in permanent buildings, have had designed a car which makes them independent of the billeting officers.

The vehicle, an illustration of which is published, is a 35-hp. Renault with a special sleeping car body built on it. Down the left-hand side are two berths, consisting of a frame with adjustable headrest and mattress. These berths are carried on rails and are spring-mounted with a view to comfort when the vehicle is in motion. The two berths can be pulled out like stretchers and the supports for the rails can be demounted in a few minutes, leaving the interior of the car absolutely free.

On the right-hand side is a wardrobe and washing apparatus. There is a spacious central alleyway leading into a forward compartment just behind the driver's seat. This front compartment forms an office or smoking room, and admission to it is by means of side doors.

The car is equipped with electric lighting and is mounted on Michelin detachable steel disk wheels, those at the rear

being duals. This is one of the most comfortable and luxurious automobile sleeping cars in use on the front in France.

### Michigan Divided Into 13 Districts for War Work

DETROIT, June 29.—The lower part of Michigan has been organized for general work under the direction of the War Industries Board. Thirteen districts of the regional industrial commission were named and leaders put in charge of the work in each division. These districts will work under the general supervision of Allan A. Templeton.

Every industry in the State of Michigan comes under the general direction of the commission, whose main duty will be to facilitate the production of war material under the general direction of the War Industries Board. One of the main objects of the commission will be to obtain war contracts for the companies able to handle them. As soon as information is obtained about companies which can take additional munition contracts the commission will endeavor to place contracts with them.

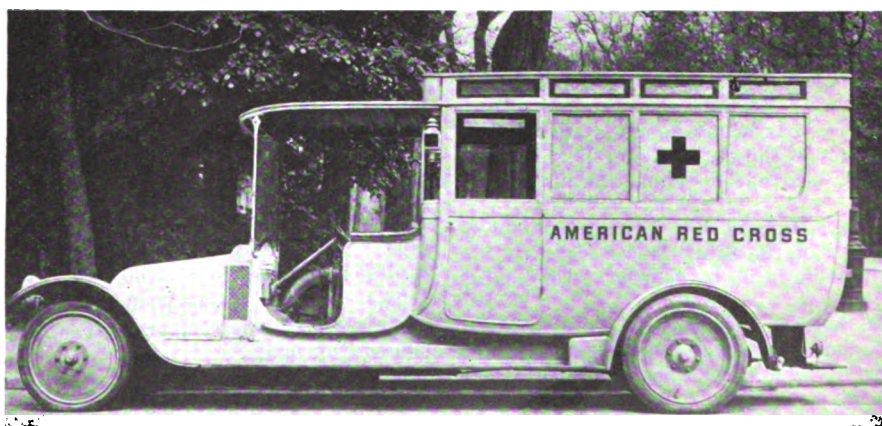
### Copper Price May Be Increased

WASHINGTON, June 29—There is a strong feeling among copper producers that the War Industries Board, through its price-fixing committee, should increase the price of copper from 23½ cents a pound to 25 cents. The chief reason for asking for an increased price is that the new freight rate, it is estimated, will add a full cent to the cost of production.

The next conference between the Government and company representatives is to be held on Aug. 7 to consider the price, which will extend from Aug. 15. It is believed that before the former date a preliminary conference will be held either in New York or Washington.

### Philadelphia Office for Edison Battery

PHILADELPHIA, June 29—The Edison Storage Battery Co., Orange, N. J., has opened a sales office here in the Land Title Bldg. J. A. Hurst, sales engineer of the company, is in charge.



*External appearance of the Red Cross sleeping car which has been built on a Renault chassis*

## Sibley Joins Packard Co.'s Advertising Staff

Hi Sibley, formerly advertising manager of the Republic Motor Truck Co., Alma, Mich., has joined the advertising staff of the Packard Motor Car Co., Detroit.

R. J. Price, sales manager for the Highway Tractor Co., Indianapolis, has resigned to become zone manager in the southeast for the Heath-Duplex department of the McCord Mfg. Co., Detroit.

C. W. Zaughop, formerly eastern district manager of the Rainier Motor Truck Co., has joined the wholesale sales force of the Hurlburt Motor Truck Co., New York. He will cover Pennsylvania and Ohio territory.

Louis W. Cossey has been appointed sales representative of the Lane Motor Truck Co., Kalamazoo, Mich., for western Massachusetts and New York. He was formerly in charge of the International Motor Company's Albany branch.

T. L. Loose, formerly with the Hendee Mfg. Co., Springfield, Mass., has been appointed manager of the Canton Spring & Axle plants of the Standard Parts Co., succeeding J. B. Childe. The latter will go to the general offices in Cleveland.

F. F. Grimmelsman, formerly assistant manager of the Hess-Pontiac Co., has been appointed manager of the Perfection Spring plant of the Standard Parts Co., Cleveland.

W. L. Woodward, formerly assistant manager of the rim and tube plant of the Standard Parts Co., Cleveland, has been promoted to the managership, succeeding J. C. Manternach, resigned.

Ralph A. D. Preston, who has been in charge of the flying field of the Goodyear Tire & Rubber Co., near Akron, Ohio, where instruction in balloon service is given to student officers of the army and navy, has received his commission as lieutenant, senior grade, in the United States Naval Reserve Flying Corps. He is stationed at Washington, where he is in charge of repairs on navy airships.

William A. Scharon, formerly with the advertising departments of the Packard Motor Car Co. and the Timken-Detroit Axle Co., has been appointed advertising manager of the Hyatt Roller Bearing Co., tractor bearings division, Chicago.

K. B. Howard has been appointed a director of the Stutz Motor Car Co., Indianapolis, to fill a vacancy on the board.

D. Kiefer, engineer in charge of the ordnance division at the Harroun Motors Corp., Wayne, Mich., has resigned to join the navy.

J. M. Dine, for the past 5 years manager of the Omaha branch of the Goodyear Tire & Rubber Co., has been ap-

## Men of the Industry

*Changes in Personnel and  
Position*

pointed assistant manager of the Chicago branch of the company. C. A. Cramer, of Cedar Rapids, Ia., succeeds Mr. Dine as manager of the Omaha branch.

K. R. Jacoby, formerly assistant sales manager of Willys-Overland, Inc., has been promoted to the position of assistant to First Vice-President C. A. Earl.

J. H. W. Mackie has been appointed sales manager of the Saxon Motor Car Co. He was appointed assistant sales manager in February.

G. M. Evans, formerly treasurer of the Menominee Motor Truck Co., Menominee, Mich., has received the commission of captain in the Ordnance Department.

C. J. Welch, for 5 years manager of the truck tire department of the United States Tire Co., New York, has been promoted to the position of assistant sales manager of the organization.

Theodore H. Harvey, general manager and assistant secretary of the Pelton Steel Co., Milwaukee, since its organization 3 years ago, has resigned to accept the position of general manager of the Ohio Steel Foundry Co., Springfield, Ohio, effective July 1. William H. Schuchardt, vice-president and secretary of the Pelton company, has assumed the duties of general manager and will devote his entire time to the concern.

T. O. Kellogg, general manager of the Overland Wausau Co., Wausau, Wis., distributor of the Overland and Willys-Knight, has been transferred to the same position in the Overland Madison Co., Madison, Wis., distributor in the state capital territory, embracing all of southwestern Wisconsin.

### Capital Increases

The K. & M. Brass & Aluminum Castings Co., Cleveland, has increased its capital from \$10,000 to \$100,000.

The American Twist Drill Co., Detroit, has increased its capital stock from \$100,000 to \$200,000.

The Detroit Gear & Machine Co., Detroit, has increased its capitalization from \$500,000 to \$700,000.

The Ferro Stamping & Mfg. Co., Detroit, has increased its capitalization from \$25,000 to \$40,000.

## Hayes Plant Manager For Hess-Pontiac Axle

Lawrence Hayes has been appointed factory superintendent and assistant plant manager of the Hess-Pontiac Spring & Axle Co., Pontiac, Mich., having been transferred from the Perfection Spring division of the Standard Parts Co., Cleveland, where he was superintendent. Previous to this he was superintendent of the Cincinnati & Hammond Spring Co., Cincinnati, and D. W. Shuler & Sons, Amsterdam, N. Y.

George H. Bishop, for sixteen years connected with the Eclipse works of Fairbanks, Morse & Co. at Beloit, Wis., to-day resigned to accept charge of the general organization and system work of the Wright-Martin Aircraft Corp., with works at New Brunswick, N. J.; Long Island City, N. Y., and other eastern cities.

Howard Cody, for the past several years sales manager for the Frank O. Renstrom Co., San Francisco, Premier, Grant, Bethlehem and Atterbury distributor has been placed in charge of wholesale sales. He is succeeded by E. W. Papert.

H. G. Wedler of the Emil Grossman Mfg. Co., Brooklyn, has joined the colors and is in the mechanical repair shops, Unit 305, Camp Jesup, Atlanta, Ga.

### Record Pennsylvania Registration

PHILADELPHIA, June 29—It is expected that fully 350,000 Pennsylvania license tags will be used this year, as the department at Harrisburg is issuing No. 325,000. The order for 1919 will be the biggest ever issued—for 400,000, to be of black enamel with numbers in red and a space for the manufacturer's number. They will be similar in general style to those now in use.

### Ohio Has 380,000 Cars

COLUMBUS, O., July 1—The Ohio Automobile Department up to July 1 has issued approximately 380,000 registrations for gasoline cars in Ohio as compared with 347,542 registrations for the whole of 1917. Electrics were registered up to July 1 to the number of 4400 as compared with 4510 during last year, and dealers and manufacturers to the number of 32,000 were registered to the middle of the year compared with 34,078 for last year.

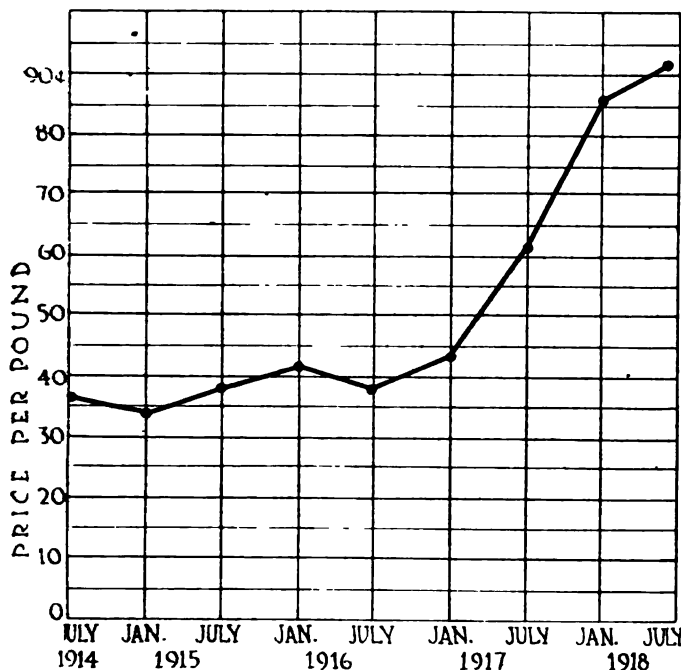
### Truck Converter from Loganville

MILWAUKEE, July 1—Leicher Bros., Loganville, near Prairie du Sac, Wis., have undertaken the manufacture of a new type of truck chassis for application to used passenger cars and plan a large production. The Leicher shops are being enlarged and considerable new equipment installed to handle the growing business, which comes from all sections of Wisconsin and eastern Minnesota.

## AUTOMOTIVE MATERIALS MARKETS

## Material Market Prices

<b>Acids:</b>		<b>Lake, lb.</b>	.23½
Muriatic, lb.	.02-.03	<b>Fabric, Tire (17½ oz.):</b>	
Phosphoric, ct.	.35-.39	Sea Is., combed, lb.	1.65-1.70
Sulphuric (60), lb.	.11	Egypt., combed, lb.	1.20-1.30
<b>Aluminum:</b>		Egypt., carded, lb.	1.15-1.25
Ingot, lb.	.33	Peelers, combed, lb.	1.05-1.20
Sheets (18 gage or more), lb.	.40	Peelers, carded, lb.	.95-1.05
<b>Antimony, lb.</b>	.13	<b>Fibre (¼ in. sheet base), lb.</b>	.45
<b>Burlap:</b>		<b>Graphite:</b>	
8 oz. yd.	.19	Ceylon, lb.	.07½-.25
10 oz. yd.	.23½-.23½	Madagascar, lb.	.10-.15
<b>Copper:</b>		Mexican, lb.	.03½
Elec. lb.	.23½	<b>Lead, lb.</b>	.07½-.08½



How the price of tin has increased since the war began. The points on the curve are the monthly averages of daily New York quotations

<b>Leather:</b>		<b>Smoked, ribbed sheets, lb.</b>	.62
Hides, lb.	.18-.33	<b>Para:</b>	
<b>Mica:</b>		Up River, fine, lb.	.68
India:		Up River, coarse, lb.	.40
Grade 4, lb.	3.00	Island, fine, lb.	.59
Grade 5, lb.	1.50	Island, coarse, lb.	.27
<b>Amber:</b>		Caucho, ball, upper, lb.	.40
Grade 4, lb.	1.25	Caucho ball, lower, lb.	.36
Grade 5, lb.	.65	<b>Shellac (orange), gal.</b>	.65-.70
<b>Nickel, lb.</b>	.40	<b>Soda, caustic, lb.</b>	.04
<b>Oil:</b>		<b>Solder:</b>	
Gasoline:		Half and half, lb.	.70
Auto, gal.	.24	No. 1, lb.	.63
68 to 70 gal.	.30	Refined, lb.	.51
<b>Lard:</b>		<b>Spelter</b>	.04½
Prime City, gal.	2.20	<b>Steel:</b>	
Ex. No. 1, gal.	1.45	Angle beams and channels, lb.	.03
Linseed, gal.	1.65	Automobile sheet (see sp. table).	
Menhaden, gal.	1.05	Cold rolled, lb.	.06½
<b>Petroleum (crude):</b>		Hot rolled, lb.	.03½
Kansas, bbl.	2.25	<b>Tin</b>	.94-.95
Pennsylvania, bbl.	4.00	Waste (cotton), lb.	.12½-.17
<b>Rubber:</b>			
Ceylon:			
First latex pale crepe, lb.	.63		
Brown, crepe, thin, clear, lb.	.60		

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only. Per 100 lb.	Primes when seconds up to 15 per cent are taken. Per 100 lb.	Seconds arising.
Automobile body stock	\$5.95	\$5.85	*See Note
Automobile body stock, deep stamping	6.20	6.10	
Automobile body stock, extra deep stamping	6.45	6.35	
Hood, flat fender, door and apron, or splash guard stock	6.05	5.95	
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20	
Crown fender, cowl and radiator casing, extra deep stamping	6.55	6.45	
Automobile Sheet Extras for Extreme Widths:			
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.			
Nos. 19 to 21 over 36 in. to 44 in., 30c. per 100 lb.			
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.			
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.			
Black sheet extras to apply on narrow widths.			
Oiling, 10c. per 100 lb.			
Patent leveling, 25c. per 100 lb.			
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.			

\*Ten per cent less than the invoice Pittsburgh price for corresponding primes.

## Automotive Securities Quotations on the New York Exchange

	Bid	Asked	Net Ch'ge		Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	87½	87½	+2½	*Lee Rubber & Tire Corp.	19	20	+1
*J. I. Case T. M. Co., pfd.	80	86	..	*Maxwell Motor Co., Inc., com.	27½	28½	..
Chalmers Motor Co., com.	4	6	..	*Maxwell Motor Co., Inc., 1st pfd.	55	..	..
Chalmers Motor Co., pfd.	25	35	+5	*Maxwell Motor Co., Inc., 2nd pfd.	19	21	..
*Chandler Motor Co.	81	82	+2	Miller Rubber Co., com.	99	101	..
Chevrolet Motor Co.	138	142	+10	Miller Rubber Co., pfd.	90	92	..
*Fisher Body Corp., com.	38½	40	-1	Packard Motor Car Co., com.	112	120	+4
*Fisher Body Corp., pfd.	86	89	..	Packard Motor Car Co., pfd.	93	..	..
Fisk Rubber Co., com.	55	58	+1	Paige-Detroit Motor Car Co.	18	20	+3
Fisk Rubber Co., 1st pfd.	98	102	..	Peerless Truck & Motor Corp.	14	16	-1
Fisk Rubber Co., 2nd pfd.	78	103	+19	Portage Rubber Co., com.	100	102	..
Firestone Tire & Rubber Co., com.	89	91	..	*Reo Motor Car Co.	13	15	..
Firestone Tire & Rubber Co., pfd.	93	95	..	*Saxon Motor Car Corp.	8½	8½	-½
*General Motors Co., com.	152¾	155	+14	Standard Motor Construction Co.	12	14	+1½
*General Motors Co., pfd.	81½	82	..	*Stewart-Warner Speed, Corp.	57½	58½	..
*B. F. Goodrich Co., com.	45	46	+½	*Studebaker Corp., com.	46	46½	+1
*B. F. Goodrich Co., pfd.	98	99	+¾	*Studebaker Corp., pfd.	80	90	..
Goodyear Tire & Rubber Co., com.	167	170	+10	Swinehart Tire & Rubber Co.	50	65	..
Goodyear Tire & Rubber Co., pfd.	97	99	..	United Motors Corp.	34	35	+4½
Grant Motor Car Corp.	2½	3½	+½	*U. S. Rubber Co., com.	58½	59	+½
Hupp Motor Car Corp., com.	2½	3	..	*U. S. Rubber Co., pfd.	103	105	+1½
Hupp Motor Car Corp., pfd.	78	81	-4	White Motor Co.	41	42	-½
International Motor Co., com.	29	35	..	*Willys-Overland Co., com.	20	20½	-½
International Motor Co., 1st pfd.	55	65	+3	*Willys-Overland Co., pfd.	81	83	..
International Motor Co., 2nd pfd.	35	40	-3				
*Kelly-Springfield Tire Co., com.	50	51	+½				
*Kelly-Springfield Tire Co., 1st pfd.	81	87	..				

\*At close June 29. Listed N. Y. Stock Exchange. †Par value \$10.



## Government to Train Women Health Officers

WASHINGTON, June 29—Women health officers, whose duty will be to see that the thousands of women workers in munitions plants are kept healthy and their output of war materials thus maintained at the peak of production, are to be trained under the direction of the Women's Division of the Industrial Service Section of the Army Ordnance Department.

An eight weeks' course of study for a limited number of carefully selected women health officers started to-day at Mount Holyoke College, South Hadley, Mass. The course will be given under the general direction of Dr. Kristine Mann, Health Supervisor of the Women's Branch of the Ordnance Department. The women who are to take the course are college graduates, or women of equivalent technical education. Almost all

have had experience in dealing with working women. The first requirement for admission to the course has been perfect health, and only those have been selected who will inspire wholesome living among the munitions workers.

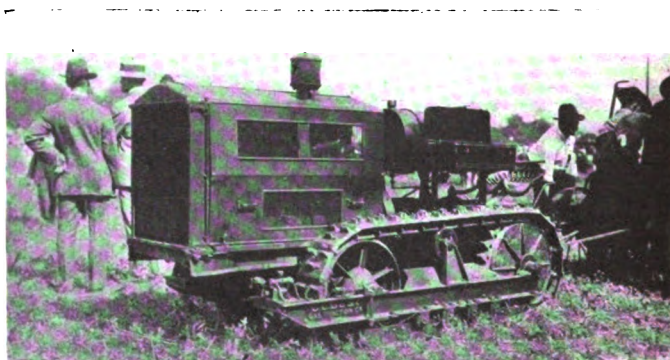
### G. M. C. Trucks for Medical Corps

WASHINGTON, June 29—One and one-half-ton G. M. C. trucks equipped with special bodies made by the H. M. Babcock Co. will be used by the Medical Corps of the United States Army for mobile X-ray equipment. Each truck will carry a complete X-ray outfit with a specially designed collapsible X-ray table. A stationary gas engine is included in the equipment and generates the electrical power for the X-ray. The sides of the truck body can be converted into tables, on which the patients can be treated. A demonstration of this truck and X-ray table was successfully made here before several medical officers.

## Find Brisk Demand for All Closed Car Types

TOLEDO, June 27—The demand for closed cars is greater than at any previous time, according to the Willys-Overland, Inc., and the proportion of closed car sales as compared with sales of open models shows a remarkable increase. More Willys-Overland closed cars have been sold since Jan. 1 this year than the total sales of all closed cars, excepting only the coupe types, in all the previous years the company has been in business. At the present time three models of closed cars are available for delivery: Overland Model 90 sedan and model 85-six coupe; Willys-Knight model 88-four coupe. Production plans for the balance of this year also provide for other models. These include the Willys-Knight model 88-four sedan and limousine, and the model 88-eight sedan, limousine and coupe.

## The Tractor Demonstration at the S. A. E. Meeting in Dayton



*During the S. A. E. summer meeting there was quite a demonstration of farm tractors, the Fordson, Best, Cleveland, Case and Parrett being put through their paces for the benefit of the visiting engineers. Below is the Parrett and above is the Best; the others are easily recognizable*



## Premier Rubber To Make Insulation Material Line

DAYTON, OHIO, June 29—The Premier Rubber & Insulation Co. has been organized for the manufacture of rubber insulation used for airplane and automobile parts. A plant has been erected here and is already in operation. The company was founded by A. Huetter, for many years superintendent of the Boonton Rubber Mfg. Co., Boonton, N. J., and who is now vice-president and general manager of the Premier organization.

### Buckeye Brass Adds to Plant

CLEVELAND, June 26—The Buckeye Brass & Mfg. Co. has purchased the plant and part of the tool equipment of the Cleveland Pneumatic Tool Co. The former company was organized 8 years ago and has outgrown its present plant.

### Smith & Hemenway Adds

IRVINGTON, N. J., June 29—The Smith & Hemenway Co., Inc., is erecting an addition to its plant. This will be used for the manufacture of Red Devil tools ordered by the Government.

### Anderson Has New Building

DETROIT, June 27—The Anderson Electric Car Co. announces the completion of its new building, 300 by 150, which is to be used for the assembling of ambulances for the Government.

### Combine Boston Maxwell and Chalmers

BOSTON, June 30—One of the biggest deals in combining two forces was announced to-day when the C. E. Fay Co. that handles the Maxwell line joined with the Chalmers Motors Co. of New England. The plan had been under contemplation for some time. Mr. Fay heads the company as president, Francis P. Allen, manager of the Chalmers, is vice-president, and Allan M. Fay, a son of the president, is treasurer.

### Donovan Enters Truck Business

BOSTON, MASS., June 30—Joseph S. Donovan, who conducts the Studebaker agency in Boston and vicinity, has entered the truck business, too. He has taken on the Sanford line for eastern Massachusetts. Frank E. Wing, who has handled the Marmon for many years exclusively, has been considering adding a truck line to his business, and has had conferences with a couple of well known makers.

### Dividends Declared

The Curtiss Aeroplane & Motor Corp. has declared a regular semi-annual dividend of 3½ per cent on preferred stock, payable July 15 to holders of record July 2.

A quarterly dividend of 1¼ per cent on the preferred stock of the Mason Tire & Rubber Co., Kent, Ohio, has been declared, payable July 1 to stockholders of record at close of business June 15.

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

### Recent Incorporations

MILWAUKEE, WIS.—Acme Motor Parts Corporation; capital stock, \$25,000; to manufacture and deal in motor car, truck and tractor parts and accessories; incorporators, William S. Smulski, Joseph Mietus and William P. Doucette.

MILWAUKEE, WIS.—North Milwaukee Chemical Works; capital stock, \$30,000; to manufacture and refine chemicals, etc.; incorporators, John Hauser, Charles A. Schulz and Joseph M. Thomas.

### Baltimore Branch for Moline

BALTIMORE, July 1—The Moline (Ill.) Plow & Tractor Co. has opened a branch house in Baltimore to take care of the business on the Atlantic coast territory. The branch house has been organized and incorporated under the name of the Eastern Moline Plow & Tractor Co., the same as the branch at Bloomington, Ill.

### Corcoran to Increase Capacity

CINCINNATI, June 27—The Corcoran Mfg. Co. has purchased the former plant of the Knabe Piano Co. and will now be enabled to largely increase its production of radiators.

### Will Market K. A. L. Products

GRAND RAPIDS, June 28—The Furniture City Laboratories was recently organized for the purpose of manufacturing and marketing K. A. L. products throughout this territory. The line which they will produce includes body polishes for automobiles, hood and fender dressing, carbon remover and oil and greases. John F. Healy is manager of the company.

### Harroun Shipping Shells

WAYNE, MICH., June 28—The first unit of the shell department of the Harroun Motors Corp. is in operation, giving employment to about 300 people. There will be three more units in operation as fast as the machinery can be installed. The daily car production of nearly 200 per week is being maintained.

### Another Ford Plant for War

LOUISVILLE, July 1—The Louisville assembly plant of the Ford Motor Co. will be taken over by the Government for war work next month. Manager C. S. Williams said that the factory will cease assembling cars to-day and will prepare to turn over the place to any department of the Government which calls for it.

## Olds Motor Works Will Produce Own Engines

LANSING, June 27—The Olds Motor Works is erecting a new building for the manufacture of engines for its car, which heretofore have been supplied by the Northway Motor Co., Detroit, one of the divisions of the General Motors Corp. The new building, which will be 500 by 240, and loading dock, 700 by 60, will cost \$600,000, and an additional \$500,000 will be spent in equipping it. Contract calls for completion of the new plant by Nov. 1, and operations will be started about Jan. 1, when from 1500 to 2000 additional employees, both men and women, will be placed on the pay roll. Plans call for separate locker rooms for each sex and rest rooms for the women. There will also be a convention lunch room where department heads may gather for meals.

### Bloomington Shops Organize

BLOOMINGTON, ILL., July 1—A strike of mechanics and helpers of Bloomington garages and repairshops was adjusted after the men had been out a week. The terms of the settlement fix 9 hours as a working day, overtime to be paid for at the rate of time and a half, including Sundays and all holidays.

Apprentices are subject to the same shop rules as mechanics. They must be between the ages of 16 and 21 and serve 4 years of 290 days per year before qualifying as mechanics. All competent mechanics with 4 or more years of actual repairshop experience will receive 55 cents per hour. Apprentices will receive 20 cents per hour and an increase of 2 cents per hour for every 6 months until 4 years have been served. Shop helpers will receive a minimum of 35 cents per hour. Floor men, washers and night men were given a 10 per cent increase in pay.

### Feltes Treasurer of Studebaker

SOUTH BEND, IND., July 1.—N. R. Feltes has been elected treasurer of the Studebaker Corp., succeeding Charles C. Hanch, who has been placed in charge of the Automotive Products Section of the War Industries Board. Mr. Feltes has served 8 years as assistant treasurer of the U. S. Rubber Co., one year as treasurer of the Lozier Motor Co. and for the past 4 years has been vice-president and general manager of the Ames-Holden-McCready, Ltd., Montreal.

### F. T. C. Finds Huge Profits

*(Continued from page 33)*

refineries operated for the sake of the gasoline almost exclusively, and fuel oil was commonly sold at a loss, but now fuel oil is a very profitable product.

"The foregoing table will show the percentage of net earnings on investment for a series of years. The earnings for 1918 are estimated on the basis of the second six months of 1917 or the first quarter of 1918."

## Credits America With Tank Idea

NEW YORK, June 29—Major General E. D. Swinton of the British Army, in an address delivered at the Astor Theater for the benefit of the United States Tank Corps, said that the basic idea from which the British tanks were evolved was derived from American agricultural tractors of the creeper type.

The greatest secrecy was maintained in building the first lot of the machines. Even the name given to them was intentionally misleading. "They were called Tanks," said General Swinton, "so that not even the working men who were making them would know what they were manufacturing, and the rumor was circulated among the men that they were to be used in connection with the watering of our men in Egypt.

"Later, when it was time to punch holes in their sides for the guns, another story had to be invented. It was then rumored that they were snow ploughs to be used in Russia, and to carry out this deception each tank was stencilled with a Petrograd address, and when the tanks were finally shipped it was generally believed that they were going to Petrograd.

"In the final days of the construction of the tanks, 700 sentries, in three cordons, were thrown around the field in which the tanks stood. Matters were so arranged that the sentries of the outside cordon were not even aware of what was going on inside. It was shortly before the first of the tanks was shipped to France, in September, 1915, that a Zeppelin hovered over the tanks one night. The Zepp, however, came accidentally, and as they did not throw a searchlight to the earth the secret was never discovered."

## Housing Provisions Determined

WASHINGTON, June 29—All houses constructed for war workers by the Government will remain under the control of the United States until after the war. In so far as possible, all housing accommodations will be of a permanent character excepting where they are constructed in communities not likely to continue after the war. Loans will be advanced for the erection of dormitories to responsible corporations and associations not organized for profit. These arrangements for housing war workers have just been approved by Secretary of Labor Wilson and Director of Industrial Housing and Transportation Otto M. Eidlitz.

A management division is to be organized, which will undertake the manage-

ment of government erected properties, and a division of existent housing will deal with the question of utilizing housing and boarding facilities of each community to reduce government housing to the lowest possible minimum.

In fixing the rentals for government constructed houses the following factors will have to be taken into account:

1. Fixed Charges.  
Interest on investment.  
Insurance.
2. Reserves for upkeep of rented houses.  
Repairs.  
Renovating and redecorating.
3. Reserve for loss in case of non-occupancy.
4. Overhead expenses of administration.
5. Depreciation.

## To Reconstruct Belgian Industry

PARIS, FRANCE, June 29—An organization has been started to help reconstruct Belgian industry and trade by furnishing tools and necessary raw materials for every possible industry. This society, which is called "Comptoir National pour la Reprise de l'Activite Economique en Belgique," and which is working with the co-operation and under the control of the Belgian government, is endeavoring not only to reconstruct the industries, but also to help the people of Belgium by enabling them to work in the reconstructed shops. The organization is appealing to American manufacturers of materials for the construction of buildings, leathers, textiles, farm implements, chemical products, wood machines, electrical materials, motor cars, trucks, oils and greases, for catalogs and price lists to facilitate it in the placing of orders.

## Canadian Settlers May Import Vehicles

OTTAWA, CANADA, June 29—Machines for agricultural purposes, and vehicles and implements moved by mechanical power may be imported free of duty by a settler, provided he has owned it 6 months before his removal to Canada. The machine, however, may not be sold or disposed of without payment of duty before it has been in actual use in Canada for 12 months.

## Grace Motors Takes on Sterling for Canada

MILWAUKEE, June 29—The Grace Motors, Ltd., with headquarters in Toronto, and branches in several Canadian cities, has been appointed Canadian distributor of the Sterling truck.

## No Quad Royalties

KENOSHA, WIS., June 29—There has been much speculation concerning the manufacturing arrangements of the Nash Quad for military purposes, by which several organizations, namely, Hudson, Paige and National, are each building 2000 Quads for military use. C. W. Nash, president of the Nash Motors Co., has given to the United States Government the right to build the Nash Quad without royalty in any factories and in any quantities necessary for the period of the war. In addition to this the Nash company has furnished, free of cost, to different concerns manufacturing the Quads, the necessary working blue prints and is furnishing all the information by way of revisions to these blue prints without cost. G. W. Smith, who has been connected with the Nash engineering department, is giving all of his time assisting these companies in the manufacture of the Quads. It is expected that all three companies will be in production by July and the 2000 trucks from each should be completed soon after the first of the year.

Several outside concerns are assisting in the manufacture of parts for these trucks. Axles are being manufactured by Timken, Columbia and Salisbury. Transmissions are being manufactured by the Brown-Lipe and Haynes companies. Engines are being manufactured by Buda and Haynes. The M & S type of differential is being manufactured by Brown-Lipe-Chapin and M & S Corp. Lavigne is manufacturing the steering gears.

## Offer Night Photography Invention

WASHINGTON, June 29—An Italian invention permitting photography by night has been submitted to the Department on Military Aeronautics of the Army. It is claimed that excellent pictures can be taken of enemy positions from airplanes, lying at low heights on moonlight nights, and that the invention can be fitted to moving picture cameras, permitting photography of actual fighting much of which takes place in the early morning hours.

## Fafnir Starts a Dragon

NEW BRITAIN, CONN., June 30—The Fafnir Bearing Co. has issued a house organ which is called "The Dragon." It is devoted to affairs of the Fafnir manufacturing organization, its buying clientele, and information relating to the products.

## Calendar

## RACING

July 4—Cincinnati, Cincinnati Speedway.  
July 4—Tacoma, Wash. Tacoma Speedway Assn.  
July 27—Chicago. Chicago Speedway.  
Aug. 2—Uniontown. Uniontown Speedway Assn.  
Aug. 10—Providence, R. I.  
Aug. 17—Sheepshead Bay.

Sept. 2—Uniontown. Uniontown Speedway Assn.  
Sept. 7—Chicago. Chicago Speedway.  
Sept. 21—Sheepshead Bay.  
Oct. 5—Cincinnati. Cincinnati Speedway.

## SHOWS

July 29-Aug. 4—Salina, Kan. National Tractor Demon-

stration. Auspices of National Implement and Vehicle Assn.

Sept. 23-28—Chicago. National Accessory Show for Fords. Coliseum.

Oct. 14-27—Dallas, Tex. Seventh Annual Texas Automobile Show. Texas State Fair.

## ENGINEERING

Sept. 2—Cripple Creek, Colo. American Institute of Mining Engineers.

Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.



# AUTOMOTIVE INDUSTRIES

## AUTOMOBILE

WEEKLY  
JULY 11, 1918

## Hudson Dealers and the Advantage They Have

Hudson dealers have a decided advantage in these times. They are established. They have built reputations in their communities.

The very fact that most Hudson dealers have concentrated their efforts during the past few years has strengthened their connection, not only with the factory, but with their customers. When others were taking on side lines, Hudson dealers were working for Hudson. It is co-operation of this sort that has made Hudson dealers prosperous and has made them the leaders in their localities.

Hudson has always demanded merchandising ability and now more than ever this quality is necessary for the present day automobile dealer.



**Hudson Motor Car Company**

**Detroit, Michigan**



# THE THREE DOMINANT ACCESSORIES OF THE SEASON



## UTILITY SURE-GRIP PEDALS FOR FORDS

**Price Only \$1.00 PER PAIR**

Transforms the small, smooth Clutch and Brake Ford pedals into standard size, comfortable pedals. The driver's foot absolutely cannot slip off the pedal. The heavy rubber pad and flange at the side prevent all possibility of a slip, even in rainy weather when the shoes are wet.

The Utility Sure-Grip Pedals also serve to easily distinguish the clutch and brake pedals from the reverse.

### One Dollar Prevents Accidents

By installing these pedals on Fords, drivers can absolutely prevent accidents due to the foot slipping off the pedal.

In crowded traffic a slip of the foot may mean jamming into a street car or the car ahead. One dollar will prevent this.

These pedals can be attached instantly—no holes to drill—no special tools required—one nut to tighten and the job is done. Made of high grade pressed steel beautifully finished in black baked enamel.

Absolutely guaranteed.



2 SECONDS AGO



AND NOW

## UTILITY DISAPPEARING TRUCK FOR FORDS

**Price \$32.50**

Once the Utility Disappearing Truck is installed it requires only 2 seconds to change from a Ford roadster to a half-ton truck. The truck is completely out of sight, telescoped under the original turtle back of the Ford. The car is not disfigured in any way—it looks just as it always did, with no hints of the truck when it is not in use.

### Hauls Any Half Ton Load

Can be completely installed by *anyone* with a hammer and wrench in one hour. Only four bolts used in attaching it. No rattle—no vibration. Will haul any load up to a half ton.

Made of heavy gauge steel finished in black baked enamel to match finish of car. Can be pulled out to the desired length. No bolts or rivets are used in its construction. It is acetylene welded throughout.

Makes a Ford the most *useful* car on the market.



**PRICE  
\$1.50**

## UTILITY UNIVERSAL RIM WRENCH

**ONE TOOL FITS EVERY NUT**

The UTILITY Universal Rim Wrench is built in only one size—yet it automatically fits every nut on every demountable rim. In the tool box of the motorist, in the stock or the shop of the garage or repairman, it is small enough to be always out of the way—except when you need it. Then it is always ready for use—a single tool that fits, holds, and turns any nut.

### One Tool For Every Nut

The new UTILITY Universal Rim Wrench is beautifully finished in nickel and black enamel. It is more compact and lighter, and built with practically unbreakable jaws. It is shortened to go into the tool box without folding, and is absolutely rigid in action—a stronger brace that cannot close up or slip while in use by the operator.

**DEALERS!—Get Detailed Information Concerning "The Big Three"**

**HILL PUMP VALVE CO.**  
Archer Avenue and Canal Street, CHICAGO, ILLINOIS

District Offices: NEW YORK, 149 Church St.; SEATTLE, L. C. Smith Bldg.; SAN FRANCISCO, 149 Montgomery St.; KANSAS CITY, Rialto Bldg.



# AUTOMOTIVE INDUSTRIES

## THE AUTOMOBILE

VOL. XXXIX

NEW YORK—THURSDAY, JULY 11, 1918—CHICAGO

No. 2

## Steel Shipments Can Be Made Without Priority Certificates

War Industries Board Reclassifies Consumers, Allowing Makers of Cars, Trucks and Tractors Sufficient Steel to Complete Present Production

### New Steel Arrangements

*Classification of steel consumers allows shipments to certain consumers without priority certificates or written approval from War Industries Board.*

*Jobbers in steel and steel products will be allowed to maintain and replenish stocks.*

*Consumers ordering not more than 5*

*tons of steel in the aggregate will secure delivery regardless of their classification.*

*Exports of steel and iron products will be supervised by War Industries Board. The steel and iron will not be shipped to the manufacturers for construction into products for export except by written approval.*

By Allen Sinsheimer

WASHINGTON, July 9—Shipments of steel and pig iron can now be made to certain consumers without priority certificates or written approval from the War Industries Board under a new classification plan just arranged.

The trend of the new scheme inaugurated by the Board marks a relaxation from the strict steel control it has supervised in the last 60 days. It appears that the forecasts made by the steel industry that the War Industries Board would learn that the Government does not require the entire steel output for war work are true. Apparently steel production is greatly in excess of Governmental steel requirements.

There are five classifications of consumers, including, according to unofficial version:

*Class AA, A and B*—Ships, including destroyers and submarine chasers; aircraft; munitions; fuel for military, naval and domestic consumption and for war factories.

*Class C*—Railroads and other necessary transportation equipment; public utilities serving war industries, army, navy and the civilian population; clothing for civilian population; fuel for food, clothing and like industries; tools, implements, utensils and equipment required directly or indirectly for food production, completion and preservation.

*Class D*—All industries and products not included in the above.

Making public the classification scheme, the Board declined the request of AUTOMOTIVE INDUSTRIES to outline either the above classifications or the posi-



tions of automotive products as told below, officially, but in interviews indicated that these classifications and positions would be approximately correct.

The positions of the automotive products under the new classification will be:

**Classes AA, A and B**—Airships; passenger cars for war purposes; trucks for war purposes; motorcycles for war purposes; military tractors.

**Class C**—Farm tractors; commercial trucks; passenger cars partly finished and requiring only a minimum of parts for completion; passenger car factories performing considerable war work where it is desirable to maintain that part of the organization making passenger cars; motorcycles.

**Class D**—Passenger cars not strictly for utilitarian purposes or not specified in the above classifications.

Priority certificates will be issued by the director of steel supply, War Industries Board, to classes AA, A and B, indicating that these are of the utmost importance and will receive first consideration.

Producers of steel and pig iron can ship these commodities to class C consumers without priority certificates or written approval. They are allowed by the War Industries Board's instructions to ship to class C consumers not only after priority certificates are filled, but at any time such deliveries do not interfere with the filling of priority certificates. It is anticipated that this arrangement will insure adequate steel supply to all class C consumers.

Orders not exceeding 5 tons in the aggregate for class D consumers can be filled by producers without written approval from the Board provided these shipments are reported monthly with a statement that the orders were filled in the public interest. Orders from class D consumers for more than 5 tons must first be approved by the War Industries Board.

#### Procedure for Manufacturers

The surest plan for all manufacturers to pursue, if not in classes AA, A or B, is to assume that they are in class C and apply for their full steel and pig-iron requirements from the producers on that basis. If they are unable to secure their needs through this plan or cannot find a producer or manufacturer who will accept the order, application for allotment should be made to the Director of Steel Supply and should be supported by strong evidence in writing that the public interest requires that such orders be placed and filled.

Purchasers of steel under class C rating should not apply to the War Industries Board so long as reasonably satisfactory delivery is secured. They should apply for their requirements only to the steel producers. Class D consumers should apply only to the producers and manufacturers of steel and pig iron, who will in turn, when the orders amount to more than 5 tons, mail such applications in duplicate to the War Industries Board for approval.

Discussing the classification of passenger cars it was said that all such applications for steel or pig iron when not in class C or higher will be considered on their respective merits. The extent of loss, the quantity of steel needed, the conversion possibili-

ties of the factory will be taken into consideration.

According to some officials of the War Industries Board a plan is now under consideration whereby steel will be supplied to all passenger car manufacturers under a license plan under which they will be allowed to make and sell passenger cars for solely utilitarian purposes. The plan is at this time very vague in the minds of those conceiving it.

They are considering some method by which the consumer would supply a certificate testifying to the uses planned for the car he desires to purchase. If some such plan can be successfully operated it is expected that the manufacture of the great bulk of passenger cars, which goes to the farmers, doctors, contractors and other businesses and professions, will be continued.

#### Requirements for Jobbers

Jobbers of farm tractors and similar commodities will be allowed to maintain and replenish their stocks, but must observe the essential minimum in placing orders. They must sign a pledge to prevent hoarding, and to sell their stocks only for essential uses. They must exact similar pledges from their customers. By meeting these conditions they will be assured prompt shipments by the makers and will be given priority ratings by the War Industries Board.

The jobbers dealing in plates, sheets, bars and shapes, structural shapes, farm implements, tubular products, wire and wire products, tin plates, heavy hardware, farm implements, mining tools, machinery and equipments, oil well supplies and similar products will operate under the following plan in the maintenance of their stocks:

Each jobber will file before the 5th of each month with the director of steel supply, War Industries Board, a certified statement covering shipments made during the preceding month. Forms will be furnished for the statements by the War Industries Board.

To the extent that such shipments fall within classes AA, A, B or C as defined above or by permits issued by the director of steel supply, the jobber will be entitled to rank with the manufacturer and secure priorities for the replacement of shipments so made, provided that the total tonnage ordered for replacement will not be in excess of the amount shipped during the previous month.

Manufacturers will be expected to scrutinize all orders from jobbers to guard against hoarding.

#### Must File Pledge

All orders placed in accord with the above rules will be rated as class B-4 and entitled to class B priority and precedence, providing the jobber placing the order has filed with the priorities committee and the director of a steel supply, War Industries Board, a pledge in writing as follows:

*"I do hereby pledge myself not to use or so far as lies within my power permit the use of any stocks now in or which may hereafter come into my possession or control, save*

"(1) for essential uses as that term may be defined from time to time by the priorities division of the War Industries Board, or

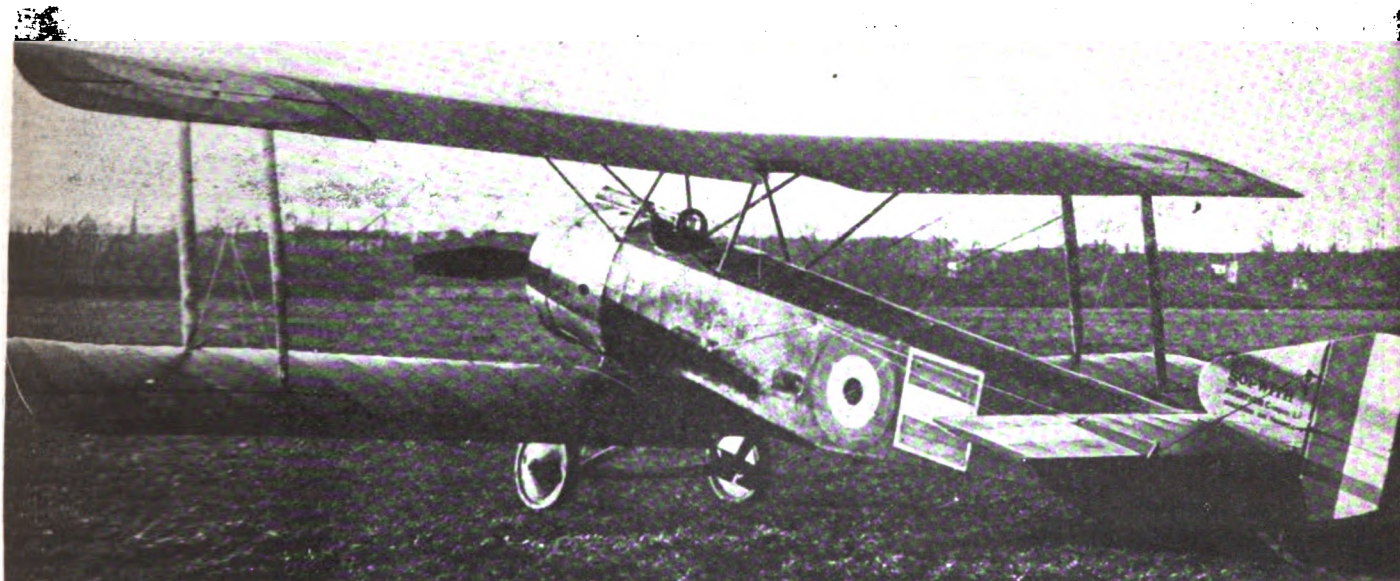
"(2) under permits in writing signed by the director of steel supply; that I will make no sale or delivery from such stocks to any customer or retailer before his filing with me a similar pledge in writing; and that I will use my utmost endeavor to prevent the hoarding of stocks and to insure that they be distributed solely for essential uses."

When this pledge has been once filed the jobber should certify this fact on each order when placed with the manufacturer. Manufacturers will not accept orders without such certification.

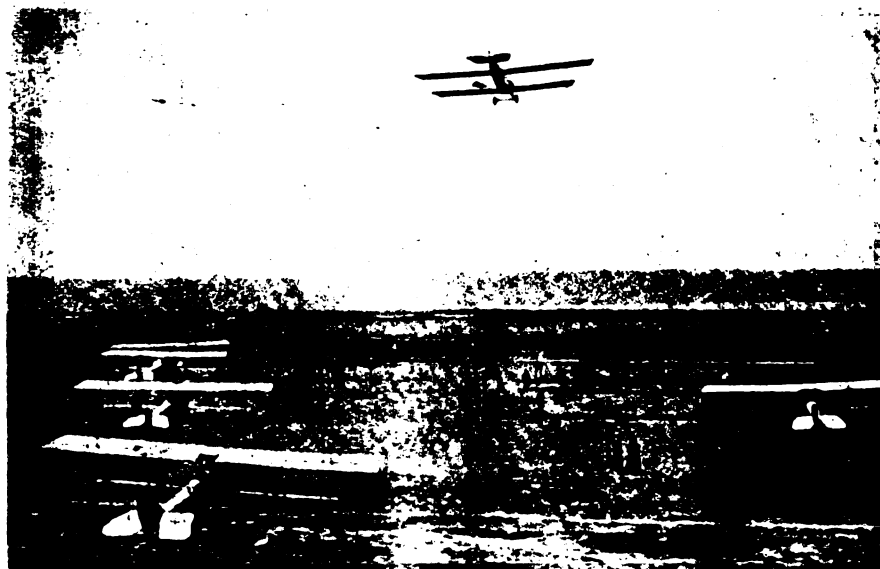
No applications for licenses to export iron or iron

and steel products should be made of the War Trade Board (except on direct orders of the U. S. Government and its Allies) unless the orders are (1) covered by priorities certificates Classes AA, A or B or (2) covered by a permit signed by the director of steel supply. This ruling does not indicate that the steel division of the War Industries Board has usurped the duties of the War Trade Board and will control all exports. It does mean that wherever an article or commodity which would ordinarily fall in class C for consumption in this country, such article or commodity will fall into class B if manufactured for export and the manufacturer will lose his preferential class C rights. Before he secures the steel for manufacture of an article of iron or of iron and steel for export, he must secure a permit from the director of steel supply just as if he were in class B.

## Two New Features of Airplane Development



A new English Sopwith combat plane, built on the same principle as the French Spad



A general view of the new Rockwell Aviation Field, San Diego, Cal.



# First American-Built Handley-Page Plane Launched

At Ceremony, Ryan Praises Work of His Predecessors, Howard Coffin and Colonel Deeds—Says Liberty Engine Is "Best Ever Built"

ELIZABETH, N. J., July 8—At the launching of the first Handley-Page bombing plane constructed in this country at the plant of the Standard Aircraft Corp., John D. Ryan, head of the Aircraft Production Board, paid a generous tribute to the work of his predecessors, undoubtedly meaning Howard E. Coffin and Col. Deeds, and pronounced the Liberty engine "the best and most powerful aeronautical engine ever built."

With regard to the work of those who had preceded him in charge of the Government's aircraft building program, Mr. Ryan said:

"Much good work has been done by my predecessors, and I am taking this opportunity to assure the people of the country that, in my opinion, there has been no such delay with the work or anything like such incapacity of those in charge as has been indicated in some of the criticism of the accomplishments, or lack of them, in production. A few facts will, I think, bear me out.

"In the fifteen months we have been at war here has been designed and put into production the Liberty engine, which is acknowledged by all of the Allies as a great performance and a distinct contri-

bution to the cause. As a powerful machine to drive heavy aircraft, it is undoubtedly as satisfactory as any engine produced by any nation on either side of the war. There were produced here in our workshops during the months of May and June just passed as many of these engines as Great Britain produced of all types of aeronautical engines in the entire year of 1915, at the close of which she had been seventeen months at war. Including other types of aircraft engines, there were more produced in our shops in the month of June than Great Britain

(Continued on page 85)



©Central News Photo Service

Many well-known persons attended the launching of the first bombing plane to be sent into the air in America. This took place at the plant of the Standard Aircraft Corp., Elizabeth, N. J.



The plane was christened "Langley" at its launching. Double machine guns are mounted at the nose



The "Langley" on its initial flight over the Jersey field after its launching



# Distribution of Truck Weights

## An Analysis of the Weights of Component Parts, Worked Out on a Percentage Basis, and Showing Variation of the Percentages with Truck Capacity

By P. M. Heldt

**A** STUDY of the distribution of weight among the components of a motor truck is of considerable interest. Heretofore we have not given very much attention to weight reduction in trucks, but if fuel and tires continue to increase in price it will assume a much greater importance in the future. As in other pieces of mechanism, the individual components of a truck should be nicely balanced against each other, so that each affords substantially the same degree of safety. The dimensions, and consequently the weight, of some parts are dependent upon the wear desired. In their case it is probably not correct to say that all should be designed for an equal life, as those parts which can be replaced quickly and at slight expense may well be made somewhat smaller, relatively, than others, the replacement of which is fraught with more difficulty and expense.

Motor truck components divide into two classes, one comprising all those which constitute a substantially fixed proportion of the weight of the complete truck, irrespective of the size or load capacity of the truck, and the other all those whose proportional weight varies with the capacity of the truck. In the following discussion the weight of the complete chassis, dry, is taken as 100 per cent.

### Engine Weight Proportions

It is generally known that large trucks carry a relatively smaller engine than small trucks. From the load capacity standpoint, the large truck has a higher weight efficiency, that is, the proportion of useful load to dead load moved is higher, and, besides, the larger truck is geared down more and runs at lower speeds, consequently it does not need so powerful an engine. One well-known truck manufacturer in the past equipped a complete line with a single engine, depending upon the higher gear ratio in the larger trucks to move the heavier loads. This, of course, is an extreme case. In general the piston displacement of truck engines may be represented by a curve concave toward the horizontal axis, the curve tending to become horizontal as the larger capacities are reached.

Data used in this article are from twenty-one models of trucks ranging in capacity from  $\frac{3}{4}$  ton to 5 tons. The data have been averaged, mean percentages being given where there appears to be no variation in the proportional weight with the capacity of the truck, and curves where there is such variation.

Frames appear to bear a substantially constant proportion to the total weight of the truck chassis, the figures obtained for the different trucks varying only within narrow limits. The average value is 10.6 per cent.

In springs there is a decided difference in the proportional weights at the ends of the list but nothing like uniformity of variation from one end to the other. This may possibly be due to the fact that small trucks are sometimes mounted on pneumatic tires and these

may require less range of spring action and consequently less weight of spring material. Taking only trucks above  $1\frac{1}{2}$  tons load capacity, the proportional weight of the springs is not affected by the size of the truck. In this class all four springs together weigh 8.16 per cent of total weight of the chassis dry, whereas the springs of the trucks of  $1\frac{1}{2}$  tons and under weigh on the average 6.77 per cent of the total. The front springs in each case weigh much less than the rear springs. For eight models the front and rear spring weights were given separately, and for these the front springs made up an average of 26.6 per cent of the total spring weight.

The proportional weight of front axles does not vary materially with the load capacity of the truck. The front axles on the larger trucks are slightly heavier in proportion than those on the smaller sized trucks. Thus, if we take the axles on the  $3\frac{1}{2}$  and 5 ton models only, their mean proportional weight is 3.6 per cent of the whole, whereas the mean proportional weight of front axles of trucks of less than  $3\frac{1}{2}$  tons capacity is 3.13 per cent. For all of the trucks on which data were obtained the mean is 3.28 per cent.

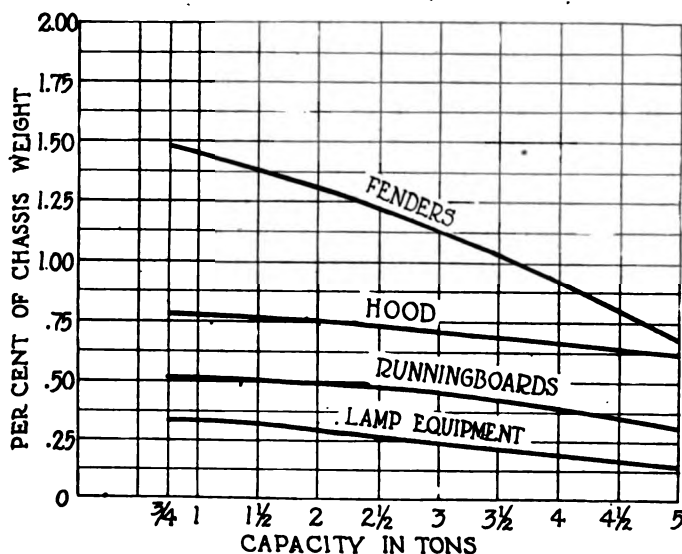
Rear axle weights show much the same characteristics as springs in that the percentage is materially smaller at the lower end of the load scale than at the upper, yet there is no steady increase from one end of the range to the other. Thus the average percentage for the three 1-ton models considered is 12.83, while that of the three  $1\frac{1}{2}$ -ton models is 15.82, which is more than that of three 5-ton models, viz., 15.49. It must be remembered, of course, that rear axle designs vary a great deal, both as to the form of drive employed and as to the design of the axle housing which makes up the greater part of the weight. The great majority of the trucks considered have worm drive, however. In the curve an attempt is made to average all the figures, and a gradual increase is shown.

### Steering Gear and Radiator Weights

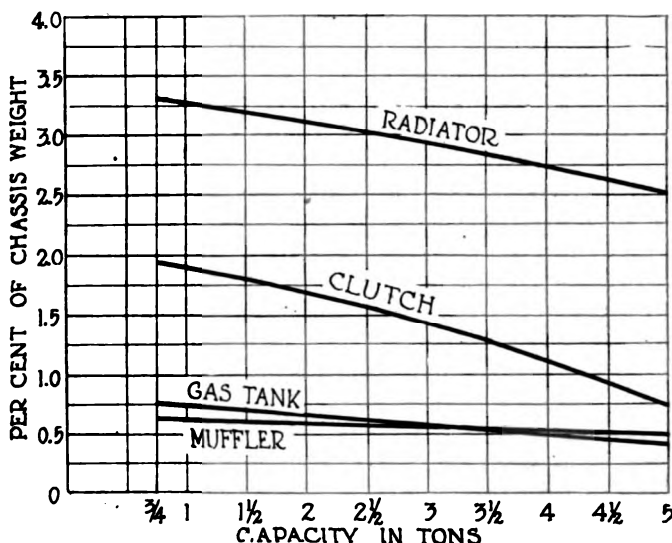
Steering gear weights are proportional to chassis weights throughout. The lowest figure is 1.11, the highest 1.50 and the mean 1.37 per cent.

Radiators make up a smaller proportion of the weight of large than of small trucks. This is what might be expected, since the size of engines does not go up in proportion to truck capacity, while the size of the radiator must be roughly proportional to the size of the engine. The variation of the percentage weight is shown by one of the curves.

Engine proportional weight shows the most pronounced decline with an increase in truck capacity of all the large items considered. The one  $\frac{3}{4}$  ton truck listed has an engine weight equal to 17 per cent of the chassis weight, which is substantially the same figure as found in passenger cars. On the other hand one of the 5-ton trucks has an engine proportional weight of



Curves showing the relative proportional weights of various truck components and equipment for trucks of different capacities



8.77 per cent and the mean value for all four 5-ton models is 9.75 per cent. Variation of the proportional engine weight with load capacity is shown by a curve.

The friction clutch is not always a distinct part, and it is therefore hardly warranted to expect close agreement between proportional weights of this part on different trucks. For those trucks for which the clutch weights were given the mean percentage value is 1.40. There is apparently a slight decline in the percentage with an increase in the size of the trucks, but the values found are so irregular that it is difficult to see the nature of the variation.

Transmissions drop in proportional weight with an increase in truck capacity even more rapidly than engines. It is customary to use relatively heavy transmissions on motor trucks, for one reason because trucks are driven a good deal of the time on one of the lower gears and the gear wheels must be dimensioned for continuous service. Roughly, on a motor truck the transmission weighs about one-half as much as the engine. One of the curves shows the variation of proportional transmission weight with truck load capacity.

Front wheels, like the front axles on which they are mounted, show no perceptible variation in proportional weight with truck size. The average value for seventeen models is 7.35 per cent.

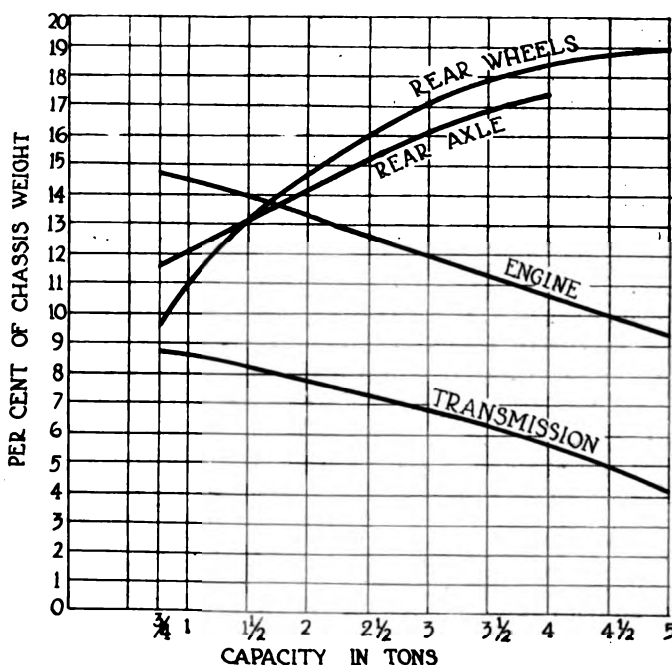
#### Rear Wheel Weights Vary Considerably

Naturally the total weight of a chassis is 100 per cent for both a large and a small truck, and as the percentage weight of a great many items, such as engine, transmission, radiator, fuel tank, etc., is less in the large truck than in the small one, there must be other items whose proportional weight is greater in a large truck. Chief among these is the rear wheels. As shown by the curve, the proportional weight of the two rear wheels with their brake drums, rims and tires is about twice as great in a 5-ton truck as in a 3/4-ton truck. One reason for this is that the capacity of the rear tires must be in direct proportion to the weight on them when the truck is loaded, and practically all of the load rests on the rear wheels. The front wheels are very little affected by the load and therefore the proportional weight of the front wheels does not vary with the truck capacity. If the load was proportional to chassis weight then the proportional weight of the rear wheels need not vary with truck capacity, but this is far from being the case. Using round

figures, a 1-ton truck weighs about 2 tons empty and when loaded may have 1 ton of dead load and 1 ton of useful load on the rear tires. A 5-ton truck, on the other hand, weighs only about 4 tons empty and when loaded may have 2 tons of dead load and 5 tons useful load on the rear tires. This brings out the reason why the rear tires must be proportioned in accordance with the load. The same applies to a certain extent to rear axles, as the load must be held up by the axle.

It might be thought that as the load has to be supported by the springs the proportional weight of the latter also should increase with the truck capacity. There is indeed a slight increase, as already shown, but this is nothing like as pronounced as the increase in the proportional weight of the rear wheels. One reason for this is that the necessary weight of springs depends on other factors besides the weight to be carried. The heavier trucks are slow speed vehicles and not as much spring compression under load needs to be allowed for as in a

(Continued on page 85)



Axle and wheel weights increase considerably with any increase in the capacity of the truck

# The Matter of Credit in Export Trade

## Soundness of the Short Term Principle Which American Exporters Advocate —Open Credit vs. Time Acceptances—Adapting Methods to Product, Market and Buyer

By W. E. Tarlton\*

**M**ANUFACTURERS anticipating a permanent export business must decide upon some definite policy regarding credit. As a rule, there are three points to consider:

1—The product—If it is non-competitive the exporter may dictate terms and prices; if not, he must be governed very largely in these particulars by what others are doing.

2—The market—The rules of the markets of the world have been long established and are not easily changed for the convenience of the seller.

3—The buyer—He will consider a cash transaction last. He probably will expect credit.

It has been said, and rightly, that if a manufacturer would export at all, he must handle his credits in an intelligent way and along lines not fundamentally different from those employed in dealing with domestic trade.

American exporters have been harangued by writers of various creeds and tongues, even American writers, for their rigidity of terms, and, in contrast with them, mention has been made of the liberality of Germany. We, of course, have to-day our own ideas as to the extent of Germany's liberality. England and other exporting countries have been extolled and their praises sung. We have been told of their philanthropy, of their enterprise, of their investments made for pioneering enterprises with no desire for return except as a benefit to their country as a whole, but all of this is quite misleading.

True enough, in the experience of American exporters, it has been found that in many instances long terms have been granted and liberal credits extended by foreign manufacturers in these various countries, but an analysis of the situation will invariably show that these long terms and liberal credits have been extended only after careful investigation and after applying the same general rules that should always govern the extension of credit of any character.

### Short Term Principle Fundamentally Sound

Even our so-called "American" cash terms are quite freely indulged in by our competitors in international trade, and more often than otherwise are demanded by them. Conservatism pervades the mind of every intelligent credit grantor, whether he learn it from an American business primer or from an English, French or Dutch. The short term principle which, I admit, is desired by every American manufacturer, is fundamentally sound, ideal, and, in fact, enviable, and the time is ripe for a forceful attitude toward short terms, especially in lines of quick turn-over possibilities, commodities, etc.

Up to the present time it has not been expedient nor necessary that we should place our goods in foreign fields on long terms or under a system of loose credit; in fact, it has not been necessary that we sell our goods to foreign countries at all except where it could be done on an extremely profitable basis, and long terms and long profit are not compatible unless they are accompanied by a mediator—long prices. Implicit faith in American business capacity and ingenuity prompts me to feel that we can and will overcome any and all competition, however, when once we have found it necessary to do so.

The manufacturing capacity of the United States has heretofore just about equalled our demand, but, of course, we are

beginning to realize that there will be surplus production so soon as the high peak loads toward which we have been so fast climbing is reached. It is only caution, therefore, that prompts those who have analyzed this situation to begin now to prepare for the struggle for commercial supremacy which will surely follow that for military supremacy now being waged. That we, as exporters, are willing to grant credit is an irrefutable fact.

One hundred and forty-one representative firms were asked the question: "Are you granting credit to concerns located in countries other than our own?" One hundred and ten replied affirmatively, thirty-one only were insisting upon cash in every instance. Our American firms are as able to extend credit, or better able, in fact, than any competitor we have. We have the financial strength, and when the propitious moment arrives and a reasonably substantial basis for credit can be shown, we are perfectly ready to extend the necessary credit.

Importers of our goods, however, must know or be taught, if they do not know, that merchandise on credit costs more, that short terms are economical, sound and safe; that long terms and the pernicious abuses of credit which have been prevalent in some countries, should be wiped out at this, the most opportune time of all history.

### Open Credit vs. Time Acceptances

Up to this time I have not attempted to differentiate between the term "open credit" and "time acceptances." Both are credit, one extremely hazardous, the other considerably less so. There are, of course, sound, honorable business men in every civilized country in the world and I, for one, deeply appreciate the truth of this, but these qualities are most loudly extolled by those whose close, first-hand knowledge and experience is not represented by many years of actual, open-credit relationship with merchants in foreign countries, and I mean it as no reflection upon these merchants when I warn against open credit. It is a policy only to be dealt with with eyes wide open and after a thorough investigation.

Open credit is based solely upon confidence. Confidence is the result of one's own or some one's else experience and should only be dealt in when you are familiar with the details of some such experience.

There will come times, in the experience of every exporter who does any volume to speak of, when he must extend open credit or lose profitable business, and in many cases, under any and all sorts of circumstances, and in most any country, some open credit can be extended with no more attending dangers than is average with any well-organized house, even though dealing exclusively with domestic trade.

We need badly further help from our enormously large financial institutions. They, at least some of them, have had the vision and are bending and lending every effort toward promoting the interests of American exporters. We need also serious study on the part of our legislature toward expansion of foreign trade interests, but, greater than all these, is the need that the mist of indifference and business apathy be removed from the eyes of our manufacturers that they may not only see the benefits that will accrue to them as individuals by a closer study of this vital issue, world's commerce, but that they may consider it a duty to interject their energies into it so that as a nation we may become a real factor.

\*Abstract of a paper presented before the National Foreign Trade Convention.



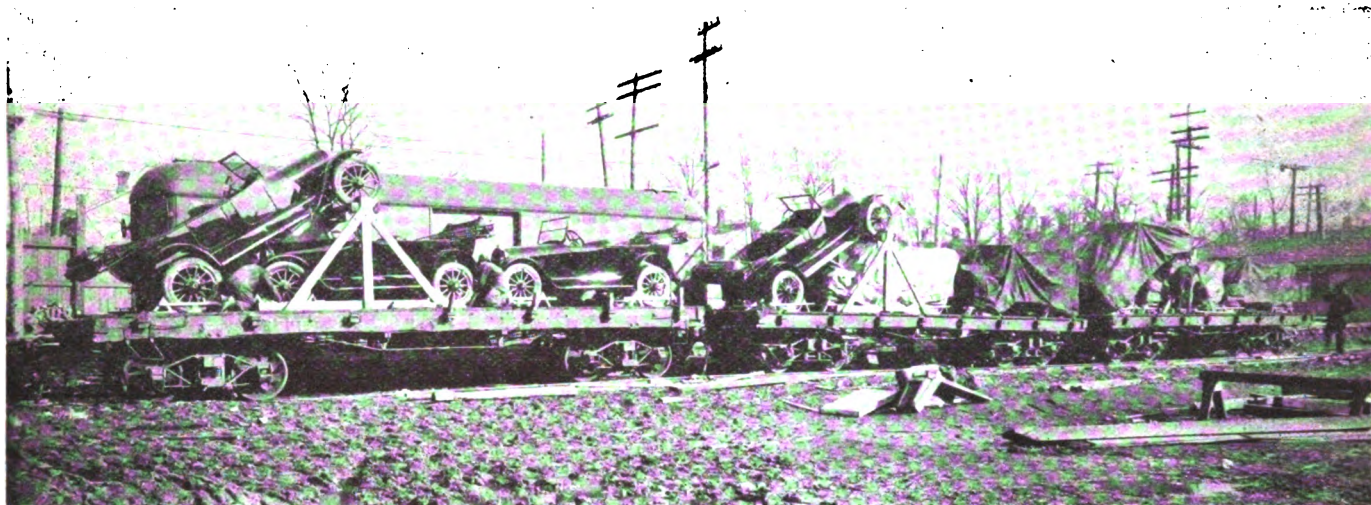


Fig. 1—Arrangement of cars for shipment on electric flat cars

## New Methods of Loading Freight Cars

Schemes Devised for Loading Cars on Other Than the Regulation Automobile Type—Continental Motors Has Improved Shipping Facilities

By C. J. Shower

THE scarcity of freight equipment has made it necessary for the traffic departments of all car manufacturers to use their ingenuity in devising schemes for loading cars in the most efficient manner. There was a shortage of all kinds of freight cars. If the manufacturer could not get the regular automobile cars he was obliged to accept anything he could get if he wanted to dispose of the accumulating stock. With the supply of box cars very small, manufacturers were thankful to obtain flat cars, gondolas or any other type of car that was available—even cattle cars were used in many instances.

The use of other equipment necessitated a change in loading facilities. A number of companies borrowed the wrecking equipment of a railroad. By running this alongside a gondola it was a very simple operation to lift the passenger cars into it by means of the crane.

The Cadillac Motor Car Co. built its own lifting device. With the aid of chain hoists the cars are lifted off the ground and when above the sides of the freight car are pushed over it and lowered. Fig. 5 illustrates this. After two cars are deposited within the body of the gondola another one can be set on top as illustrated in Fig. 3. The cars are lifted on two iron bars which are hooked to the chains at each end, Fig. 4. Fig. 5 shows a car suspended in the air ready to be moved over the gondola and lowered.

The method of loading gondolas by the Dort Motor Car Co. is somewhat different. Runs are built up to the gon-

dola and the cars are driven up on them. After two cars are thus placed upon the floor of the car, tracks of boards are made on top of them and another incline is built to connect with these tracks. Two more cars are then driven up and placed on boards above those on the floor, making a second tier of cars. Fig. 8 shows a car ready to start on the first incline, while the car in the distance has succeeded in climbing the second incline and is being fastened (Fig. 2).

Fig. 9 shows the method employed by the Olds Motor Works in loading flat cars. A rigid framework is built on a flat car, and boards placed at an angle of about 30 deg. form a track at each side upon which the cars may ride and be placed in position. It is possible to load four cars on a flat by this method; this is styled "end up" loading. Tarpaulins are thrown over the cars afterward

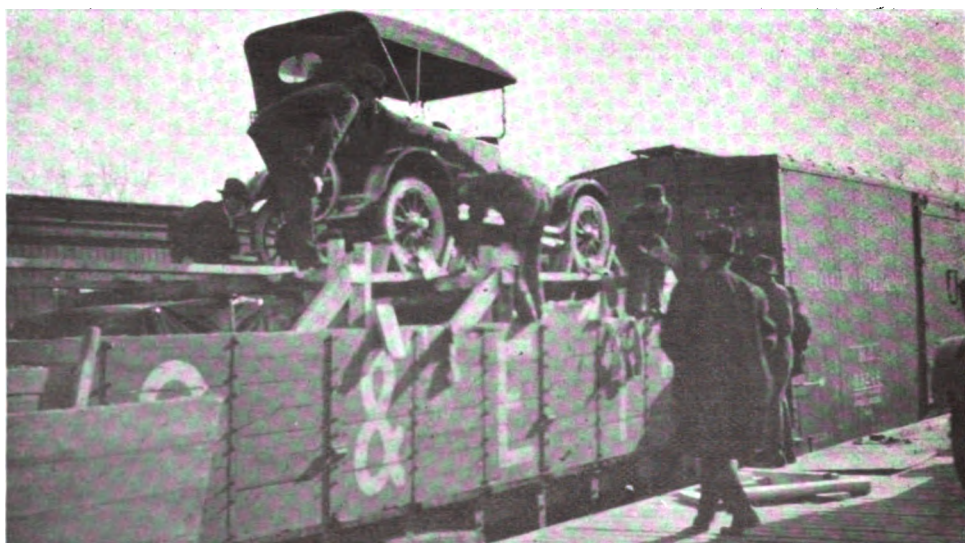
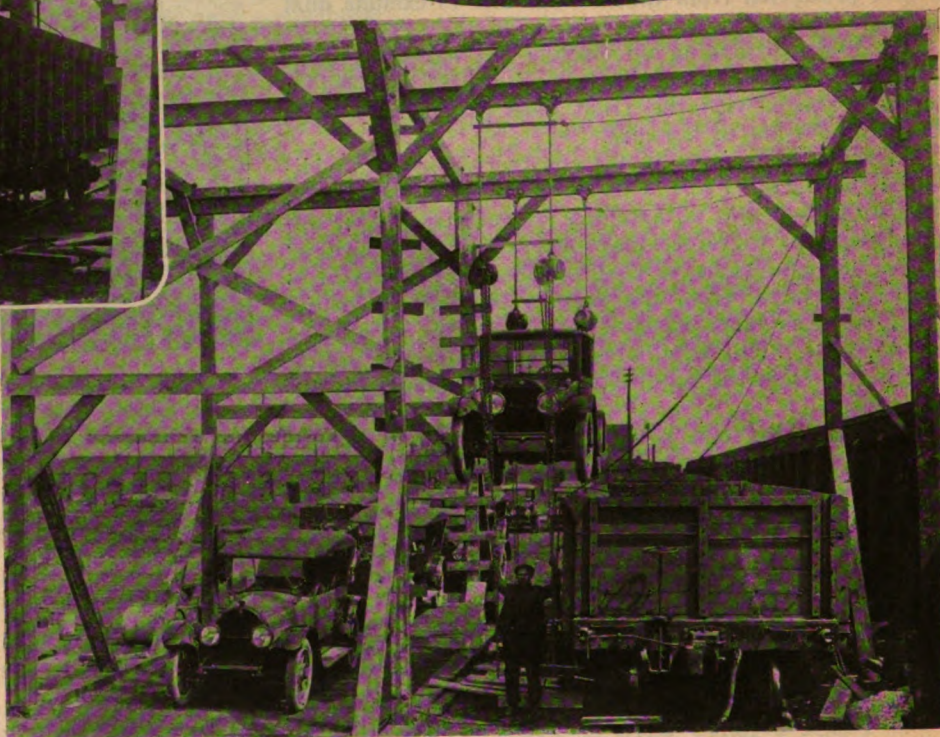
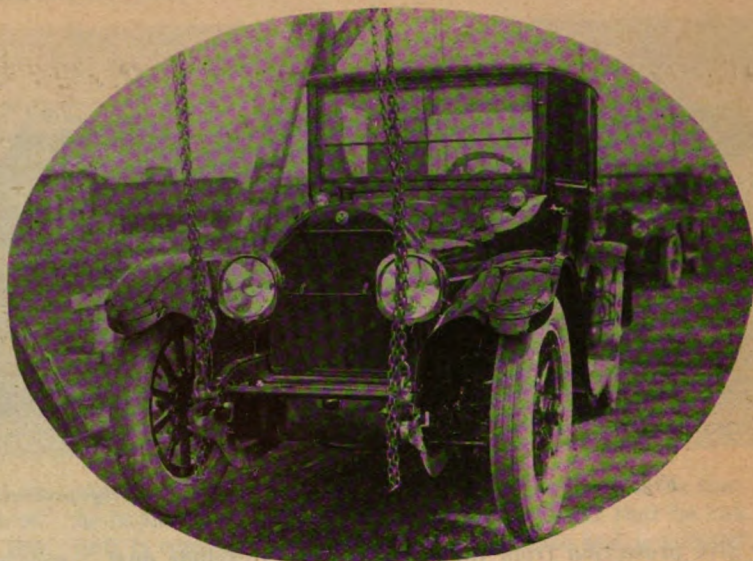


Fig. 2—Fastening the second layer of cars





Above: Fig. 3—The freight has just received the last of its quota. This gondola is carrying three cars; one is directly underneath the one that has just been placed and the corner of a coupe is seen immediately ahead. Upper right hand corner: Fig. 4—This illustrates the manner in which the car is lifted. On right: Fig. 5—The method of loading cars used by the Cadillac Motor Car Co., Detroit. A derrick is built to which the cars to be loaded are driven on the ground. One by one they are lifted with the aid of a chain hoist and swung into the gondola

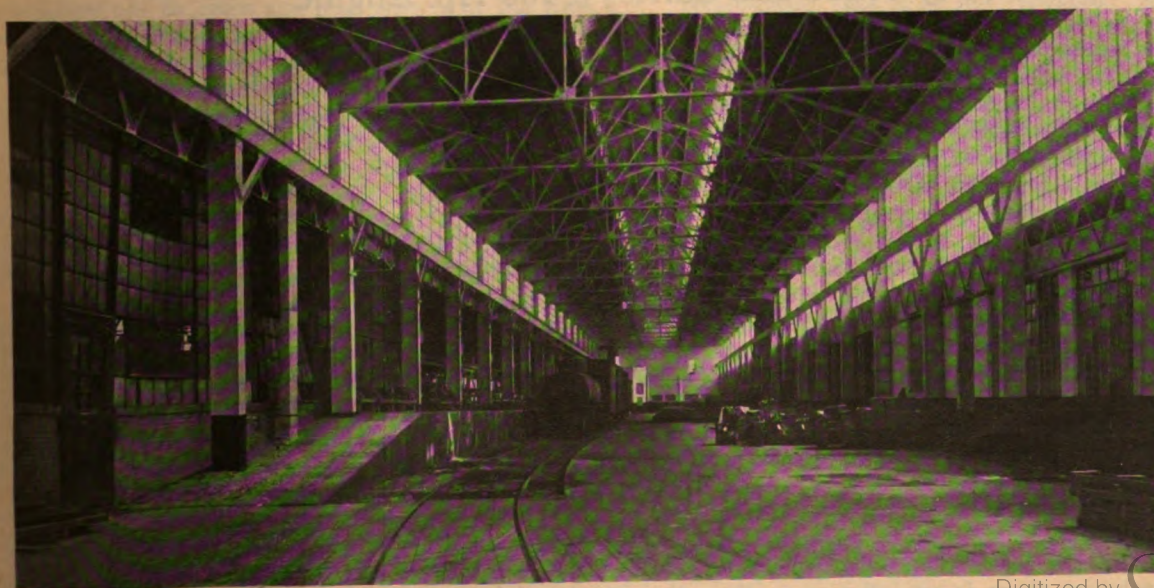


Fig. 6—Shipping at the Continental Motors Corp. is all handled under cover. The finished motors are loaded in the same cars that have just been emptied of their loads of rough stock without moving the freight cars



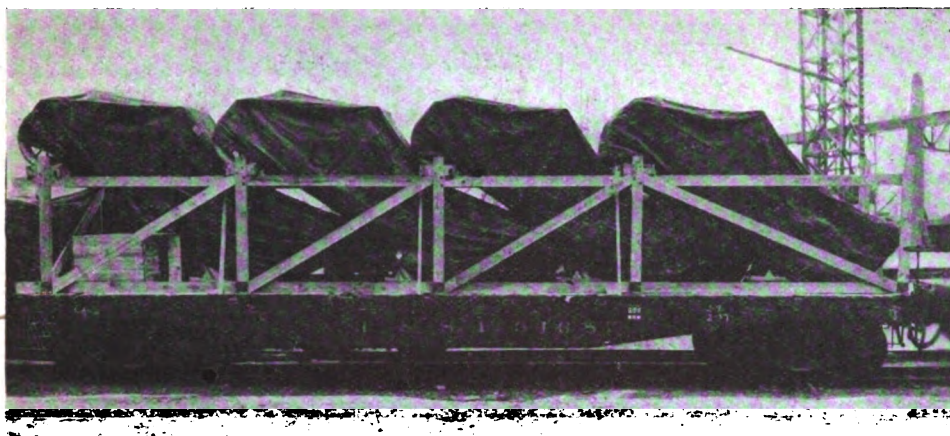


Fig. 7—Four Oldsmobiles, with their bodies properly protected, on a flat car ready for shipment



Fig. 8—The way the Dort Motor Car Co., Flint, loads its cars

to give protection from the weather and to exclude dust and dirt.

Fig. 1 shows loading on electric flat car equipment. Two cars are driven upon the flat and a third is raised on its rear wheels with the front ones propped up on a standard over one of the cars.

A feature of interest in the construction of the addition of the Detroit plant of the Continental Motors Corp., besides the fact that all handling of material is done under cover, and therefore may be carried on regardless of weather conditions, is that the incoming material is delivered directly from the cars to the various points in the machine shop, where it is turned over directly to the machines. This eliminates the necessity of trucking of material from the rough stores to the manufacturing department.

A crane in the test house is used in taking up the finished motors and placing them on the shipping platform alongside the railroad track, where they are loaded directly in the same cars which just previously brought in rough stock. This arrangement greatly expedites the

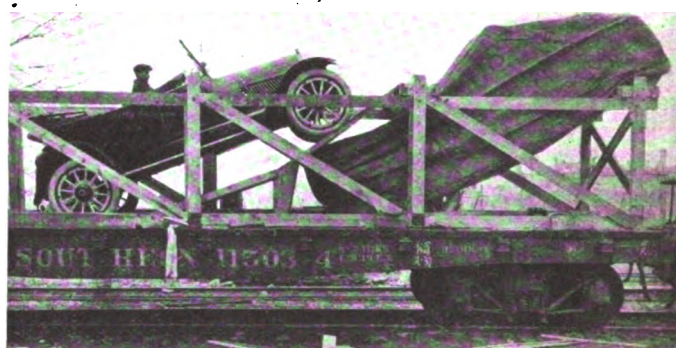


Fig. 9—The method used by the Olds Motor Works in loading cars on end. The cars are driven up the inclined tracks at both sides and blocked

handling of material, and makes it unnecessary to move the freight cars from the point of unloading raw materials to the receiving of the finished product.

## New Pfalz Single-Seater Scout

Fast Plane-and-a-Half Type—Has Elliptic Section Body Covered with Three-Ply Wood and Carries a 160 Hp. Engine

ONE of the latest models of German aircraft to make its appearance on the battlefield is the Pfalz Scout, which is of the type that has come to be known as the plane and a half. This type is characterized by a large top plane and a smaller lower plane. In some of the previous models of this type, like the Albatross, two struts connect to the lower plane in a single point, but in this detail the Pfalz is different, there being a short horizontal distance piece between the lower ends of the two struts. The small lower plane is made with two spars instead of a single center spar, and is therefore a compromise between the single-spar type and the regular two-spar plane, in which the spars are placed the same distance apart as in the upper plane.

One feature of the Pfalz reminding one of the Albatross is that the upper wings are formed in a single piece, and are, of course, without any dihedral angle. The top planes are secured to struts sloping upward from the fuselage. A somewhat novel idea is embodied in the method of securing the lower planes to the body. At the point of attachment there is an inflexion in the

curvature of the body outline, the surface of the body swinging outward and gradually merging into the wing surface. That part of the body extending toward the wing may be regarded as a wing root.

The body or fuselage of the Pfalz is of elliptical section, deep and narrow. This has the advantage that both the engine and the pilot are practically entirely within the body, thus reducing the head resistance to a minimum. The narrowness of the body also minimizes interference with the pilot's view. Body construction is of the semi-monococque type, the body being covered by two thicknesses of three-ply wood put on diagonally in long, narrow strips, one strip crossing the other at an angle of about 90 deg. The tail planes are somewhat unusual in that their top surface is flat, while the lower surface is convex. Just what the object of this deviation from conventional practice is it would be hard to say.

The engine fitted to the Pfalz Scout is a 160-hp. Mercedes, and is very well housed in, only the upper ends of the cylinders projecting from the cowlings.



# Pontiac Centralizes Its Employment of Labor

Organization of Manufacturers' Association Has Eliminated to a Great Extent the Practice of Shop Raiding

By C. J. Shower

FOR the purpose of eliminating shop raiding and of equalizing the scale of wages, the manufacturers of Pontiac have banded together and formed the Manufacturers' Association, whose duty it is to keep an accurate record of all the employed men in the city, find employment for those who seek it and by the same token secure men for the factories needing help.

The association was organized in October, 1917, and since then (to June 4) it has placed 1540 men. It is upheld by the manufacturers by assessments levied on them each quarter, the amount varying according to the expense incurred by the association. One quarter it was 50 cents per employee and the last quarter it was only 40 cents.

## Acts as Central Employment Bureau

This association acts as a central bureau of employment. Any man in search of work applies at the office of the association, where an introductory card is filled out and given him to take to the factory where such help is desired. At the factory an application blank (Fig. 1) is filled out in triplicate. The original is sent to the office of the association the same day and the two copies are retained at the factory until the man leaves its employ, when the second sheet with the reasons for leaving is sent to the association for record. The third, or last, sheet remains at the factory.

From fifteen to twenty-five men apply at the association for work daily. During February and March the average was much higher—from twenty-five to fifty applications were received daily. It is the policy of the association not to place any man who is at the time employed in another factory. It was astounding what a large number of men came to the office and falsely stated

that they were out of work. An employee who states that he has notified his foreman or superior officer that he has quit is considered an undesirable employee and is treated accordingly.

About 5000 names of employees are in the "live" file at the association office—all alphabetically arranged. The cards bearing these names are called "history cards." An accurate record of the employees is kept. In addition to the personal history of the man, space is provided for the names of the places he has worked, and a record of every change is kept. The association can at any time refer to these cards and ascertain where a certain man is employed, how long he has been there, where else he has worked, and whether or not he has a high rating in his line (Fig. 2). A record is kept of all changes within the factory, that is, if an employee goes from one department to another the fact is noted on a slip of paper and sent the association (Fig. 3).

Every day all the factories send to the office of the association a report giving a review of the labor situation. The report made out on the last day of the quarter determines the amount of the assessment to be levied on that factory (Fig. 4).

## No Local Advertising for Help

It is agreed by the manufacturers of Pontiac that no advertising for help be done locally. If necessary to advertise, manufacturers must use outside mediums. It is claimed by the association that advertising for Sunday interviews has a demoralizing effect upon the local market. Very little has been done and the executive board recommends that it be not repeated. It is the belief of the association that fully 95 per cent of the men who answer such advertisements are employed. Many of

APPLICATION FOR EMPLOYMENT									
Full Name (Last, First, Middle)		Date		File No.		(Leave blank)			
Home Address No.		Street		Phone No.					
Is name of husband's family?		Street		Town					
Age	Height	Weight	Married	White	Number				
Sex	Color	U. S. Citizen	1st Place	2nd Place	State	Disability			
How often employed by this factory?		Where from?							
Left	Reason for leaving	Address		Date		Re-employ?			
Left	Reason for leaving	Address		Date		Re-employ?			
In accepting employment with this company, I agree to comply with all its rules and regulations.									
Signed by		Date							
Employed by		Occupation		Date					
What is		Purpose		Date					

EMPLOYMENT RECORD					
Transferred to Department	Date	Rate	Class No.	Personnel	Occupation
Left				Stop	Quit
Reason for leaving				(Personnel)	(Occupation)
Re-employed					
Left				Stop	Quit
Reason for leaving				(Personnel)	(Occupation)
Re-employed					
Left				Stop	Quit
Reason for leaving				(Personnel)	(Occupation)
Re-employed					

Fig. 1—Application blank, front and reverse sides



# Development of Propeller Manufacture

Output of American Factories Now Fully Equal to the Demand—Materials Used and Methods of Production—Theory of Blade Number

**T**WENTY-FIVE experienced American manufacturers are now producing between 350 and 400 airplane propellers per day, fitted for the most strenuous air service. Ample stock of propeller timber is already purchased or available and the present supply of propellers in this country is more than equal to the demand.

The number of spare propellers required for each fighting unit was reduced by the air service recently. Hence it has been possible to cut down the original program for the production of propellers.

After the declaration of war the Signal Corps was forced to build up the existing propeller industry and encourage the manufacture of propellers as a new enterprise.

## Growth in Number of Manufacturers

In April, 1917, there were four airplane companies making their own propellers. Each of these produced propellers in keeping with the requirements of their airplane output. In addition, six other companies made propellers for airplane companies not manufacturing them and for foreign governments, the U. S. Army and Navy, private aviation schools, and exhibition and amateur fliers. The total output last April was approximately 25 propellers per day.

Since that time, and especially since December, 1917, a great development has taken place. The older companies have expanded and new concerns have sprung up, due chiefly to the increased demand for propellers and the requests of the Signal Corps. The Government co-operated both in design and production, and this co-operation resulted in the adoption of standard methods and economical manufacture. The treatment of airplane propeller lumber was worked out, and many special machines and tools were developed and built, materially reducing the amount of hand work previously necessary.

American double-bladed airplane propellers are built up from boards about 1 inch in thickness, cut out to the rough shape of the laminations. Specifications for mahogany lumber for aircraft propellers as issued by the International Aircraft Standardization Board were printed in AUTOMOTIVE INDUSTRIES of May 23 last.

## Treatment of Lumber

The boards or laminations are cut out from carefully selected lumber which has previously been kiln dried to a uniform moisture content of from 6 to 8 per cent, great care being taken to avoid case hardening and too rapid drying, which may diminish the strength of the lumber. The laminations when cut for use in the propeller must be clear pieces, free of all defects and with straight grain running along the length of the piece. After cutting to shape, the boards are balanced individually and selected according to this balance for grouping together for the complete propeller.

Following this selection, the completed groups of laminations are assembled and placed in a hot box to prepare for gluing. With correct temperatures of material and room, gluing is done as rapidly as possible,

and the glued-up blocks are left in presses or clamps to set for 24 hours. The blocks are then cut down by carving machines, lathes, shapers, etc., to within about  $\frac{1}{4}$  inch of the final finished size and shape, and in this state are hung for two weeks in a conditioning room before being worked to the final finish.

The finishing operation is performed on the bench and completes the propeller to the point of being ready for varnish or covering. The bench work is done with great accuracy, to insure that the propeller conforms exactly to the desired pitch and shape and has the two blades in exact alignment and track. The propeller, acting as a flywheel for the engine, must be perfectly balanced. When the propeller is finished in the "white," it is ready for inspection of glue joints, dimensions and balance, after which it is finished with 5 coats of spar varnish and rebalanced.

Some propellers have the tips covered with linen fabric to protect them against splitting, which results from picking up sand, running in long grass or in the rain.

Existing opinion is somewhat divided as to the best wood for propeller purposes, but the past practice of the French and English Governments greatly favors walnut and mahogany for combat plane blades, the former being considered best. Other woods have been extensively used for training-type propellers, principally quarter-sawed white oak, birch, cherry and poplar. Originally the walnut used by the French was their own French walnut, but this wood is no longer available. American black walnut has taken its place, and large quantities have been exported to England and France for propeller purposes, as well as for the manufacture of rifle stocks. To-day the available supply of black walnut is limited by the ability of producers to obtain the scattered timber, and the demand is greatly in excess of the supply. The exclusive use of black walnut for rifle stocks manufactured in the United States has an important bearing upon the available supply for propellers.

## Mahogany Used Comes from Central America

All the mahogany used has, for the past four years, been exported as lumber from the United States, having been imported in the log from Central America and Mexico. Some of the largest and best tracts of mahogany timber are in British Honduras. This is being cut under the direction of the British Admiralty and brought into the United States for manufacturing into propeller lumber before exporting to England. Large quantities of British Honduras mahogany and other tropical mahogany have been exported, so that the existing situation is one wherein the available supply is just about adequate for the combined demands of the Allies and the United States, provided restrictions are placed upon the use of mahogany propeller stock for commercial purposes. This situation affecting the manufacture of furniture, pianos and the like can be relieved by the use of substitutes, such as Philippine mahogany, which is lacking in some qualities required by the specifications for propeller wood.

It is believed that quarter sawed white oak will come to be used more generally, on account of its greater



strength and the necessity for getting maximum strength in the propellers used on the newer high-powered, high-speed engines.

The amount of wood in the present two-bladed propellers varies from 30 board feet in a training type to 80 feet in a combat type. These figures are net, while the gross lumber required to manufacture will be about twice the net amount in both instances.

Many attempts have been made to design and produce a metal propeller, but to date no tests reported have been sufficiently successful to warrant putting the propellers into production. The difficulty is to construct the blade light enough and strong enough to resist the tensile and bending strains set up. Propellers have been manufactured from a synthetic material called "Bakelite," shaped under hydraulic pressure at a high temperature. To date these have been successful, in destruction tests and flight. They weigh slightly more than wooden propellers of the same design but have greater resistance to wear and tear.

In determining the number of blades to use in the pro-

PELLER, account is taken of the double requirement of developing the maximum efficiency in converting shaft horsepower into propulsive horsepower and at the same time developing a blade that will be adaptable to the construction of the complete machine.

The greatest efficiency is always obtained by a two-bladed propeller of the largest diameter that the engine will turn at the correct engine speed. In this way the propeller has an effective thrust over the maximum possible air area, with least blade surface resistance.

In many cases, however, the construction of the plane is such that a two-bladed propeller of sufficient diameter cannot be used on account of clearance, and the three or four-bladed propeller is adapted to take up the full horsepower in effective thrust, in spite of greater resistance losses. The four-bladed propeller is generally used instead of the three, because of its simpler and stronger construction features. The two-bladed propeller is more efficient than the three or four, and would always be used if the arrangement of plane and engine permitted.

## An Improved Cost Keeping System

Mechanical Time Recorders Make for Accuracy—Electric Clock System, Comprising a High Grade Master Clock and Secondary Clocks Throughout the Plant, Adds Further to Accuracy

A TIME recording system for cost keeping, making use of secondary clocks operated from a master clock by means of electric current, is manufactured by the Stromberg Electric Co., Chicago. The machine makes an imprint of the exact time on a card or work ticket, which may be placed in it for that purpose. As a rule, secondary clocks and time recorders are distributed throughout the shop, the clocks being operated from the master clock which is located in some central position, generally the main office. The master clock is a high grade timepiece and claimed to keep accurate time. The mechanism of this clock is used to periodically make electric contact, to the end that electric current may be transmitted through relays at regular intervals to operate the electromagnets of the secondary clocks. The master clock is self-winding, the work of keeping it wound being accomplished by the same current that operates the secondary clocks, and as all of the secondary clocks must always be in absolute synchronism with the master clock, the same time is shown by clocks throughout the plant.

The Stromberg company points out the advantage of the mechanical system of recording the time spent on different operations in the shop, insuring the greatest degree of accuracy in the cost keeping. When workmen are required to put down the time spent on different jobs with a pencil, they often wait until the end of the day and guess at the time worked on different jobs. It is obvious that this introduces appreciable errors.

We show herewith an illustration of the Stromberg company's time recorder and also reproduce a combination pay roll and cost coupon ticket worked out by the accounting de-

partment of the Metal Specialties Mfg. Co., Chicago, which is filled out from the records of a Stromberg time recorder. This ticket takes care of both day and piece work. It permits of quickly accounting for a full day's time. The top



Stromberg electric time clock

METAL SPECIALTIES MFG. CO.									
PAY ROLL SLIP									
EMPL. NO. 83		DATE 9/21/17							
ORDER NO.	DAY WORK HOURS	DAY WORK WAGES	PIECE WORK HOURS	PIECE WORK WAGES					
292	2.4	72							
289			4.0	1.38					
305			3.1	.92					
TOTAL	2.4	8	7.1	\$ 2.30					
SEP 21	9 5	TIME	F	ORDER NO. 292	EMPL. NO. 83				
SEP 21	7 1	2.4	S	ARTICLE NO. 1324					
OPERATION Threading									
EMPL. NO. 6	STOP 7954	RATE PER HOUR	RATE PER HOUR	LAMER COST					
START 7450			30	72					
MADE 504		APPROVED							
SEP 21	7 1	TIME	F	ORDER NO. 289	EMPL. NO. 83				
SEP 21	3 1	4.0	S	ARTICLE NO. 1550					
OPERATION Blanking									
EMPL. NO. 12	STOP 7844	RATE PER HOUR	RATE PER HOUR	LAMER COST					
START 6372			40	1.38					
MADE 3452		APPROVED							
SEP 21	3 1	TIME	F	ORDER NO. 305	EMPL. NO. 83				
SEP 21	0 0	3.1	S	ARTICLE NO. 1559					
OPERATION Hand Screw Mach.									
EMPL. NO. 4	STOP 4136	RATE PER HOUR	RATE PER HOUR	LAMER COST					
START 4028			130	.92					
MADE 708		APPROVED							

Time card

coupon is marked under the employee's number in the payroll department and the totals are added at the end of the pay period. No daily posting is necessary. The job coupons go to the cost department and are there filed under their respective numbers and totaled when the job is completed. It is claimed that by this method much posting and chance for error are eliminated.

# Solving the Problems of Female Labor in a Car Making Plant

The Importance of Careful Selection of Women Employed and Sympathetic Supervision Over Them, as Shown in the Experience of the Maxwell Company—Rest Rooms and How They Should Be Used



*Women exclusively are employed in this department of the Maxwell plant. More than fifty of them are engaged here in assembling ignition and lighting wiring units*

**T**HE several problems incidental to the employment of women in large numbers in manufacturing plants where they have not previously been used to any great extent have been given careful study by the Maxwell Motor Co. of Detroit, where recently it was estimated that fully 12 per cent of the working force is made up of female operatives.

Special thought has been given by the Maxwell company to the method used in selecting the women who are employed, to adequate arrangements for and equipment of rest rooms, to the proper dressing of the women for their work, to the provision of hospital facilities and cafeteria. The company has its Supervisor of Female Welfare in the person of an experienced woman.

Great care is exercised by the superintendent of employment who hires the help to see that there are taken on only such women as are not working merely for pin money with which to buy clothes and luxuries. It is considered inadvisable to hire a married woman whose husband earns six dollars or more a day, as she would be very apt to leave on short notice after having earned suf-

ficient money with which to purchase some particular article or make certain investment, the desire for which had provided the chief reason for seeking employment.

The girls who apply for work at the Maxwell plant are first interviewed by the supervisor of female welfare, who ascertains particulars in regard to their ambitions, their home life and their physical condition. In order to minimize the percentage of transient help, they are thoroughly questioned as to whether or not their livelihood depends upon their employment. They are then turned over to the superintendent of employment, who has a faculty for reading human nature and hires only those who he believes will make the best grade of women workers.

## Success Largely Due to Careful Selection

By weeding out the applicants and recommending for employment only those who are likely to develop into good workers, much of the credit for obtaining such excellent results as have been obtained from the use of women at the Maxwell plant is given to the supervisor of female wel-

fare. She is a woman of very pleasing personality, who makes it her business to be a friend to all the girls, encouraging them and keeping them satisfied with their work and factory surroundings at all times.

If a girl is dissatisfied with the work she is doing, or if she desires to increase her earning capacity, she is transferred to some other job where she has more congenial surroundings or an opportunity to earn more money. If the work allotted to any girl is found too heavy for her she immediately reports at the supervisor's office, presents her statement of the case and is transferred to lighter work.

On a card index maintained by the supervisor a record is kept of the name of each dissatisfied employee, the nature of her work, her foreman, present wages, and the date on which the dissatisfaction was manifested. The matter is investigated by the supervisor, who confers in regard to the case with the foreman in charge of the particular department in which the girl works. If it is decided that an increase in pay is merited, or a change of work desirable, it is immediately put through. When the change or increase is made, a notation to that effect is made on the card in red ink and the card is disposed of in a dead file. In this way the women are kept satisfied and the company is saved much inconvenience and cost resulting from losing help and breaking in new operatives. The minimum wage at the Maxwell plant is \$2.50 per day and some of the women make as much as \$4.50 a day on piecework.

Rest rooms are regarded as of prime importance and are established chiefly as places for the women to change their clothes, and to provide space for the woman who is suddenly taken ill to rest in retirement. They are not in-



*One of the four rest rooms for women workers at the Maxwell plant. It is impressed upon the women that the privileges of these rest rooms must not be abused*

tended to be general loafing places, and women are not permitted to go to them at any time they may happen to choose for the purpose of loafing. If a woman is out of work she must remain at her machine or at least in the department where she is working. Lunching in the rest rooms is discouraged.

The Maxwell company maintains three spacious rest rooms, one of which is shown in an illustration herewith. The girls are allowed to spend their noon hour in them in dancing, reading or playing games. These rest rooms are furnished with lounges, easy chairs, palms; in fact, everything possible which would add to the comfort of the girls employed at the plant.

A matron is placed in charge of each rest room to look after the requirements of the girls and to keep the room in order. The girls are allowed to spend 10 minutes during working hours in these rest rooms, and, in order that the privilege may not be abused, the matron records when a girl comes in and informs her when her time is up. However, the precaution seems hardly necessary, as in only a very few instances is advantage taken of this privilege. Adjoining the rest room are cloak rooms, wash rooms and toilets. Another large rest room is being constructed at the Maxwell plant, as women are hired every day in increasing numbers.

In one section of the factory is a general hospital and doctor's office shown in the illustration herewith. Both men and women are treated in this hospital, there being separate rooms for male and female help. All employees are given to understand that no matter how small an injury may be, even if it is only a scratch, they should report at the doctor's office for treatment. In this department a physician is in charge assisted by two trained nurses.

#### A Restaurant on the Serve-Self Plan

A cafeteria for those women who do not care to bring their lunch is also maintained at the Maxwell plant. It is shown in the illustration herewith. It is conducted on the serve-self plan and the girls can have whatever they want to eat.

The women workers in the Maxwell plant are furnished with bloomer uniforms and caps in cases where the work



*A view of the Maxwell company's cafeteria, exclusively for women*



is dangerous. These uniforms are laundered and kept up at the expense of the company. The women go about their business in these uniforms without any annoyance from men employees. The men are warned by the foreman of each department that such conduct would constitute a serious offense and the guilty liable to dismissal.

Visiting among female employees during working hours is discouraged by the foreman, and the machines on which the girls work are spaced far enough apart so as to preclude conversation or whispering among the girls during the working period.

#### Much Depends on Foremen

According to the views of those in charge at the Maxwell company, success in adapting women to the industry rests with the foremen, who should aid in their proper training, and at all times lend their influence to maintaining good deportment. The women who are serious-minded and show a desire to improve and become adapted should be given careful and painstaking encouragement; while, on the other hand, those who do not adapt themselves to conditions and are prone to visiting soon eliminate themselves.



*General hospital and doctor's office at the Maxwell plant. There are separate rooms for male and female employees in addition to the general office shown above*

## An Innovation in Strip Steel Practice

THE rapid development of the automotive industries and their demand for improved materials have led to the introduction of new methods in rolling and handling strips in standard and alloy steels. To meet the requirements especially of the automobile industry, the National Pressed Steel Company has recently put down an interesting plant at Massillon, Ohio. This plant was designed to turn out a wider range of sizes and the proper quality of hot and cold rolled strips used in deep drawing, stamping, forming and pressing operations.

In order to be able to accurately gage the demands of the trade, a questionnaire was prepared containing thirty-seven questions. This was sent to a large number of manufacturers of pressed and drawn products, and the returns from it were most satisfactory, inasmuch as 47 per cent of those addressed answered either all or some of the questions posed. The information thus obtained, relating to the size, finish, chemical analysis and physical properties of the steels used by those addressed, was made the basis for the design of the new plant. In spite of the adverse conditions in the materials and machinery markets, it was only ten months and one day from the time ground was broken until the new plant was in operation.

For the product of the new plant it is claimed that it can be used without annealing for many purposes which have called for annealed strip heretofore. Raw material is received in the form of slabs and billets and is unloaded from the cars by means of cranes carrying rectangular lifting magnets. Before any material is placed in stock or used, each piece is carefully inspected for seams, pipes or any other defects which could be rolled into the steel by later manipulation and not detected until the material was in the customer's presses. The stock yard has a capacity of from 15,000 to 20,000 tons of steel and adjoins the mill building.

Great care and attention were given to the design and detail for the furnaces to insure uniform heating. They are of the large continuous reheating type, using powdered coal as fuel. All parts and accessories were specially designed and constructed for this method of heating. Pushers, drawing machinery, door hoists, transfer tables and all equipment auxiliary to the furnaces are electrically operated. The steel is transferred to the roughing mill in a unique manner, and in such a way that practically all furnace scale is removed.

The roughing mill is a high speed 24-in. two high universal mill and is driven by a Westinghouse reversing motor similar to those used in blooming mills, but smaller and much faster.

An idea of the extreme proportions of the mill will be conveyed by the statement that the housings weigh approximately 42 tons each, and that all other parts are correspondingly heavy. When it is borne in mind that this company produces large quantities of special alloy steels in the form of strips up to No. 00 gage by 24 in. wide, the necessity for such heavy units will be appreciated. The extreme rigidity of the mill and foundations are also realized upon considering that when finishing 0.50 carbon steel less than one-thousandth inch (0.001 in.) is allowed for spring of the mill. The vertical rolls on this mill are designed and operated so that proper side work may be given the steel. This method of rolling also holds the width dimension to slight variation.

If the material is brought to gage on the roughing mill, the strip is turned over after rolling in order to facilitate inspection and remove any slight remaining scale. It is then transferred to a leveller or straightener of extremely rugged construction. From this the product is delivered to the hot bed.

When producing lighter material only the roughing operations are used on the roughing mill, as a train of finishing mills has been provided for the final passes. These mills are operated entirely by mechanical means—no manual labor being required. Driving power is furnished by a Westinghouse motor of the Kramer type, permitting a wide range of operating speeds with good electrical efficiencies.

From these mills the material is delivered to hot bed or coiler as may be required. On leaving the hot bed the strips are cut to length and piled by a mechanical piler, placed in stock if they are to be shipped as plain hot rolled material, or transferred to the finishing department if additional treatment is required.

In addition to the usual slitting, shearing, oiling and liming machinery, the finishing department has extensive facilities for heat treating and pickling. Each furnace has a charging capacity of approximately 25 tons and also the necessary mechanical means for reading and heat control, assuring uniform and proper heat treatment. The furnace men can observe and control the furnace temperature at all times, but the recording instruments and the records are seen only by the department superintendent, who thus has a definite and accurate record of all conditions and every operation employed on past work. The pickling vats are of the plunger type in standard details, but of large size for pickling large pieces whether flat or coiled. The steam for heating pickle liquors and other miscellaneous heating processes is generated by a boiler placed over the annealing furnace flues.

# War Airplanes of To-Day

A Comprehensive Collection of Photographs and Descriptions of the  
Scout, Reconnaissance, Battle and Bombing Planes and  
Flying Boats in Use in the World War

(Concluded)

**I**N the July 4th issue of AUTOMOTIVE INDUSTRIES appeared the first part of this comprehensive collection of photographs and descriptions of airplanes, employed by the warring powers in Europe, which formed the basis of the paper which was presented at the Dayton meeting of the Society of Automotive Engineers by Fay Leon Faurote.

The planes shown and described previously were the Bristol tractor monoplane and scout tractor biplane, the Morane Parasol and three place tractor; the Spad pursuit biplane, the Pomilio and the Thomas Morse single seater. The remainder of the collection is shown on the following pages.

## HALBERSTADT SINGLE-SEATER MACHINE

Equipped with an Argus or Mercedes engine. Fish-shaped fuselage. Staggered planes—the upper plane with overhang. Width, 28½ ft. and length, 24 ft.

## MARTINSYDE SCOUT TRACTOR BIPLANE

One-seater, powered with a 120-hp. Beardmore, which drives a two-bladed, 9 ft. 6 in. propeller with pitch of 6 ft. Span, 38 ft.; chord, 5 ft. 11.75 in. Gap, 5 ft. 8 in. Overall length, 26 ft. 6 in. It is moderately fast, making 98 m.p.h. near the ground and climbing 3000 ft. in 4 min. The complete machine unloaded and dry weighs about 1400 lb.

## D. F. W. AVIATIK C V

The wings have a dihedral but no sweepback. The span of the lower wings is 42 ft. 5 in., nearly equal to the span of the upper wings, which is 43 ft. 8 in. The ends of the upper planes are oblique, those of the lower retracting and rounded. The maximum chord is 5 ft. 9 in. The total lifting surface is

about 421 sq. ft. The gap is 5 ft. 7 in. The angle of incidence of the upper plane is 5 deg. from the cabane to the sixth rib and 3.3 deg. at the thirteenth rib, where the ailerons commence. There are two pairs of struts on either side of the fuselage. The metallic ailerons are rectangular with rounded ends. The empennage has a heart-shaped appearance. The fuselage, rather shallow in depth, terminates in a vertical knife-edge in the rear, with a somewhat pointed propeller pot in front. It has the standard landing-gear.

The D. F. W. is equipped with a fixed Benz engine of 228 hp. at 1410 r.p.m., almost entirely inclosed in a special cowl. The radiators are mounted on the sides of the fuselage. The pilot sits on the gasoline tank, with a machine gun within easy reach of his right hand; the passenger sits behind in rear cockpit. The full load carried is 2100 lb., of which 660 lb. is the useful load.

## C-4 RUMPLER (GERMAN SINGLE-SEATER BIPLANE)

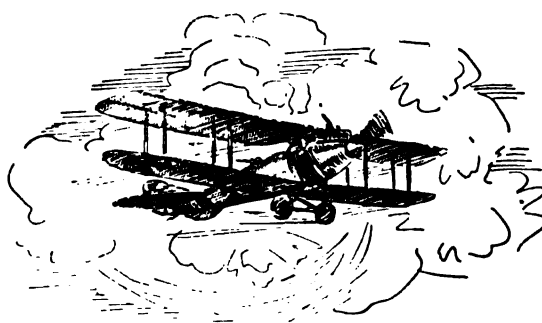
The upper plane is 12.6 m. span, the length, 8.4 m., height, 3.25 m., chord, 1.7 m., gap, 1.85 m., dihedral angle, 2 deg., the angle of incidence, 5 deg. and a sweepback of 3 deg.

The C-4 is generally equipped with a 200-hp., six-cylinder Mercedes. The tank capacity is 290 liters. Contrary to German practice, the trailing edges are rigid.

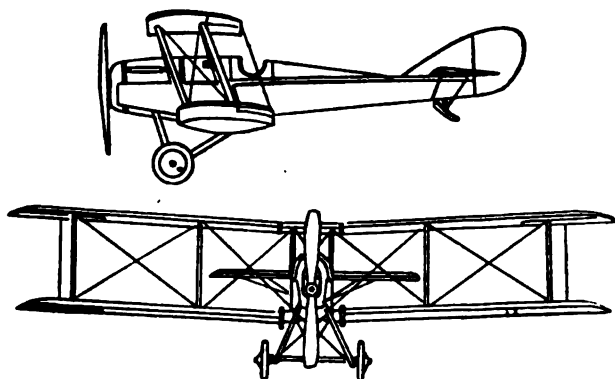
The upper wings are cut out for visibility above the body. The lower wings have rounded tips like a D. F. W. It has two pairs of interplane struts on either side, narrow horizontal stabilizers and balanced elevators. The control cables are carried entirely within the body in wooden tubes. The fuselage is of regular construction of wood and wires. The engine is similar to that used in a Zeppelin; its radiator has blinds. It is equipped with one fixed Spandau machine gun.



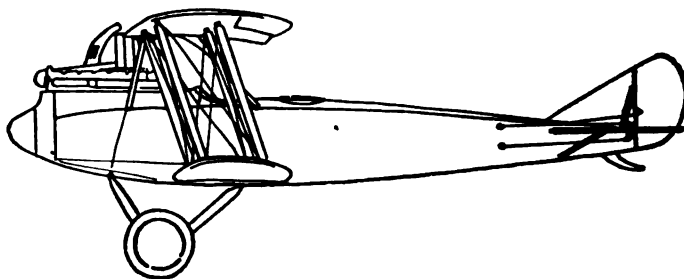
Halberstadt (German)



Aviatik DFW (German)



Martinsyde Scout (British)



Profile of the Rumpler C-4 type (German)

The pilot sits in front, the gunner in the rear. It has a Parabellum gun placed in the rear and four bombs, radio and camera are carried.

It will climb 16,400 ft. in 35 min. The machine is good for all purposes and high altitudes have been made with it. The machine can fly 4 hr.

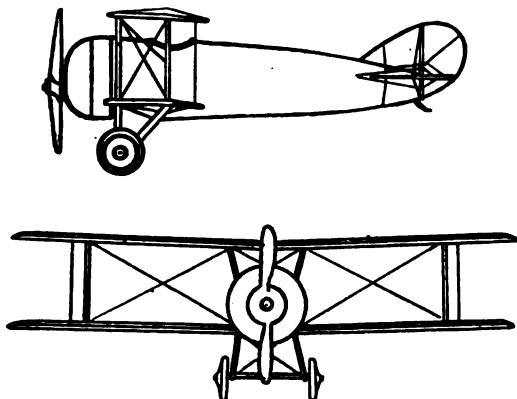
#### STURTEVANT SINGLE-SEATER SCOUT

It has pyramid trussing. This is a half-wing feature made by the steam-lining of the single lower spars. The stationary engine is carefully cowled. Overhead radiators are set into the wings. Its design affords a wide range of view and good facilities for mounting a machine gun. Its compactness is notable. All structural parts are built of vanadium steel. It is fitted with 150-hp. Sturtevant engine, of the eight-cylinder, water-cooled type. The net weight is 1000 lb.

#### VICKERS SCOUT ES-1 ONE-SEATER BIPLANE

Rather chubby fuselage; small wing span, 24 ft. 4½ in.; only 20 ft. 4 in. long and 8 ft. 10 in. high. Driven by 100 to 110-hp. air-cooled Clerget or 110-hp. LeRhône, equipped with 8-ft. 6½-in. propeller of 8-ft. 2½-in. pitch, two-bladed. Aspect ratio 5.1. Small dihedral of 1 deg.; no stagger and no angle of incidence. Chord, 4 ft. 9 in.; gap, 4 ft. Total weight, 1500 lb. Carries 28 gal. of gasoline and 6½ gal. of oil. Climbs 10,000 ft. in 18 min. Maximum speed, 112 m.p.h.

The Vickers Scout is a difficult machine to fly and tiring



*Vickers Scout E.S.1. with rotary engine (British)*

on the pilot. Great care is required in landing. The machine is tail-heavy with the engine on. It will get off in about 325 ft. and can be stopped in 600 ft. if the engine is off. A slightly better performance is attained by the use of the 110-hp. LeRhône engine.

#### ENGLISH S.E.5.A. SINGLE-SEATER FIGHTER

The two wings have an area of 22.8 sq. m.; span, 8.15 m.; chord, 1.52 meters. Stagger, 0.46 m. The wings have no sweepback. Dihedral, 171 deg. The lower wings are cut away near the body for a better view. The angle of incidence of the wings is 5 deg.

The interplane bracing is streamline wires. That of the overhanging portion is thick-ended wire. The trailing edge of the wings is formed by a wood strip. Between every two ribs are two short false ribs running from leading edge to front spar. The engine section struts are steel tubes streamlined with wood fairings. The interplane struts are of wood. The lift wires are in duplicate and landing wires single. Non-balanced ailerons are hinged to the rear spar on both upper and lower wings.

The fuselage is a type of girder, and has a turtleback formed by vertical formers. It is covered up with wood as far as the pilot's seat. The tail plane, cambered on both sides, is so attached to body that its angle of incidence can be varied during flight from + 4.5 deg. to - 3 deg. The front spar oscillates freely from end; the rear spar and its bracing is attached to a tube, which can be raised or lowered in the stern post of the body.

The under-carriage is of the usual type. The tail skid,



*Sturtevant Scout (American)*

which is of unusual construction, is swivelled from the stern post and connected to the rudder control-cables. A brass shoe is sprung by means of two spiral springs inclosing telescopic tubes.

The inclosed Wolseley-Hispano engine develops 206 hp. at 2005 r.p.m.

The radiator forms the nose of the body. Shutters operated from the pilot's seat permit of covering up about half of the radiator. The main gasoline tank is mounted behind the engine on the upper longerons.

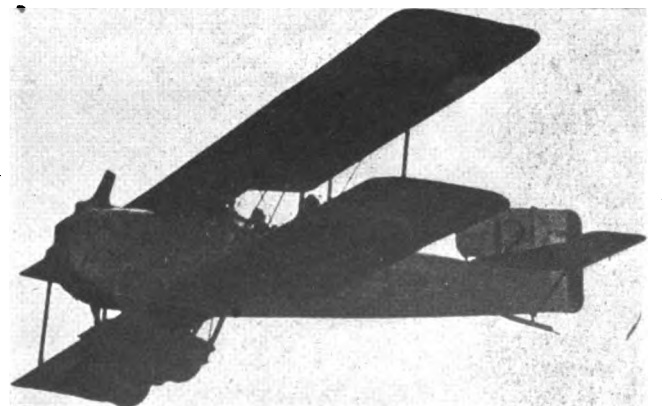
The fixed machine-gun is mounted to the left of the pilot inside the body covering. The firing of the gun is operated hydraulically by control mechanism in front of the engine, and driven by spur gearing on the propeller. The trigger is mounted on the control lever. On a bent rail above the center section of the upper plane is a Lewis machine-gun which can be pointed to fire upward during flight.

The weight of machine empty is 706 kg., and 250 kg. useful load is carried.

### Battle Planes

#### BREGUET RECONNAISSANCE TWO-SEATER

It is powered with a 450-hp. Renault twelve-cylinder engine. The gross weight is about 3700 lb. It carries a live load of about a half ton. It has a spread of 38 ft., a small dihedral on the upper plane only and a little sweepback. It is made largely of aluminum, the ribs are wood. The speed is about 128 m.p.h., and the machine will climb 16,000 ft. in 19 min. It carries four machine guns. It has a double set of ailerons, the lower ones being longer and extending from the wing tip nearly to the body. The elevators are balanced. There are two vertical fins and a vertical rudder. It has a three-wheeled landing-gear. The machine may be recognized by its three sets of struts on either side and set of V-struts in the



*Breguet in flight (French)*





Twin-engined Bristol (British)

center, the line of which if continued makes a large V with the front landing-gear. An M is formed by the trussing of landing-gear.

#### BRISTOL WITH TWO 120-HP. BEARDMORE ENGINES

Two two-bladed propellers of 9 ft. 6 in. diameter and 7 ft. 8½ in. pitch. Weight, 5210 lb. Maximum speed, 85 m.p.h. Comparatively wide span of 53 ft. 6 in.; overall length, 39 ft. 2 in., and is 12 ft. 8 in. high. Capacity for 115 gal. of gasoline, 9 gal. of oil, and 10 gal. of water. Total wing area, including tail planes and elevators, 945 sq. ft., making a loading of 5.5 lb. per sq. ft. Aspect ratio, 6.7. Stagger slightly less than 1 ft. Dihedral, 4 deg.; angle of incidence, 2 deg.; chord, 8 ft.; gap, 7 ft. 10½ in.

This machine is heavy and extremely trying to fly. It has to cover considerable ground to get off and cannot be landed in a small field. It is a very slow climber, taking 54 min. to climb 10,000 ft.

#### L.V.G. (MADE IN TWO TYPES)

The D-9 has a 175-hp. Mercedes or Benz engine, the D-2 a 235-hp. engine. It is distinguished by its half-negated ailerons. The D-2 has a wing chord greater near the fuselage than at its extremities.

#### GERMAN RUMPLER TWO-SEATER MACHINE

It is equipped with a 260-hp. six-cylinder vertical engine, but actually develops 286 hp. at 1500 revolutions. It has little dihedral and very little stagger. The war load is 1150 lb., and it will attain a speed of 110 m.p.h. It cannot climb very



Captured L.V.G. (German)

well, making only 14,000 ft. in 35 min. and 16,000 ft. in 43 min. Its weight is 10.6 lb. per square foot.

#### BRISTOL TWO-SEATER TRACTOR BIPLANE

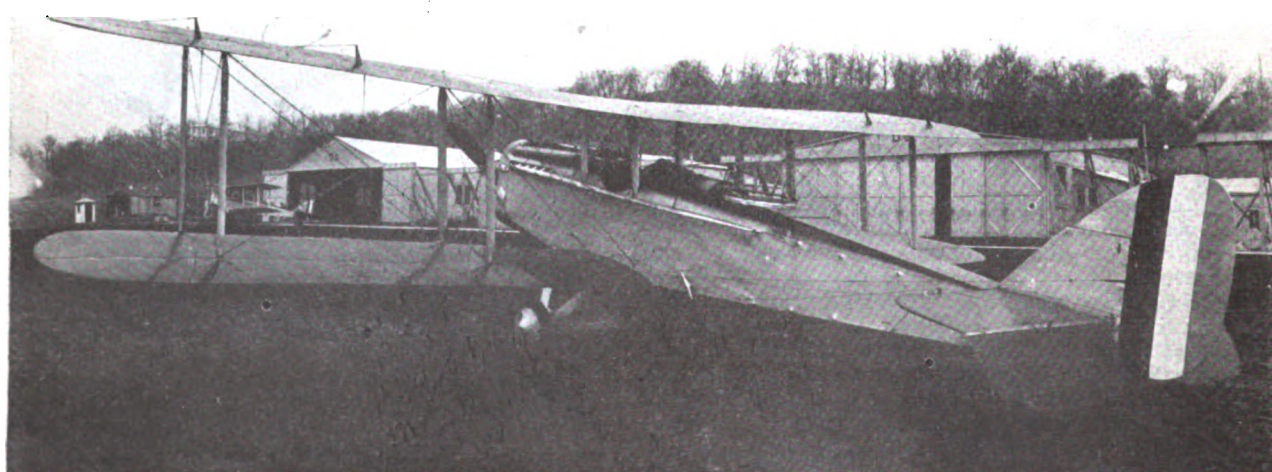
One of the best known of British reconnaissance machines. Powered with a 200-hp. water-cooled engine, driving a four-bladed propeller of 8 ft. 1 in. diameter. Credited with air speed of 111 m.p.h. At this speed it consumes 14½ gal. of gasoline with the engine running at 1290 r.p.m. Equipped with this engine it climbs at the rate of about 68 m.p.h. Wing spread, 42 ft. 6 in. Overall length, 31 ft. 1 in.; 10 ft. high Aspect ratio, 7.7. Dihedral, 3 deg.; stagger, 12 in.

Equipped with a 310-hp. Rolls-Royce and crew of two, this bombing machine carries a total military load of 545 lb., makes a speed of 130 m.p.h. at 10,000 ft., and climbs 15,000 ft. in 21 min. It has an air endurance of four hours at full speed at 15,000 ft., including climb to that height. The machine weighs fully loaded 3575 lb. The machine is modern in design and has a tail that can be adjusted by the pilot so that he is enabled to climb at any speed without effort.

#### BRITISH FE 2-B TWO-SEATER PUSHER BIPLANE

Equipped with 160-hp. Beardmore and four-bladed propeller 8 ft. 11.9 in. diameter. Wing spread, 48 ft. Chord, 5 ft. 6 in. Gap, 6 ft. 3 in. It is 33 ft. 4 in. long and 12 ft. 8 in. high. Carries total useful load of 976 lb. Total flying weight is 3037 lb. The best climb with which it is credited is 10,000 ft. in about 40 min.

It is very stable and is especially useful for photographic



Battleplane (DH4) built in United States



FE26 (British) Pusher Plane

and reconnaissance work. Being a pusher the engine is located in the after part of a nacelle, and the empennage is carried at the extremity of a V-shaped outrigger system of trusses. The machine has a wide tail with a comparatively small chord. The nacelle projects forward from the central portion of the machine and carries a pilot in the after cockpit and a gun and gunner in the forward. The landing-gear has the well-known third wheel in front. The machine is readily distinguishable on account of its peculiar rudder form.

#### S. I. A. TWO-PLACE COMBAT MACHINE

This Italian biplane has remarkable air endurance. It made a nonstop flight from Turin to London and a 100-mile flight from Turin to Naples and return. It is equipped with a six-cylinder Fiat engine with an exhaust stack leading to the upper plane. Both planes have an equal span. Central braces from the fuselage to the upper plane are in the form of a letter W. The trailing edges of plane surfaces are straight and not formed of wire. A balanced rudder is used. It has a high forward compartment and flies in a tail high position so that the pilot-seat is unobstructed.

#### FARMAN F-40. SINGLE AILERONS ON UPPER PLANE ONLY

Pusher type of biplane with a Renault or Lorraine-Dietrich engine. Nacelle above the lower wing plane which has only about two-thirds the span of the upper panel. Empennage carried at end of outriggers, which terminate in vertical knife-edge.

#### ROLAND (GERMAN) TWO-SEATER WITH 175-HP. MERCEDES

Carries machine gun and bombs. Fuselage egg-shaped, very high and narrow. Windows provided in sides of fuselage for observation. Fuselage fills in entire space between wings. Only one interplane strut on either side of fuselage. Planes considerably staggered. Fin and rudder very high.



The DH4 (British)



S.I.A. (Italian) with 300-hp. Fiat engine

#### ENGLISH DH4 (REDESIGNED TO TAKE THE LIBERTY ENGINE)

This machine has a wing-spread of 42 ft. 7 in. Its length over all is 30 ft. 7 in. It is equipped with one Liberty twelve 420-hp. engine. Its weight, empty, is 2337 lb., and when completely loaded about 4100 lb.

### Bombing Machines

#### TWIN-ENGINED A. E. G. (GERMAN) BOMBING BIPLANE

Basically the A. E. G. bomber is similar to the Gotha biplane, the latter being somewhat larger however; also the former has its two propellers placed in front of the main



Reconnaissance Farman (British)

planes—the Gotha has pusher screws. The wings sweepback, are placed at a dihedral angle, appearing larger in the bottom than in the top plane. The span of both wings is the same, 57 ft., the overall length about 30 ft. The ailerons, peculiar in shape, are fitted to the top wing only and operated by a crank lever working in a slot. The tail wings, of monoplane type, have fixed stabilizing planes and a vertical fin-hinge to elevators and rudder respectively. Elevators and rudder have forward projections in order to partly balance them. The tail skid, which is under the stern of the fuselage, is sprung, not by rubber shock absorbers, but by coil springs. This is also the case with the landing-chassis.

The material used in the construction is mainly steel; the ribs and main planes are of wood. The main spars are of steel tubes. The fuselage is built up of steel tubes, also the longerons, struts and cross members. These are connected by welding; the joints are stiffened and an anchorage provided for the cross bracing wires by triangular pieces of sheet steel welded to longerons and struts.

There are three divisions for passengers. The cockpit in the extreme nose provides a seat for the bomber, who sights through openings in the floor. A rack is placed at the right for holding bombs. Under the center of body there is another bomb-holding rack and near the inner ends of the lower plane there is space for more. The center cockpit has two seats for two pilots or two pilot gunners. Behind the pilot's cockpit is the gunner's, who operates a machine gun mounted on a turntable. The engines are generally of 260-hp. Mercedes



*Breguet Bomber (French)*

type, and placed one on each side of the center section of the lower plane. The main gasoline tank is carried in the pilot's cockpit, and a service gasoline tank is fitted in each engine housing. The speed is not known, but is roughly estimated at about 90 m.p.h. The head resistance appears to be excessive.

#### BREGUET BOMBER OF TRACTOR TYPE

This machine is an example of excellent streamline construction and compactness, and its construction represents a marked advance in engine cooling. Attention is called to the louvers in the cowl, and also to the clean opening between the panel and the fuselage. It is being used for bombing and has a great carrying capacity for its size. Its war load is 1900 lb. It has a speed of 110 m.p.h. and will climb 12,000 ft. in 33 min.

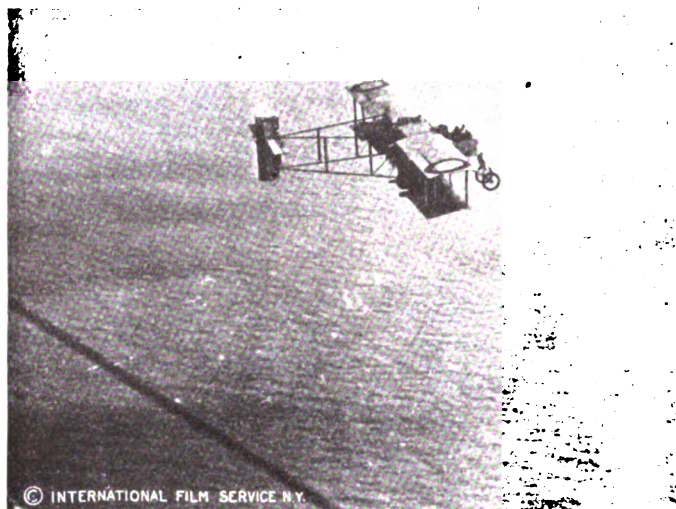
#### TYPES OF CAUDRON MACHINES

The Caudron G-4 has two rotary LaRhône engines carried in small nacelles between the planes. The pilot's nacelle is situated between the engine nacelles. The empennage is carried on four outriggers running back on a line with the engines, the lower outriggers acting as landing-skids. The four fins and four rudders are carried above the tail.

The Caudron G-6 has two rotary LaRhône engines and four

landing-wheels. The upper wing is large with a considerable overhang. The lower wing is much smaller and narrower. The trailing edge is flexible. There are twin powerplants in line with the centerline of the landing-chassis. The fuselage is fish-shaped and in the center of the machine. The two main struts are on either side of the engines; the outer forms part of the triangular truss with a slanting strut supporting the overhang of the wing.

In the Caudron R-4 the Hispano or Renault engines are used. The landing-gear is made up of five wheels, a set of

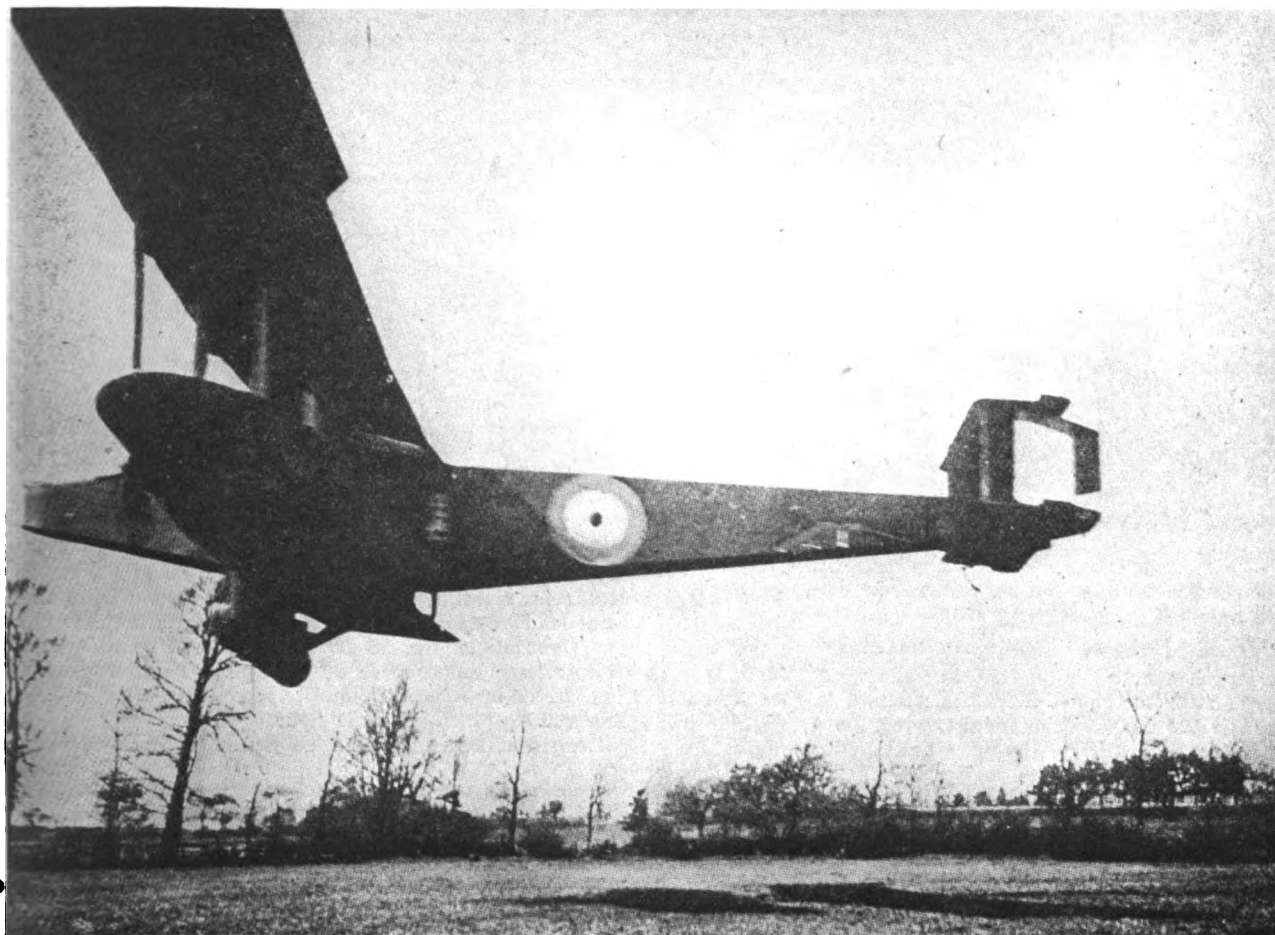
*The Voisin (French)*

two each under each engine and one small fifth wheel under the nose of the fuselage.

The Twin Caudron is a bombing machine, equipped with two 110-hp. LaRhône engines. The 1914 model was the first twin-engined machine ever built.

*Caudron Twin Tractor Biplane (French)*



*Handley-Page Bomber in flight (British)***VOISIN PUSHER TYPE OF BOMBING PLANE**

The Voisin of 50-ft. span carries a useful load of 1000 lb. The maximum speed of 80 m.p.h. and climbs 6000 ft. in 15 min. It is powered with a 150 to 200-hp. Renault engine, and has a cruising radius of 4 to 5 hr. The Voisin has no fuselage. It has a balanced rudder and a balanced elevator carried on four tubular outriggers, which terminate in a vertical knife-edge. There is no horizontal fin. The gunners sit very far forward.

Various engines are used: the Peugeot, the Renault and the Salmson. A small cannon and a machine gun are carried. Both pilot and gunner sit in front of the engine. The machine gun may be fired forward and backward over the upper plane.

**HANDLEY-PAGE BRITISH BOMBER**

This is a very large machine (in the same class as the Russian Sikorski, the Italian Caproni and the giant Curtiss boats. Wing spread, 97 ft.; length, 47 ft.; and height, 15 ft. Chord, 9 ft. 6 in.; gap, 9 ft.; no stagger and no sweepback, a small dihedral, and an angle of incidence of  $3\frac{1}{2}$  deg. It carries sufficient fuel so it can stay up from 10 to 12 hr. Its gross weight is about 13,000 lb. and it carries a useful load of a little over a ton. Its maximum speed is about 88 m.p.h. and it will climb 10,000 ft. in 30 min. Powered with two 450-hp. Rolls-Royce engines. All-wood fuselage with passenger compartments below and a gunners cockpit in the nose.

In spite of its size, the machine has been a great success, and it is to be expected that even larger machines of this character will be manufactured.

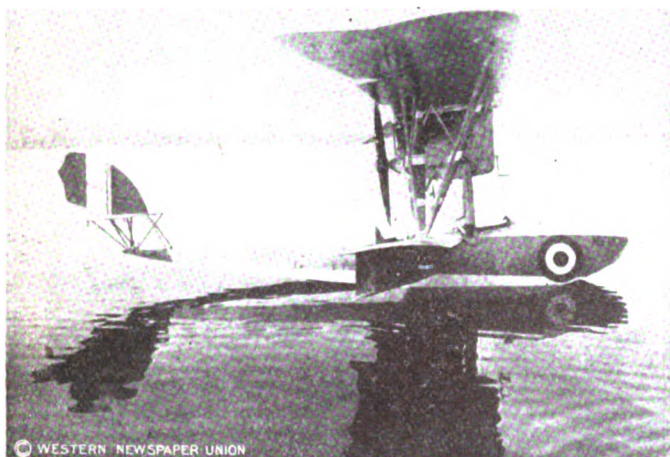
**CAPRONI TRIPLANE WITH THREE ENGINES**

It is equipped with three 200-hp. Fiats or Isotta-Fraschini engines, two located in the tractor position at the front of the fuselage and one pusher at the rear of the pilot's nacelle. It carries about a ton and a half. Next to the Curtiss triplane

boat it is the largest triplane that has ever been built and successfully flown. It has five sets of struts on either side of the engines. The planes have practically no stagger, no dihedral and no sweepback. The empennage is very wide but has a small chord, and the elevator is a single narrow tail-flap with three balanced rudders above it. The landing-gear is composed of four pairs of wheels, one set under each fuselage. The fuselages are very long and only about half as deep as the gap. They are located just under the middle wing panel.

An unusual form of skid prevents the machine from turning over when landing. The machine is used for bombing and has a very large cruising radius.

*Burgess U-2 Hydroaeroplane (American)*

*Macchi Flying Boat (Italian)*

### Flying Boats

#### BURGESS "U-2" NAVY SEAPLANE

The length over all is 30 ft. 5 in.; the width, 46 ft. 9 in.; height, 11 ft. 2 in.; chord, 6 ft. 3 in.; gap, 6 ft. Its supporting area is 574 sq. ft. The weight, when empty, is 1800 lb.; its live load 600 with a 100-hp. Curtiss OXX engine. Its low speed is 48.3 m.p.h., its high speed 75.2 m.p.h. It will climb 300 ft. per minute.

#### F. B. A. FLYING BOAT OF PUSHER TYPE

Equipped with a Gnome, Clerget or 130-hp. Hispano-Suiza engine. It has a span of about 46½ ft., a chord of 6 ft., and a gap of 5 ft. 9 in. It is 32½ ft. long. The engine is mounted well up between the planes on an inverted V frame. There are three sets of vertical struts on either side with a set of inclined ones at the ends.

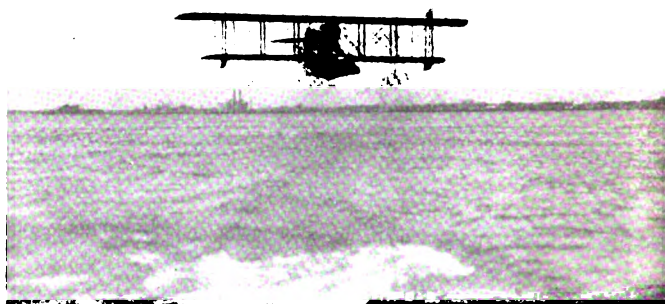
The after part of the boat comes to a rather sharp point. The fins and rudder are mounted at some distance above the hull. The front of the hull is whale-shaped with room for pilot and passenger side by side in a forward cockpit.

#### MACCHI FLYING BOAT (ITALIAN)

This boat has a very peculiar tail, Nieuport V-type of strut, is a pusher type and is very fast. Single-seater, fine construction, light weight, high-powered motor, quick climber. Head resistance slight. Struts and interplane bracing similar to Nieuport. Isotta-Fraschini engine. Over all dimensions: span, 39 ft. 4 7/16 in.; length, 27 ft. 3 in.; height, 9 ft. 10 1/16 in.

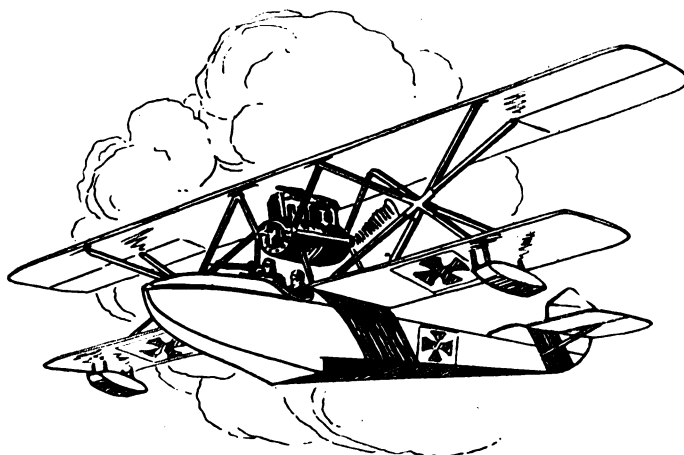
#### ARMSTRONG-WHITWORTH (90-Hp. R. A. F. ENGINE)

Two-seater, tractor stick-controlled biplane school machine. Aspect ratio, 7. Dihedral at the top, 3½ deg.; at the bottom, 2½ deg. Stagger, 1 ft. 11.6 in., a chord of 5 ft. 8.3 in., gap 5 ft. 10.9 in., and angle of incidence 2½ deg. It is equipped

*Löhner Flying Boat (Austrian)**A Curtiss Flying Boat (American)*

with R. A. F. 90-hp. air-cooled engine, which at 1700 r.p.m. drives a four-bladed propeller of 9-ft. diameter, 10-ft. pitch. It carries a military load of 80 lb., a human load of 360 lb., total load of 440 lb. The weight hp. ratio is 22.8. Span, 40 ft. Over all length, 28 ft. 9 in. It will climb 10,000 ft. in 49 min., and has a speed of 72 m.p.h. Total weight, 2050 lb. The air endurance is 3 hours. It consumes 9.3 gal. of gasoline and 3.3 pints of oil per hour.

Length of run to unstick, 85 yards. Length of run to pull

*Ago (an Austrian flying boat)*

up (engine stopped), 120 yards. Single stick control. It will climb 12,300 ft. in 78 min.; rate of climb 75 ft. per minute.

#### AGO AUSTRIAN FLYING BOAT

This is a two seater sea-going fighter. There are no wires employed in the structure of the wing cell, which is composed of two cross-networks consisting of a front spar and a rear spar and of adjacent struts in inclined planes connecting the spars. The struts are of steel tubing with a fairing of laminated wood with good streamline effect.

The span of the upper plane is 8 m., the lower 7.38 m., and the chord for both planes is 1.50 meters. The length over all is 7.62 m. It is powered with a 218-hp. engine.

The carefully stream-lined shape of the hull and complete covering of cables and control wires are designed to decrease head resistance as much as possible.

#### AUSTRIAN LÖHNER FLYING BOAT

In this six steel struts are placed on either side, and, two by two, are connected in transverse planes with steel tubes. The upper plane span is 9.70 m., the lower span 7.20 m., the chord of the upper plane 2.70 m., that of the lower 2.20 m. The length of the hull is 12.50 m. The capacity for carrying bombs is 400 kg.

It is equipped with a 300-hp. Austro-Daimler twelve-cylinder V engine.

# Tubing in Airplane Construction\*

## Manipulation of Tubes and Design of Tubular Structures for Aircraft

By A. G. Hackett

THE possibilities of tube manipulation, such as butting, tapering, drawing with taper gage, expanding, flanging, bending, lapping, etc., are becoming better understood. Some designers, however, while recognizing the usefulness of these different operations, still ask for what is not commercially possible, because they fail to make allowances for the alteration in the thickness of the tube which will occur as the result of such operations. For instance, if the diameter of a tube is increased the thickness of the wall is reduced, and if decreased in diameter the thickness is increased. Again, if a tube is flanged, the flange will not be of uniform gage, but will decrease in thickness as it increases in diameter.

A section of a bent tube cut from an F.2.B. undercarriage "V" strut shows that the gage of the tube has, by bending, been reduced on the outside of the curve from 0.061 in. to 0.048 in., and increased on the inside from 0.061 in. to 0.072 in. The thinning of the tube would cause it to break if it had not been properly annealed; and, further, if proper mandrils had not been used, or the tubes had not been filled with suitable material, a series of "puckers" or "corrugations" would have been formed on the inside of the bend. Where proper thickening up of the wall along the inner curve takes place in bending the bent portion of the tube is the strongest, but if "puckering" takes place this point becomes the weakest.

Bending is sometimes carried out with steel tubes in the hot state, but where strength is required this is bad practice, as by heating the tube is rendered much weaker than it would be if bent in the cold state. Of two "V" struts, one bent in the hot and the other in the cold state, and the same weight being applied in each case, it will be seen that the tube bent while hot has been distorted much more than the other.

### Tubular Joints

Generally speaking, structural work for aircraft purposes is to-day carried out by means of sockets placed in suitable positions and arranged to receive the ends of the various tubular cross-members and bracings. These tubes and sockets are connected in three or four ways, namely:

By brazing.

By silver-soldering.

By soft-soldering.

Sometimes the sockets or lugs are dispensed with, in which case the cross-tubes are mitered and welded direct to the main tube.

The latter method is not advisable except in very rare instances, as any operation involving great heat is dangerous, owing to the weakening which results from the annealing or perhaps burning of the steel.

Another method is sometimes employed in which the cross-bracings are connected by means of a hinge joint to a sleeve on the main tube (i.e., a trapped end tube with a nut and bolt).

Of types of lugs used in aircraft structural work, perhaps the most common is the lug made up by one long sleeve, with two branches mitered and welded on. Into and through these the main and branch members are fitted, and are held there, preferably, by soft-soldering and pegging. Another form of lug is made in two halves, pressed to shape, trimmed to depth, and welded along the joints. A wiring plate may be included. A three-way lug, with double wiring plate is common.

It will be useful to give the results of some comparative tests made on these various methods of jointing tubular structures, but before doing so we would remark that, in a paper like this, only the fringe of the subject can be touched. Everyone who is in any way connected with the practical side of aeronautical construction will readily call to mind many other types of joints, each designed for a special purpose or to overcome a constructional difficulty.

### Soldering, Brazing, or Welding

Speaking from an experience of at least eight years in which we have been in touch with aircraft construction and design, we have met with a surprising amount of fluctuation in the respective popularity of soldering, brazing, welding, etc., for steel tube work, all these methods having been ruled out in turn, only again to find favor in certain quarters. This is partly due to the fact that machines designed by private manufacturers have been brought into great popularity, and the methods and designs of such makers adopted.

We have seen welding carried almost to excess and then almost abolished. Brazing has been boomed and then decried, and soft-soldering substituted for it—with a different type of lug or joint to allow for the reduced strength of the jointing material.

This, again, has been deemed unsafe, and silver-soldering, or hard-soldering, has risen into prominence, and to-day one hardly knows which type really is the popular one, as on the machines now being built for war purposes all styles and types of jointing may be found.

One has to realize that in all these methods the human element comes much into play. For instance, it is possible so to weld a joint that it appears to be sound, yet it may be a "fake"—metal being merely laid on and not fused with the surrounding parts. Or, again, the welded joint may be burnt, thus causing a dangerous weakening.

Similarly with brazing, it is possible with care to make a fine type of joint, but the probability is that in a certain percentage of cases overheating will take place and failure result.

We will now deal with the results of a few experiments recently carried out on certain of these types of joints.

### Soft-Soldered Joints

Let us take soft-soldering first. In all cases the tests were made with a soft-solder composed of 60 per cent tin and 40 per cent lead—using "Fluxite" or some similar article as a flux.

Tubes of various gages were tried, but up to a certain point the strength of the soldered joint was such that the tube failed in tension without the joint giving way.

It was found that the strength of a soldered joint is much greater than it is generally supposed to be, and from experiments carried out, the clearance or thickness of the soldering material does not, between the limits of 0.001 in. and 0.008 in., make much difference, but for any components that can be guaranteed to size we would recommend as "thin" a joint as possible.

A striking example of a strong joint of the soft-solder type was given, an elevator "bloater" and its tube being selected for the purpose. The test on this joint was carried out in order to prove to the satisfaction of inspectors that the stipulated minimum clearance of 0.005 in. on the diameter was not necessary. In this particular case the elevator lever (or

\*From a paper read before the Aeronautical Society of Great Britain.



"bloater") was held stationary while a torsional load was exerted on the tube. The result showed that the tube twisted and buckled without affecting the soldered joint.

One of the chief arguments against the use of soft-solder is the reduction in strength resulting from vibration, it being claimed that this form of joint will not sustain a vibratory load nor a series of shocks. This may sometimes be right, but even under these conditions a very satisfactory result can be obtained if the sweating is done thoroughly and well, and added strength is given if the joint be "pegged."

#### Tests on Soldered Joints

The writer recently carried out some experiments on what may be termed a "tup-testing machine" for soldered and brazed joints. It will be noted that the rising and falling tup or hammer is actuated by a bell crank lever, worked by a "sudden-drop" cam rotating in the direction of the arrow. The dead load on the tup shaft can be varied by means of the sliding weight. This consisted in fitting a tube into a lug or socket and then tapping—or "tupping"—it on the end to try and drive it further into the socket. A standard drop of 4 in. was arranged.

It was at first thought that the effect of the "tup" action would be to quickly rupture the joint, but to our great surprise the joint held to such an extent that we found it necessary during the test to increase the load from 10 lb. to 24 lb. The following are the details of the test:

Size of tube: 1 in. outside diameter by 18-gage.

Depth in socket (or lap):  $\frac{1}{2}$  in.

Thickness of solder: 0.005 in.

Number of blows: 113,500 with 10 lb. weight up.

Further number of blows: 64,000 with 24 lb. weight up.

At this stage the joint showed signs of giving way, so it was decided to apply a tensile test to see if the repeated blows had in any way deteriorated the solder. To our surprise the tube did not pull out until a load of 5.2 tons had been registered, giving the excellent result of 3.31 tons per super inch on the solder lining.

It may be urged that these results are not a fair basis on which to reckon, as they do not represent the ordinary work of the average operative. In answer, we would say that these results were all obtained from test pieces sweated by different operatives, in some cases being the work of girls with about two months' experience.

It may be possible to work out a formula to arrive at a basis for designers of soft-soldered joints, but even here, as in all calculations relating to structures, other factors have to be taken into account. For instance, a joint may be quite strong enough if in a 1 in. by 20-gage tubular joint the solder reaches to a distance of  $\frac{1}{2}$  in., and working on this basis it follows that the same distance for a 2 in. diameter tube of the same gage would be correct, but no one would be satisfied with this, and would naturally double the length of socket to meet the increased diameter.

Generally speaking, it may be taken for granted that with ordinary care, and with a good quality of soft-solder, a joint can always be made to withstand a shearing stress of  $2\frac{1}{2}$  tons per super inch on the solder itself—provided (and this is the crux of the whole matter) that the articles are well tinned and cleaned prior to the operation of sweating.

#### Choice of Sweating Apparatus

As regards the apparatus for sweating, different people will have a different choice, but having tried soldering irons, blow-lamp, coal-gas jets, and hydrogen flame, we have found that the three latter are about equal, and each is better than a soldering iron alone, but this latter is necessary for finishing in awkward corners.

Eventually the use of a simple electrical device will probably become popular for repetition work.

As previously mentioned, this means of connection still has many adherents. There is, however, a great disadvantage attached to it, viz., the risk of burning the tube owing to the intense heat necessary. That this burning and consequent weakening does take place can be easily shown by the results of tests carried out by us on a cantilever testing machine.

The tests were upon tubes which had been fixed into sockets and brazed or soft-soldered, and showed the decided dis-

advantage of the brazed joint from the standpoint of strength.

A further series of tests was carried out on the alternating stress machine, and these results were similar.

Another point may be mentioned with regard to these tests. In one test the result was poor in comparison with the others. This joint was "faked," the tube and socket being left dirty and improperly tinned, in consequence of which the soldered joint had no "life." Even under these conditions the joint held for 75,130 revolutions, as against about 4000 for the brazed joint. At this point the socket failed, due to the insecure fixing of the tube.

Another peculiar feature of this test was the heat generated in the brazed tubes due to the constant working of the molecules. The tubes commenced to warm up almost immediately, and, before they broke, the temperature of the tubes near to the points of fracture (i.e., near the socket) was about 120 deg. C., sufficient to cause the charring of any adjacent wood, whereas the soldered tubes remained quite cool until the last few minutes prior to fracture.

We are quite aware that in many places on aircraft structures brazing is permissible and good, but where any weakening of a member is likely to cause disaster, brazing should be carefully avoided.

#### Silver Soldering or Hard Soldering

The foregoing remarks as to brazing hardly apply to silver-soldering, as by this method a strong joint can be obtained without undue heat. We are not in a position at the moment to give any comparative figures of tests, but we should say that from the standpoint of tensile strength, silver-soldering is higher than soft-soldering, and very near to that of brazing. The heat necessary to perform the operation is lower than for brazing, and it is not likely to weaken any members if reasonable care is used. It is, however, a longer process, and the material used is very costly.

We may well ask ourselves, in these days, where we should be without some form of autogenous welding. The thousand and one articles that are built up of sheet metal welded together speak for themselves, and make us wonder how we ever got on without this useful engineering process.

Still, welding has its limits of usefulness, and if these are exceeded danger may be near.

In the early days of aeronautical engineering welding was often used in places and on parts where to-day it is "taboo," and such a method as welding tube to tube has dropped to a great extent out of favor, having been superseded by the more costly but better and safer engineering practice of jointing by means of machined or built-up tubular sockets.

Welding—by whatever means it is done—is always open to a certain amount of doubt, and though there are innumerable cases where this doubt as to the strength of a point is well covered, yet, owing to the hidden nature of the defects of welding and the possibility of burning and oxidization, present-day designers avoid it in any important member of an aircraft structure.

A most important rule introduced during recent years has been the suitable annealing of welded joints, and this rule should be adhered to whenever possible. Many will have noticed the brittleness of a welded joint before annealing or normalizing and the malleability of the same afterward.

On this point the writer discovered within the last few months a rather strange fact. We had occasion recently to make up some small lugs in which it was found that a certain amount of shortening took place as the result of the welding on of the arm. We have since noticed this shortening in other tubes, some of quite considerable length, where various fittings have been welded on at intervals, and so far we have not arrived at a satisfactory explanation.

#### Notes on Welding

The easiest method of welding is the butt joint, i.e., when two tubes are placed end to end and joined together to form one length or mitered together to form one piece. In such a case the surfaces to be welded are readily accessible, and the flame has freedom for doing its work.

A more difficult type of welding is that necessary when one tube has to be mitered to the outside of another tube, as

when forming a "T" lug. In this case the easily-melted end of the one tube has to be united to the outside surface of the other, and anyone who has had experience with welding will know how much more difficult it is to attack the hard outside skin of a tube or sheet than it is the edge.

In order to prove this point we carried out tests on tubes measuring 1 in. outside diameter by 20 gage, and 1 in. outside diameter by 16 gage—some being butt welded and others having an interposed tube of about the same diameter, to which the end of each tube was welded.

Comparative tests were made on a cantilever tube joined to the main member by welding, and a similar type of leading was also tested for a lug, with the tube fixed in place by welding.

The following were the results: Welded direct to tube, 335 lb.; welded into socket, 365 lb.

Welding is often harshly criticized as regards its ability to withstand vibration, but even in this respect we have found striking instances where the tube has broken before the joint.

Some time ago we tried an intermittent shock and vibratory test on a machine which gave a series of vibrations to the tube, the blows due to the "peg-cam" being 1400 per minute. In some cases the tube broke off without the welded joint suffering in any appreciable manner.

As regards welding of any description to be done on tubing, we do not advocate the use of tubing made from steel too high in carbon. A low carbon steel gives the better result, and it is also most essential that the phosphorus content of both tube and welding wire shall be low.

Wherever possible, we would suggest that the welding on of hinges and sockets to a main spar or post be avoided. To slot a tube, or soften it by welding, is unwise, and in place of any fixtures that at present demand such operations we recommend a sweated and pegged fitting.

In support of this some experiments were carried out by

our company in order to convince some of our friends of the advisability of following the course we have suggested. In one case a wiring lug was fixed on a main spar by welding, and in the other by sweating and pegging. Alternating tests on these tubes gave the following results: Welded, 5190 revs.; soldered, 8800 revs.

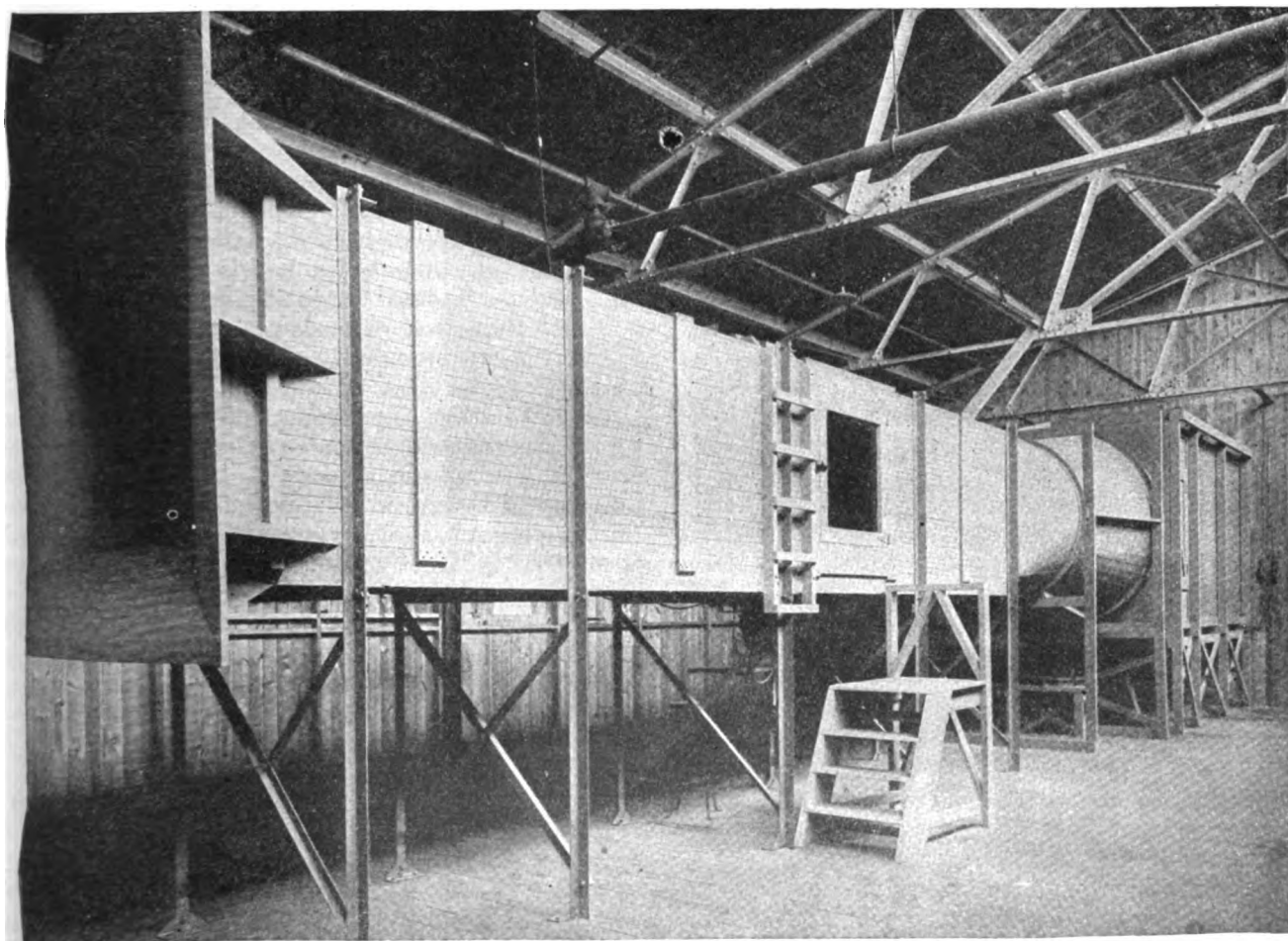
#### Rust Prevention

One further point remains to be mentioned. It is well known that a long life for any modern aeroplane is not expected. The present necessary wastage in aircraft is such that the question of internal rust and corrosion of the steel work is not of serious moment. The time is coming, however, when such matters will have to be seriously considered. For any post-war machines—especially if designed for general passenger traffic—the question of the length of life of all parts will be one of primary importance.

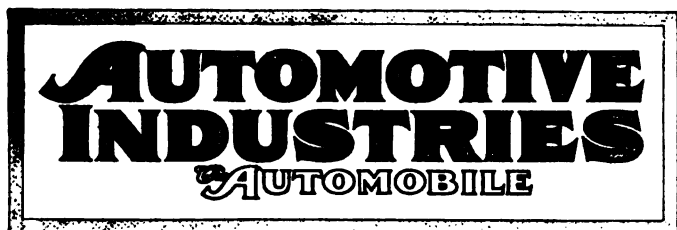
We have experimented with two or three methods of preserving from rust and corrosion, with fairly satisfactory results, and in the case of airship framework, subject as it is to salt water influence, we have used with fair success the "Cosletizing" process.

For soldered work, such as rudder and fin frames, we have instituted at our works a thorough system of washing and brushing in hot soda water to remove all traces of the "fluxite" or the flux, and we think this is most essential.

In conclusion, we would say that "the last word" in tubes and tubular structures has not by any means yet been spoken. With the increase in the size of machines, the constant and ever-increasing shortage of seasoned timber, the extended use of machines in future years in hot climates, with all the climatic effects on timber, the "all-steel" machine will undoubtedly soon become a reality and a necessity, and consequently the subject of tubes and tubular construction assumes increasing importance.



*A wind tunnel serves to determine the air resistance of different shapes of wings, struts, bodies, etc., the experiments being usually carried out by means of scale models*



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## The Vestibule School and Shop Training

**T**HERE are apparently two or more sides to the training question just as there are, or have been, to all other questions which have come up so far in the history of the world. Some manufacturers find that the vestibule school, or its equivalent, serves best for them as a means of developing the skilled operatives whom they must add from time to time to their working forces and others find, or believe they find, that the best, or at least satisfactory, results are obtained through training new employees in the shop under the direction of production foremen.

The users of each system of training advance an array of arguments which, standing alone, would convince any casual observer and when set against the arguments for the other system would apparently leave little or nothing to choose between them.

There is one point—it is a more or less general observation, perhaps, but it seems to bear on fundamentals—which apparently indicates that the vestibule school or the training department is based on sound logic. In such a school the chief business of the one charged with the instruction is to teach, and the chief business of the one sent there for instruction is to learn.

In the production department, on the other hand, the chief business of the one who does the instructing is to insure and secure output and the instruction of the beginner is a secondary or minor consideration. The desire of the latter to learn is in a measure counteracted by the inability of the former to teach, either through lack of natural aptitude, which is often the case, or through lack of time, which amounts to the same thing in the end, so far as results are concerned. In the separate school, however, the two principal factors—the desire to learn and the ability to teach—supplement each other, and this fact would lead to the anticipation of desirable results which could not otherwise be obtained.

It would, therefore, seem logical to expect when other things are equal—and they usually are—that the training of the vestibule school will be more thorough and more quickly accomplished than that done by the shop method.

## The Production Value of an Employee

**A** MANUFACTURER, in calculating the production value of a machine, considers what it will produce in quantity and quality per hour, per day and during a period of some considerable length. Many a machine has been discarded or has not been adopted even though its hourly output rate was high because its total output during a lengthy period was less than that of a slower machine which had the very desirable quality of regularity—of keeping everlastingly at it.

In calculating the production value of an employee the manufacturer is too prone to figure only on his output per hour or day. He is likely to overlook the fact—and in this day of labor scarcity and the high cost of labor turnover it is a most important fact—that it is not so much what an employee produces in one hour, in one day or even in one week, that counts, as what that employee produces during his working lifetime. And it is greatly to the advantage of the employer to see that the working lifetime of an efficient employee is as long as it possibly can be.

### Human Efficiency and Working Life

It is the employer's duty to himself, to the employee and to all of us who make up the population of this now sorely tried world, to use all available means and methods of making the employee's working life not only as long as possible, but as efficient as it is long.

They have learned much in Great Britain, since



the war began, about the output capacity of male or female workers—about human efficiency and how to obtain and maintain it. They had to learn it or lose the war. In spite of increased hours of labor production fell off. They thought it was *in spite*, but they found it was *because*. They discovered that within certain limits, which were considerably below what had formerly been considered the possible low limits for maximum production, the lessening of the hours of labor per week actually resulted in an increased output. They learned some surprising things along this line.

They learned that the working lifetime of an employee is a production unit that must be used in figuring total output. They learned that this lifetime can be varied in length and in total average efficiency by the conditions under which the worker works and lives.

They learned that the worker's health is something that has a decided commercial value, that without healthful conditions in the shop and in the worker's home both the worker's and the employer's best interests suffer. They learned, as it was expressed in a summarized report of the British Health of Munition Workers' Committee, that "without health there is no energy, without energy there is no output," and we might add, without output there are no profits for the manufacturer.

Welfare work well done pays real dividends, and pays larger ones now than ever before.

## A Scientific Headlight Law

IN New York State there now is a definite method, a prescribed legal procedure, for determining what is, or rather what is not, a glaring headlight. There is no guesswork about it; no opportunity for the local policeman or Justice of the Peace to exercise his own peculiar judgment as to what objectionable glare is, for glare is or isn't, legally, according to a fixed standard which has recently been announced by the Secretary of State under authority conferred upon him by an amendment to the State Highway law. It is possible to tell exactly in any given case by means of scientific measuring instruments whether or not the law is complied with.

For the first time in the history of headlight legislation, nothing is left to individual opinion, and this means that for the first time also car manufacturers, lens makers, dealers and car owners know, so far as one state at least is concerned, just what requirements they must meet and how they can positively meet them. A careful study of the New York law and the adopting of its provisions by other states should be strongly advocated by all with even the smallest interest in the matter.

Besides being entitled to congratulations upon being the first to standardize headlight requirements scientifically, New York may also be congratulated upon the manner in which the requirements adopted were worked out. They are not the result of the usual legislative methods of procedure, but of the research work and investigation of competent engi-

neers. The Secretary of State, acting under the provisions of the amendment to the highway law, called to his assistance representatives of the Society of Automotive Engineers and of the Illuminating Engineering Society, who conducted a number of elaborate tests, as recorded in AUTOMOTIVE INDUSTRIES at the time, and finally put their recommendations into the form of specifications for standard headlight tests, which were adopted as official.

The progress toward scientific legislation and law enforcement indicated in this case is worthy of more than passing notice. When the law makers and administrators seek the help of those who know of what they speak, another ray of optimism is projected into the future.

## School Teachers as Shop Workers

REPORTS received from a number of manufacturing plants indicate that a fairly large number of women school teachers prompted by patriotic motives or the desire to earn an extra bit of money during their otherwise idle months are seeking employment in industrial establishments as operatives to replace men who have gone into government service.

The kind of woman school teacher who would seek employment of this kind is very likely to prove to be a most excellent operative after a comparatively short training period. Certainly she would bring to the job a degree of intelligence above the average of those who usually fill it. While she works she should be able to produce at as high a rate as conditions would permit and by example, at least, should have a good effect on the others with whom she works.

She will work hard, as well as intelligently, while the job is new, at any rate, and while she works she will undoubtedly be an admirable employee. But she is a transient. She will go back to her old work as soon as the schools open in the fall. She must be replaced and therefore cannot be counted on as a regular contributor to industrial production. About as soon as the employer finds that she is an exceptional employee she will leave him unless he can persuade her that an industrial life will pay better than a life of teaching, and in some cases it might be not only possible but desirable to do so.

And here's a thought. With the possibility pretty definitely established as a probability that our industries will hereafter employ a much larger proportion of women than they did in the pre-war days, there are opportunities for advancement to positions of considerable responsibility, and proportionate reward, opened to women of the right caliber, to women who have executive ability added to the pluck and determination which prompted them to take up even, as they thought, temporarily, a radically new line. It seems highly probable that such timber may be found among the school teachers who are filling in their spare time by working as operatives in industrial plants. Consider them carefully, Mr. Manufacturer, with this in mind.

# □ Latest News of the

## Airplane Production Satisfactory

### Senate Committee Finds Excellent Progress Being Made in West

DETROIT, July 10—Airplane production in the middle Western territory is proceeding satisfactorily. The Senate investigating committee, after leaving the middle West, was greatly pleased at the progress which is being made in the factories in Dayton, Detroit and other centers in this vicinity.

This feeling on the part of the Senate investigating committee is reflected largely by manufacturers who now feel that they have set their pace and that they can see daylight in the way of production in Liberty engines and planes.

The Packard Motor Car Co. still leads in the production of Liberty engines. This concern just fell short of 800 engines during June by a very small margin. Eight hundred was the goal which was set for this month.

The production at the Lincoln Motor Co. is second, with an average of very close to 17 per day. The ultimate capacity of the Lincoln Motor Co. with its newly designed equipment will be about 70 Liberty engines per day, and it is expected that this will be reached during the coming winter.

The Ford Motor Co. has fallen far short of the rather hasty prediction given by Henry Ford during the spring. At that time he stated in his interview given out in Washington that about July 1 the Ford Motor Co. would be producing 100 per day. This was realized to be impossible by those who had had experience in airplane engine production, and the fact that Ford is in production at all is regarded by them as a big accomplishment in spite of the fact that the production falls far short of the mark set by Henry Ford at that time.

The Ford plant, according to best estimates, is turning out 2000 Liberty engine cylinders per day, and is nearing a production of complete engines of 10 per day. This is, furthermore, a remarkable accomplishment in view of the fact that the production heads of the Ford Motor Co. have been largely concerned with rapid production of the Eagle boats, or submarine chasers; one of these was ready to launch on July 4, and they will soon be coming through in a constant string, and eventually at the rate of one per day.

The Marmon company is not yet in production on Liberty engines, but shortly will be. The tooling-up progress is being pushed rapidly, and parts of the engine are ready to be in production. The complete

engines, however, are not coming out of the factory as yet, although it is a matter of but a few weeks before the Nordyke & Marmon Co. will be added to the list of Liberty engine producers.

The Cadillac Motor Car Co. is now in production on complete engines. This concern which was one of the first to conquer the difficult connecting-rod manufacturing problem on the Liberty engine, is now turning out, in connection with Buick, complete sets of parts and assembling them. The rate of production is not stable enough to set a fixed average per day, but soon will be, and probably in a few weeks a production of five per day will be reached. This will be increased rapidly as time goes on, so that this concern will be a fairly large producer of Liberty engines late in the fall or early in the winter.

The Trego Motors Co. is turning out a complete Liberty engine every day or two.

There have been reports that the Navy has taken a large percentage of Liberty engines. This is true, the percentage being estimated at from 40 to 60 of the total. With the rapid production of the De Havilland bombing plane demanding Liberty engines for equipment, the engine production will have to be speeded up to take care of both the navy and army demands. The Navy type has proved exceptionally satisfactory, and it has not been confronted with the problems of carburetion at high altitudes which has been one of the difficult kinks to solve in the Army plane.

The Liberty engine carburetor system on the Army types will have to be modified slightly for the extreme altitude. Advices have come from the staff of the American Expeditionary Forces to the effect that the carburetion system, particularly as concerns the gasoline feed, will have to be altered to eliminate fire danger due to spitting back while cold.

It has been practically decided to abandon all pressure feed of gasoline on the West front, due to the fact that a bullet through the gasoline tank renders the gasoline feed system inoperative and for this reason gravity feed will have to be substituted, or some other method which is not susceptible to destruction by punctures.

The Fisher Body Co. is pushing along rapidly with its plant and the 10 acres originally designed for have just about been completed. In addition, there will be more buildings added to take care of the enlarged battle plane production program.

The new plane which has been designated at the Packard plant under the auspices of the French Commission has been flown and has been declared a success. Captain Flachaire of the French Flying Corps, who has been in this country on propaganda work, giving exhibition flights with his Spad in different cities throughout the country, was one of those to fly the new type of machine and expresses himself as highly satisfied with it. In fact, Captain Flachaire was able to successfully execute a tail spin quite close to the ground with the machine, after having been up only a short time. This is a two-seated battleplane particularly adapted to the Liberty engine and is a modification of the design which has proven highly successful with the Bugatti engine.

## Passenger Car Tax May Be 10%

### Treasury Department Submits Tax Proposals—Gasoline Impost Not Likely

WASHINGTON, July 10—It is probable that a 10 per cent retail sales tax on passenger cars will result from the tax recommendations made yesterday by the Treasury Department to the Ways and Means Committee.

It is unlikely that the proposal to tax gasoline will be taken seriously.

The car taxes suggested include both retail sales tax to "label the taxed article as a luxury and serve notice that the Government's ban is honest," and certain manufacturers or producers taxes, as follows:

Retail sales tax:  
Twenty per cent on passenger cars.  
Twenty per cent on trailers.  
Twenty per cent on truck units.  
Twenty per cent on motorcycles.  
Twenty per cent on tires for automobiles, motorcycles and bicycles.

A license tax on passenger cars based on horsepower as follows:

Producers or manufacturers tax:  
Twenty-three h.p. or less.....\$15  
Twenty-four to thirty h.p..... 25  
Thirty-one to forty h.p..... 40  
Over forty h.p..... 50  
To be paid by wholesale dealers:  
Ten cents per gallon on gasoline.  
To be paid by consumers:  
Twenty-five per cent of the wages paid to domestic chauffeurs.

The Ways and Means Committee was both startled and amused by the suggestions. While no definite conclusions were reached following a day spent in going over each item mentioned, it was plain that the majority of the members are in favor of a high increase in the tax on passenger cars, probably to 10 per cent.

At the same time the majority are against a tax on gasoline for the reason that numerous inequalities would result. It was pointed out that motor trucks performing valuable services in relieving transportation and passenger cars engaged in utilitarian work would be unjustly taxed. If a scheme could be devised so that gasoline used for pleasure purposes could be taxed separately, it would find favor but since this plan is practically impossible, it is felt unwise to place a wholesale tax on it.

The Committee returned the list to the Treasury Department with a request for an estimate of the taxes it would yield. It is believed that in view of the greatly decreased consumption that would accompany such exorbitant taxes that the Treasury Department will find it difficult to furnish an accurate estimate of the revenue that would result.

# Automotive Industries □

## Reclassify Freight; Rates Changed

### Would Increase Passenger Cars 10% and Reduce Trucks— Permit Mixed Loads

NEW YORK, July 10—Under the Consolidated Classification, which is now in print and ready for filing before the Interstate Commerce Commission, freight rates for passenger cars will be increased 10 per cent on Western railroads, and rates on trucks will be considerably reduced.

Heretofore passenger cars and trucks have been placed in the same classification by railroads and have paid the same rates. Under the Consolidated Classification these are separated, and whereas trucks heretofore have been rated double first-class rates in l.c.l. lots and first-class rates with a minimum of 10,000 lbs. in c.l. lots, under the Consolidated Classification rates charged will be 1½ times first-class rates l.c.l. and for c.l. second-class, with a minimum of 12,000 lbs. for a 36-ft. car.

If the Consolidated Classification becomes effective, rates on passenger cars will be the same as those at present prescribed in the Official Classification on l.c.l. shipments. This is 2½ times first-class at actual weight, with a minimum charge on 5000 lbs. each at first-class rate; double first-class rate when crated and 1½ times first-class rate when boxed. Rates for c.l. shipments are increased to 110 per cent of first-class with a minimum of 10,000 lbs. This represents an increase of about 10 per cent.

A further change proposed by the Consolidated Classification would permit the mixing of various articles at carload rate. When this is done the carload will be rated at the highest rate of any commodity in it, with the carload minimum rate the highest provided for any article in the carload.

Hearings on the new classifications are to be held in Boston, Aug. 1; New York, Aug. 8; Chicago, Aug. 12, and in Omaha, Portland, San Francisco, Denver and Fort Worth at subsequent dates and at Atlanta on Sept. 19.

### Tracy To Conduct Official Fuel Consumption Tests

NEW YORK, July 10—Joseph Tracy, consulting engineer, has been appointed consulting engineer of the Bureau of Oil Conservation, United States Fuel Administration by W. Champlin Robinson, who is Director of Oil Conservation. Mr.

Tracy will conduct sanctioned tests of automobiles, motor trucks, and other apparatus for the purpose of securing greater fuel economy. These tests will be sanctioned by the Bureau of Oil Conservation. This practical testing work is being concentrated under the complete direction of Mr. Tracy. The definite plans as to the exact nature of road tests have not been decided upon.

### Ford Will Reduce Production

DETROIT, July 9—Nothing has been definitely decided upon but indications point to a sharp cut in the production of passenger cars and trucks of the Ford Motor Co. It is expected that the output of the factory will be brought down to 375 passenger cars and 450 trucks a day by Aug. 1. This is necessary because of the immense amount of government work handled at the Ford factory. It is reported that the government has suggested this action. The company is now turning out only 1000 cars daily as compared with 1600 less than 30 days ago. This last figure represents only 50 per cent of its greatest normal production.

### Government Control of Sulphur

WASHINGTON, July 10—The War Industries Board has taken over control of production and distribution of sulphur materials and W. G. Woolfolk has been made chief of the section in charge of sulphur and pyrites. Sulphuric acid is used to a certain extent in the automotive industries for pickling baths but it is not anticipated that there will be any difficulty in obtaining this material. Sulphur is an indispensable article in the vulcanization of rubber, about one-fifth of the weight of crude rubber being required. It is understood that the rubber industry, which is looked upon as an essential industry by the War Industries Board, will be protected in its requirements.

### Restriet Graphite Crucible Imports

WASHINGTON, July 11—The importation of graphite crucible has been restricted by the War Trade Board after July 15. The action was taken when it was shown that there were adequate supplies in the country.

### Marmon and Hall Going to France

DETROIT, July 11—Major Howard Marmon, Colonel Hall and Charles H. Willard, chief engineer of the Aero-marine Plane & Motor Co., will form a Government commission to obtain the latest military information on aircraft. They will leave shortly for France and England.

## No War Revenue Tax on Exports

### Treasury Department Rules Cars Shipped Abroad Can- not Be Taxed 3 Per Cent

NEW YORK, July 10—The Commissioner of Internal Revenue of the Treasury Department has ruled that manufacturers of automobiles can export cars without paying the 3 per cent War Revenue Tax which heretofore has been payable, and has virtually ruled that it is unconstitutional to tax any article which is exported from the United States.

The ruling is based on an opinion of the Attorney-General of the United States, which holds that the 3 per cent War Revenue Tax does not apply to articles sold in foreign commerce by any one of the four following methods:

- 1—Articles shipped by a manufacturer to an agent in a foreign country and sold there by the agent;
- 2—Articles shipped by a manufacturer to a foreign purchaser to fill orders received by an agent in a foreign country;
- 3—Articles shipped by a manufacturer to a foreign purchaser to fill orders received by the manufacturer in the United States;
- 4—Articles shipped by a manufacturer to a foreign purchaser to fill orders solicited by mail and received by mail from a foreign purchaser.

### Applies to Shipments to Foreign Lands

This ruling applies only to articles shipped from any state in the United States to a foreign country. The taxes apply, however, to articles sold in foreign countries by a manufacturer located in a territory or elsewhere in the United States other than in a state, and also to articles sold in commerce between the United States and any of its island or other possessions except the West Indian Islands acquired from Denmark.

In explanation of the decision, which is supplemental to Regulations No. 44 approved May 31, 1918, it is pointed out that whereas Section 600 of the Act of Oct. 3, 1917, imposes a War Revenue Tax of 3 per cent on motor cars and other articles, Section 9 of Article 1 of the Constitution of the United States provides that "No tax or duty shall be laid on articles exported from any state."

The Treasury Department has issued in pamphlet form a revision and summary of its various rulings covering the 3 per cent war tax and referring particularly to Articles 1 to 10 inclusive.



## New Rules Govern Export Licenses

After July 15 to Be Regarded As Having Been Used in Period of Validity

WASHINGTON, July 8—After July 15, new rules will be operated by the War Trade Board governing the expiration dates of export licenses. On and after July 15, 1918, export licenses will be regarded as having been used within the period of their validity:

(a) If the through export bill of lading is issued and signed on or before the expiration date of the license and subsequent to Oct. 9, 1917; or

(b) If the ocean bill of lading is dated on or before the expiration date of the license; or

(c) If the dock receipt is dated on or before the expiration date of the license, and the ocean bill of lading covering the same shipment is dated not later than 30 days after the expiration date of the license; or If the dock receipt is dated on or before the expiration date of the license and prior to July 15, 1918, and the ocean bill of lading covering the same shipment is dated not later than 30 days after July 15, 1918.

(d) If the railroad notice of arrival issued at the port of exportation is dated on or before the expiration date of the license, and if the ocean bill of lading covering the same shipment is dated not later than 10 days after the expiration date of the license; provided, that the provisions of this paragraph (d) shall apply only when the merchandise is exported on vessels loading at railroad docks, where dock receipts as provided in paragraph (b) cannot be issued by the vessel or its agents.

On and after July 15, 1918, shippers shall prepare and deliver to the railroad agent issuing a through export bill of lading one additional copy of such bill of lading, which copy will be mailed by the issuing railroad agent to the Bureau of Exports, War Trade, Washington, D. C., after there has been noted thereon the port of exit through which the shipment will pass.

Shippers who have goods in transit on through export bills of lading issued subsequent to October 9, 1917, and prior to July 15, 1918, and which goods have not actually cleared from the United States prior to July 15, 1918, must mail immediately to the War Trade Board, Bureau of Exports, Washington, D. C., a copy of such through export bill of lading, giving the port of exit from the United States as well as the number of the export license under which the shipment was made so that the War Trade Board may arrange clearance for such shipments.

### Studebaker Adds a Sedan

SOUTH BEND, IND., July 8—The Studebaker Corp. has added a sedan to its series 19 models, and this will be fitted to both the four and six-cylinder chassis, the four listing at \$1,685 and the six at \$2,185. There is practically no difference in the two bodies, both seating five passengers. Upholstery is high

grade cloth laid in parallel pleats, and equipment includes a dome light, silk roller curtains, door locks and a three-piece windshield with adjustable visor. The finish is Studebaker blue with the chassis and upper half of the body black.

### Ferro-Silicon Output Increases

WASHINGTON, July 6—Increased production of ferro-silicon, electrodes, phosphorus, chlorine and abrasives has resulted through a general supervision of the electrical power provided by the Niagara Falls, according to a report just issued. The supervision has extended over all the power generated or imported by the Hydraulic Power Co. and the Niagara Falls Power Co., and which has been distributed chiefly to war industries. Of all the power available, the war industries have received 85.29 per cent.

### Permit Magnesite to Come In

WASHINGTON, July 5—Importation of magnesite will be allowed under the new War Trade Board backhaul provision, which permits the importation of magnesite when shipped return cargo from Europe and the Mediterranean coast of Africa, and when shipped from convenient ports where loading can be done without delay. Importations of manganese ore from Asia and Australasia have, by another ruling, been prohibited as to ocean shipments made on and after July 20, 1918; and, to make this ruling effective, all outstanding licenses for the importation of manganese from those countries have been revoked as to ocean shipment on and after July 20, 1918.

### M. A. M. A. Washington Office Closed

WASHINGTON, July 6—The office of the Motor and Accessory Manufacturers' Association in this city has been discontinued, as forecast in last week's issue. A. W. Copland, who was the special representative for the association here, and who will continue as chairman of its War Service Committee, has returned to his business duties in Detroit. Mr. Copland is the head of the Detroit Gear Co.

## Production of Coal Down Slightly

Bituminous Drops 5% From Last Week, But Is Ahead of Output Last Year

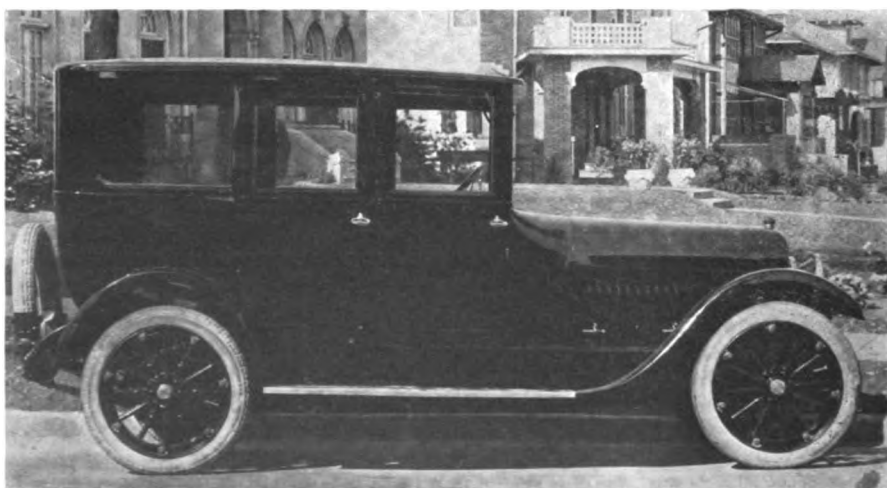
WASHINGTON, July 6—Bituminous coal production for the week ended June 22 was 12,016,000 tons, a decrease of 610,000 tons, or 5 per cent less than the preceding week, and an increase of 701,000 tons, or 6 per cent, over the corresponding week of 1917. Despite the sharp decline compared with the preceding week, the Fuel Administration indicates that the mines have adjusted their stride to a basis of 12,000,000 tons per week, and that this output is not far below the average necessary to provide the tonnage to meet the estimated requirements of the country. Falling off in production was reported from all producing centers, Ohio and Alabama decreasing the most.

Anthracite shipments for the week of June 22 amounted to 41,170 cars, a decrease of 700 cars from the preceding week, or 1.9 per cent loss.

The Fuel Administration states that the record production of 12,626,000 tons for the week ended June 15 was accomplished without any enlargement of the working forces at the mines. Output was increased by individual efforts of the men.

During this week the mines operated up to 79.7 per cent of their full time output. The percentages of full lost time are accounted for as follows: Car shortage, 10.9 per cent; labor shortage, including strikes, 4.7 per cent; mine disability, 3 per cent; no market, 0.3 per cent; all other instances, 1.4 per cent.

Insufficient car supply hampered production in Illinois, Ohio, western Pennsylvania, West Virginia and the western states. Illinois reported labor shortage. Car shortage based upon full time capacity ranged as high as 20 per cent in some districts.



Type of sedan body which has been added to the Studebaker line. It is supplied on both the four- and six-cylinder chassis

## Coal for Passenger Cars 25%

Use to Be Restricted Regardless of Quantity Stored—100% for War Work

WASHINGTON, July 8—Passenger car makers will be allowed to use only 25 per cent of the coal allotment of the 1917-18 period in the 1918-19 period, regardless of the quantities of coal they have purchased now and stored away.

Manufacturers engaged in war and passenger car manufacture will receive 100 per cent coal supply for the war work, but will be allowed the 25 per cent allotment only for passenger car manufacture. Many of the manufacturers have made expenditures of money, used considerable space for storing large quantities of coal this spring, in the anticipation that the Fuel Administration would allow them to use all the coal they buy now for passenger car manufacture next winter. The above ruling was made by F. W. Noyes, Director of Conservation of the United States Fuel Administration, to AUTOMOTIVE INDUSTRIES to dispel these hopes. It was pointed out to the Fuel Administration that:

(a) The Administration requested manufacturers to buy their coal now to relieve the railroads next winter.

(b) Many manufacturers heeding this request are making expenditures of money and using important factory space to store the coal.

(c) Many manufacturers are securing enough coal to provide them with a 100 per cent allowance for passenger car use.

(d) Other manufacturers are not heeding the request of the Government to buy coal now, and it would be a great injustice if the Administration refuses to allow those manufacturers with foresight, who buy their 100 per cent coal needs now, to use the full coal allowance next winter.

(e) It would be a great injustice to the foresighted and patriotic manufacturer who buys his coal now and who devotes an outlay of money and use of space for that purpose to be forced next winter to either have his coal lie idle or be obliged to divide it with those manufacturers who do not display the foresight and are not willing to spend the money or use the necessary space to buy coal now.

Regardless of the injustice, and regardless of the fact that manufacturers that buy their coal now are only heeding the United States Fuel Administration requests, the above rulings were made by Director Noyes.

### Benford Develops Golden Eagle Spark Plug

A new design of spark plug, especially adapted for use on tractor and truck engines, has been placed on the market by the Benford Mfg. Co., Mount Vernon, N. Y. It is of substantial construction,

and an extensive test, covering 17,000 miles in a tractor engine, has shown it to be well adapted for the purpose for which it was designed. The Golden Eagle plug is being made in several different sizes, viz.,  $\frac{7}{8}$ -in. regular;  $\frac{3}{4}$ -in. regular; metric,  $\frac{7}{8}$ -in. long,  $\frac{1}{2}$ -in. long;  $\frac{3}{4}$ -in. long and  $\frac{1}{2}$ -in. extra long. This large assortment of sizes permits of meeting the requirements of all different types of engines.

The Golden Eagle plug is of the mica-insulated type. There is an inside layer of sheet mica, wrapped tightly around a tapered rod. By a special method employed, it is possible to wrap the mica tighter around the rod than is usually the case, and it is claimed that at least one-third more mica is gotten into the same space than by ordinary methods. This extra tight winding of the mica is claimed to absolutely prevent short-circuiting by oil. As is well known, when the mica is loosely wound, oil will seep into the interstices and soak through the mica core, thus short-circuiting the plug.

To the bottom of the tapered central rod is welded a pure nickel electrode, and a pure nickel side electrode runs from one side of the shell to the other, this latter electrode being curved around the central electrode in V fashion, the same as in the Golden Giant. The bottom of this plug is closed by what is generally referred to as a "baffle plate." There are four holes in this baffle plate, through which the combustible charge and the burning gas can pass in and out respectively. The object of the baffle plate is to keep oil out of the spark plug chamber, thereby preventing the plug from fouling. It is also claimed that the baffle plate confines the heat to the spark plug chamber, and that the resulting high temperature will burn any oil that may get into the chamber, thus making carbonization practically impossible. Only one gasket is used in the plug. This is  $\frac{5}{64}$  in. thick, and is made of copper. It is claimed to hold the strongest compression. Stock plugs will be provided with double lock washers. The retail price of the Golden Eagle plug is \$2.

### First Wolverine Truck Out

DETROIT, July 8—The first Wolverine  $1\frac{1}{2}$ -ton truck of the American Commercial Car Co. is expected on the market the last of this week. The retail price will be \$1,825. The company was organized last year by H. C. Wiedeman and associates, who purchased a large manufacturing plant at the corner of Gratiot Avenue and the Detroit Terminal railroad, comprising about five acres of ground together with three large factory buildings and machine shop equipment.

## Canadian Exports Need License

Individual Permits for Non-Canadian Products—Ban Graphite for 1918

WASHINGTON, July 8—Hereafter all shipments of articles of non-Canadian origin imported from Canada and Newfoundland will require individual import licenses similar to those required for imports from other countries. This ruling by the War Trade Board is made to prevent evasions of the general import regulations. Some concerns have been making sea shipments to Canada of restricted commodities, and then import through Canada by rail to the United States. Goods of Canadian origin will be granted entry but will require individual import licenses.

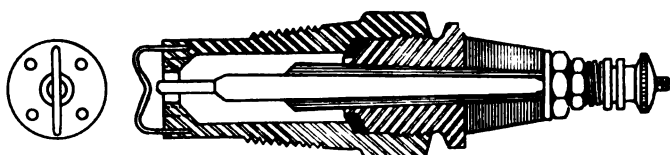
WASHINGTON, June 28—The War Trade Board has modified the export conservation list effective June 28, 1918, as follows:

Individual licenses for the export of fuel have to be secured for marine engines and parts of more than 60 hp.

Individual licenses must be secured for the export of logs, including timber round, hewn, sawed, sided or square, and for lumber manufactured in all dimensions and sizes for commercial uses, including wood suitable for gun stocks, airplane propellers, blades, veneers, for airplane and hydroplane bodies, airplane and hydroplane frames and for ordnance construction, and for wood handles for tools necessary for war supplies.

### Ban Graphite for All of 1918

WASHINGTON, July 2—The importation of graphite or plumbago has been extended to be effective for the entire calendar year 1918 by the War Industries Board. Under the List of Restricted Imports No. 1 this restriction was made absolute until July 1 of this year, the possibility of importing not to exceed 5000 long tons for the remainder of the year being left open should investigation prove that stocks in this country were inadequate to meet the home requirements for the entire year. As a result of the investigation, it has been found that present stocks, together with the home production, suffice to meet requirements until well into 1919. The restriction has therefore been continued and the Bureau of Imports has been instructed to issue no licenses for the importation of plumbago or graphite for the rest of the calendar year.



Section showing construction of Benford Golden Eagle spark plug

## Favor Government Airplane Plant

### Congress Will Probably Pass Bill for \$100,000,000 Air- craft Corporation

WASHINGTON, July 8.—The bill demanding the organization of a Government-owned aircraft corporation proposed recently by Senator Chamberlain, and told of in a past issue of AUTOMOTIVE INDUSTRIES, will probably pass Congress. This bill, which calls for the creation of a corporation directing production of aircraft equipment or materials will be formed under the laws of the District of Columbia with a capital stock of \$100,000,000.

According to Congressman Kahn, one of the chief objects of the corporation will be efficient division of spruce to the Allies. Great Britain takes eleven twenty-fourths, France one-sixth, Italy one-eighth, and the United States one-fourth of the output, and it is believed that the corporation should be organized, and each of the Allies put upon debentures of this Government for the amount of lumber they are receiving from it so that when the time of settlement arrives nations will get returns from their salvage in proportion to the stock they are allotted in the corporation. The United States Government will at all times be the majority stockholder, and the minority stock it is proposed, will be sold to the various allied governments.

The corporation will to some extent purchase all the existing plants now manufacturing aircraft, but it is anticipated will in the main co-operate with existing plants rather than purchase them or build new ones.

The corporation, which will be under the control of the Aircraft Production Board, will be similar to the Emergency Fleet Corporation, and will function with regard to the production of airplanes as the Emergency Fleet Corporation operates in regard to building ships.

Congressional debate regarding this bill developed the fact that the Wright-Martin Co., Dayton, shipped 421 planes up to June 22, and sent out 36 carloads in one day from Dayton. Some of the congressmen, told by Congressman Kahn, that they were little "behind the time" endeavored to bring up the subject of the efficiency of the Liberty engine, and the results of the expenditures of the \$640,000,000 appropriated last year for airplanes.

#### N. A. C. C. Endorses Work of N. A. D. A.

DETROIT, July 10.—At the regular monthly meeting of the National Automobile Chamber of Commerce, held here to-day, efforts of the National Automobile Dealers' Association to assist the government by reducing the amount of free service given by dealers were given the support of the chamber. Drive-aways from factories are increasing and the production of trucks has gone up 100 per

cent. The following committee chairmen were appointed: Patents, C. C. Hanch (Studebaker); Motor Truck, Windsor T. White (White); Legislation, H. H. Rice (Chevrolet); Good Roads, Roy D. Chapin (Hudson); Traffic, William E. Metzger (Columbia); Electric vehicles, W. C. Anderson (Detroit); Handbook, C. H. Pelton (Maxwell); Exports, J. Walter Drake (Hupmobile); War Service, Hugh Chalmers (Chalmers); Standardization, C. W. Churchill (Winton).

#### Reduce Airplane Mail Rate

WASHINGTON, June 29.—Beginning July 15 the postage rate for airplane mail between New York and this city, now 24 cents per ounce, will be reduced to 16 cents for the first ounce and 6 cents for each additional ounce. This is a 6-cent rate, plus the usual 10 cents for special delivery. The reduction is expected to greatly increase the use of the air mail service.

#### Six Deaths at Aviation Fields

WASHINGTON, June 28.—Six deaths resulted from aviation accidents at the aviation fields in this country during the week ending June 15. Summary is as follows:

Barron Field, Everman, Tex.....	1
Carlstrom Field, Arcadia, Fla.....	1
Ellington Field, Houston, Tex.....	1
Kelly Field, San Antonio, Tex.....	1
Payne Field, West Point, Miss.....	1
Scott Field, Belleville, Ill.....	1

#### Airplane Investigators Go to Dayton

WASHINGTON, July 8.—Charles E. Hughes, Attorney-General Gregory and Assistant Attorney-General Fitts, who are investigating the aircraft situation, leave to-day for Dayton to gain first-hand information at the factories there.

#### Solid Tires to Be Standardized

AKRON, July 8.—At a recent meeting of the War Service Committee, Division of Solid Tires, the following classification of pressed-on solid tires was adopted tentatively:

Class "A"	Class "C"	Class "D"	Class "E"
Permanent Standard	To be discontinued Nov. 1919	To be discontinued Nov. 1918	To be discontinued at once
32 x 3½	32 x 2½	42 x 5	34 x 7
34 x 3½	32 x 3	34 x 6	34 x 8
34 x 4	34 x 3	42 x 6	40 x 8
36 x 4	36 x 3	42 x 7	34 x 10
34 x 5	36 x 3½		42 x 10
36 x 5	32 x 4		36 x 12
40 x 5	38 x 4		42 x 14
36 x 6	40 x 4		
40 x 6	38 x 5		
36 x 7	38 x 6		
36 x 8	38 x 7		
36 x 10	40 x 7		
40 x 10			
40 x 12			
40 x 14			

Although the above classification has not been finally adopted, it is entirely probable that it will be at a later meeting, the definite date of which has not been announced.

## Deliver 4495 Planes to Government

### All for Elementary Training— 820 for Advanced Training Have Also Been Received

WASHINGTON, July 5.—Four thousand four hundred and ninety-five elementary training airplanes were delivered to the United States Government by manufacturers in this country up to June 8. Eight hundred and twenty advanced training airplanes were delivered up to Jan. 8. This information, together with other data, was submitted to Congressman S. H. Dent, Jr., by Secretary of War Baker this week. The further information regarding aviation included: The average weekly production of advanced training planes during April was 22; during May, 45½; week ending June 8, 78.

To June 8, a total of 286 combat planes were delivered. The weekly average of this type of machine in April was 5; in May, 38; week ending June 8, 80.

More than 2000 Liberty engines have been delivered to the Army and Navy. The average weekly production in April was 96; in May, 143, and in the first week of June, 115.

Thirty-seven thousand two hundred and fifty machine guns were delivered for use on airplanes before June 8.

#### Airplane Bombing Demonstrated

WASHINGTON, July 11.—Airplane bombing, airplane bomb flares and other trench warfare was successfully demonstrated in an exhibit held here yesterday by the trench warfare section of the engineering division of the Ordnance Department. The display included salvos of grenades, barrages, drop bombs, trench mortars, high explosives, gas and pyrotechnic signals. A De Havilland plane equipped with two Liberty engines, dropped four demolition demonstration bombs from an altitude of 2000 ft. aiming at a target 30 ft. in diameter and striking within a radius of 200 yards each time. The bombs, which are one-fourth normal effectiveness, tore holes 10 ft. deep and 30 ft. in diameter.

Airplane flare bombs used to light cities to be bombed were also exhibited. They are 36 in. in length and 8 in. in diameter and contain a parachute which suspends them in the air after they are released. They throw a light of 350,000 cp. over a radius of 2 miles. Flares used to guide night bombers to their hangars were also displayed and created a light as powerful as daylight over a radius of 300 yards. Various pistol rocket signals, used to guide or signal night bombers by throwing various colored lights carried by small parachutes into the air were shown. These are used by aviators on their return and at the hangars.

Another demonstration was of incendiary bombs, which, dropped from an altitude of 2000 ft., started huge fires in the fields.



## Exports Show Drop of 22%

Figures for May, 1918, Only  
Half Those for May, 1917  
—Trucks Increased

1918				
Cars	Value	Trucks	Value	Parts
May...2,801	\$2,907,390	866	\$1,958,603	\$2,859,496
April...6,104	3,958,560	655	1,392,125	4,004,383

1917				
May...6,725	5,189,980	1,764	3,216,620	2,715,796

WASHINGTON, July 10—Exports of passenger cars, trucks and parts during May amounted to \$7,725,489. This is 22 per cent less than the April total and 48 per cent less than the amount exported during May, 1917. The chief drop came in passenger cars. Only 2801, valued at \$2,907,390, were shipped during May as compared with 6104, valued at \$3,958,560, during April. During May, 1917, 6726 cars, valued at \$5,490,509, were shipped, which is more than twice as large as the May, 1918, figure.

Commercial car exports, on the other hand, showed an increase over the April figure. In May, 866 trucks valued at \$1,958,603 were shipped as compared with 655, valued at \$1,392,125, in April. The May total is smaller than that of May, 1917, when 1764 trucks worth \$3,222,807 were exported.

One airplane was shipped as compared with 24 during May, 1917, and none in April. The value of airplane parts increased from \$359,436 in April, 1918, and \$513,104 in May, 1917, to \$771,673 in May, 1918.

Of the 2801 passenger cars shipped 733 went to Canada. The second largest

purchaser was Australia, who received 199. Cuba came third with a total of 181. The commercial cars went chiefly to the United Kingdom, France and Canada.

### Overland Prices Increased

DETROIT, July 10—The Willys-Overland, Toledo, has advanced the prices of all its models, effective July 16, as follows:

Model	Old Price	New Price
T. touring.....	\$850	\$895
roadster.....	850	895
90, country club.....	875	925
sedan.....	1340	1385
panel delivery.....	865	895
express delivery.....	840	875
85-4 touring.....	965	1025
roadster.....	965	1025
1200-lb. delivery.....	975	1075
85-6 touring.....	1195	1300
roadster.....	1195	1300
85-6 coupe.....	1420	1550
sedan.....	1620	1720
89 touring.....	1450	1525
club roadster.....	1450	1525
38-4 touring.....	1625	1650
coupe*.....	2275	2600
sedan*.....	2325	2650
limousine*.....	2425	2750
38-8 touring†.....	2100	2500
limousine†.....	2900	3300
coupe†.....	2770	3175
sedan†.....	2800	3200

\*Include 5-inch cord tires.

†Include 5 wire wheels and 5-inch cord tires.

### Rainier Adds 1½-Ton Model

NEW YORK, July 10—The Rainier Motor Corp. will begin shipments of a new 1½-ton truck styled R-6 in the latter part of July. The chassis price has been fixed at \$1,790 f.o.b. the factory in Flushing. This model will have a Continental 3½ x 5½ in. engine, with governor, Brown-Lipe clutch and transmission and worm-driven rear axle. The wheelbase is 133 in. and the tire equipment is the Firestone solid pressed-on type, 34 x 4.

## Big Spurt in Rubber Imports

Nearly 8000 More Came in During June Than May—Figures for Half Year

NEW YORK, July 10—Imports of crude rubber took a big spurt during the month of June, an increase of 7836 tons being shown over the quantity which came in during May. During the first six months of 1918 the total amount imported was 99,468 tons. This is 11,387 tons more than were imported during the first six months of 1917.

The big increase shown during the month of June probably is due to a certain extent to anticipation of the action of the War Trade Board in limiting imports. The quantity which is to be allowed to come in during the period from May 6 to July 31 has been set at 25,000 tons, which will make an aggregate total of 100,000 tons for the entire year. Although this total has now been reached, most of the rubber which has come in has been what is known as free rubber, which is to say that it was shipped prior to May 8, when the restrictions on imports became effective. Following are the statistics compiled by the Rubber Association of America:

Month	1917, tons	1918, tons
January .....	12,788	16,084
February .....	10,162	13,108
March .....	18,624	17,161
April .....	13,000	12,703
May .....	18,411	16,288
June .....	15,096	24,124
Total.....	88,081	99,468

## Exports of Automotive Equipment for May and Eleven Previous Months

	Month of May				Eleven Months Ending May, 1918			
	1918		1917		1918		1917	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes .....	1	\$10,000	24	\$175,111	19	\$202,620	57	\$550,647
Airplane parts .....		771,678		513,104		6,836,574		2,632,430
Commercial cars .....	866	1,958,603	1,764	3,222,807	11,370	29,844,340	14,732	39,378,248
Motorcycles .....	729	154,555	1,074	224,533	9,576	2,087,235	14,916	3,047,099
Passenger cars .....	2,801	2,907,390	6,726	5,490,509	49,210	42,518,208	57,226	42,899,955
Parts, not including engines and tires.....		2,859,496		2,715,775		29,737,653		24,518,051
Total .....		\$8,661,722		\$12,341,839		\$111,226,630		\$113,026,430
ENGINES								
Automobile gas .....	2,210	\$208,371	2,389	\$229,678	33,472	3,880,248	21,467	2,581,754
Marine gas .....	580	342,407	1,079	192,840	6,983	2,457,137	8,359	1,946,615
Stationary gas .....	3,126	413,481	2,421	259,205	25,634	2,915,127	28,685	2,866,912
Tractor and creeper type gas.....	2,832	2,741,772	1,424	1,766,741	22,118	22,136,729	6,813	8,821,632
Total Engines .....	8,748	\$3,706,031	7,313	\$2,448,464	88,207	\$31,389,241	65,324	\$16,216,913
EXPORTS BY COUNTRIES MAY, 1918								
	Passenger Cars		Trucks		Passenger Cars		Trucks	
	No.	Value	No.	Value	No.	Value	No.	Value
Argentina .....	120	\$120,721			3,292	\$2,391,687		
Australia .....	199	182,980			4,003	3,150,282		
British India .....	2	2,576			59	39,978		
British South Africa .....	70	68,250			1,918	1,522,482		
Canada .....	733	652,209	146	\$140,532	12,503	9,750,648	1,001	\$1,247,405
Chile .....	107	173,683			3,100	3,214,457		
Cuba .....	181	203,229			2,784	2,819,171		
Denmark .....	1	442			2	4,100		
Dutch East Indies .....					1,272	1,302,800		
France .....	108	365,375	118	383,831	984	1,402,527	2,493	9,055,900
New Zealand .....	58	45,477			1,682	1,342,720		
Norway .....	2	2,800			92	97,366		
Philippine Islands .....	171	164,786			1,659	1,339,272		
Russia in Europe .....					492	1,136,400		
Russia in Asia .....					5	8,425	406	1,562,303
United Kingdom .....	6	10,754	299	948,436	892	1,929,677	5,047	14,185,552
Other Countries .....			303	485,804			2,423	3,793,180
Totals .....	2,801	\$2,907,390	866	\$1,958,603	49,210	\$42,518,208	11,370	\$29,844,340

## Rules for Recruiting Unskilled Labor

Only Those Employing Over 100 Need Go to Government Employment Bureau

WASHINGTON, July 8—Amending the original labor program, the Department of Labor states that for the present only manufacturers engaged on war contracts and employing over 100 workers will be required to recruit unskilled labor through the United States Employment Service after Aug. 1. Non-war industries will be affected only indirectly in so far as they must not offer superior inducements, prevent the transfer of workers urgently needed for war production or in any way attempt to compete with the Government for labor.

The following five classes of labor need not for the present be recruited through the U. S. Employment Service, although of course the machinery of the Employment Service is available to all employers seeking these classes:

- 1.—Labor which is not directly or indirectly solicited.
- 2.—Labor for railroads, except in so far as the Director-General of Railroads has or may recruit, that recruiting shall be exclusively through the United States Employment Service.
- 3.—Farm labor, which will be recruited through the Department of Agriculture.
- 4.—Labor for non-war work.
- 5.—Labor for establishments in which the maximum force including the additional number recruited does not exceed 100 employees.

WASHINGTON, June 28—The number of workers in automobile factories decreased 10.5 per cent in the past year, according to a report by the Department of Labor. In March, 1917, 27 automobile manufacturing plants reported 83,678 workers, and in March, 1918, 74,889. Forty-nine factories reported 118,255 workers in February, 1918, and 122,998 workers in March, 1918, an increase of 4 per cent, while in the same time the salaries for February, \$2,642,126, were 11 per cent less than those in March,

\$2,933,676, showing a startling increase in wages as compared with the increase in the number of workers.

Below is a table making comparison of employment in identical establishments in February, 1918, and March, 1918, showing increase and decrease of employment and wages.

### Reclassify Automobile Mechanics

BOSTON, July 8—The draft boards in Boston have set about reclassifying workers in the automobile industry, and during the past week a number of employees were ordered to come in and report what their work amounted to. Those who were doing nothing but the ordinary cleaning of cars or trucks, or porter work, were told that it did not grant them any exemption, and so some of them have been changed from the deferred class into Class 1A. Others who were working as mechanics were questioned as to whether they were employed upon trucks or passenger cars, and it is thought that the boards will rule that if they are repairmen on the passenger cars they will be certified into the "work or fight" class. Salesmen were not all called in, for about all those left now in the industry are above the draft age.

### Local Labor Boards

WASHINGTON, July 8—Community labor boards to supervise recruiting and distribution of labor will be established in each industrial region of the country by the United States Employment Service. They will apply the federal labor policies as the local draft boards put into operation the selective construction act. Employees and employers will select representatives for these boards to insure adequate representation. There will be one representative of employers, one representative of employees, and three representatives of the United States Employment Service. The members of the boards will be appointed by the State directors of the U. S. Public Service Reserve assisted by Chambers of Commerce and manufacturers' associations, who will nominate industrial management representatives, and State and city federations of labor, which will nominate the labor members.

## War Industry Short 300,000 Workers

U. S. Employment Service Seeking Relief—Coal Miners Needed

WASHINGTON, July 8—War industries of the United States are to-day short between 300,000 and 400,000 unskilled workers. The shortage of workers in the coal mining industries is said by the Department of Labor to be imperiling all other war production.

The situation is considered so serious that the United States Employment Service, which assumes control of unskilled labor on Aug. 1, is endeavoring to complete its machinery so that relief may be given even before that date.

Skilled labor is also facing a serious shortage. One of the largest munitions plants, turning out heavy-caliber guns, is short 2000 machinists. The war plants of Connecticut and Maryland alone face a shortage of 35,000 skilled machinists. The solution, according to the Department of Labor, lies in the recruiting by the United States Employment Service of workers for war work from the non-war industries as quickly as possible.

This work, as was told previously, is to be undertaken at the earliest possible moment by the United States Employment Service, which is increasing its offices to number 700 throughout the country, and is adding greatly to corps of local agents and traveling examiners.

### Many Jobs for Women Workers

WASHINGTON, July 5—Women are packing parts, stuffing bags with excelsior, working on wire parts, cutting copper pieces, binding wires with tape, and soldering joints of wire, applying "dope" and painting the United States Emblem on the bodies of the airplanes in airplane factories, according to a report made by the Women's Committee, Council of National Defense. They are also doing light carpentering and metal work, and sew linen on the wings.

### Mammoth Hotel Garage for New York

NEW YORK, July 8—Hotel men representing a number of the largest hostleries in the city, such, for example, as the Waldorf-Astoria, McAlpin, Claridge, Plaza, Ritz-Carlton, etc., are interested in the erection of a mammoth garage to care for the cars of hotel guests. A company has been incorporated under the style Inter-State Garages, Inc., and it is planned eventually to have a garage in all of the principal cities in the country. The company has obtained a city block bounded by 47th and 48th streets on Second avenue, with a frontage of 250 ft., and extending 350 ft. on the side streets. It is planned to provide an individual locked space for each car, the total capacity to be 863 cars. There will be no elevators, ramps being used to reach the five floors of the building.

Comparative Figures of Employees in Identical Trades in February and March, 1918

Industry	Establishments Reporting for February and March	Period of Payroll	Number on Payroll in—		Per Cent of Increase (+) or Decrease (—)	Amount of Payroll in—		Per Cent of Increase (+) or Decrease (—)
			February, 1918	March, 1918		February, 1918	March, 1918	
Boots and shoes.....	71	1 week	60,767	60,980	+0.4	\$933,308	\$1,016,947	+ 9.0
Cotton manufacturing.....	55	1 week	51,981	54,394	+4.6	839,660	740,215	+15.7
Cotton finishing.....	18	1 week	14,721	15,084	+2.5	222,404	244,357	+ 9.9
Hosiery and underwear.....	57	1 week	29,105	29,495	+1.3	324,424	382,099	+17.8
Woolen.....	50	1 week	48,578	50,553	+4.3	689,834	852,858	+23.6
Silk.....	39	2 weeks	13,572	13,685	+ .8	304,072	348,561	+14.6
Men's ready-made clothing.....	35	1 week	25,534	24,581	-3.7	432,465	442,757	+ 2.4
Iron and steel.....	107	½ month	204,972	208,544	+1.7	10,123,423	11,007,962	+ 8.7
Car building and repairing.....	30	½ month	29,966	29,778	- .6	1,160,831	1,263,235	+ 8.8
Cigar manufacturing.....	56	1 week	18,996	19,557	+3.0	245,837	265,174	+ 7.9
Automobile manufacturing.....	49	1 week	118,255	122,998	+4.0	2,642,126	2,933,676	+11.0
Leather manufacturing.....	36	1 week	16,199	15,790	-2.5	262,720	281,826	+ 7.3
Paper making.....	49	1 week	25,715	26,625	+3.5	430,921	494,910	+14.8

## South Africa Is Poor Tractor Field

**Gasoline \$1 a Gallon—Machinery Won't Displace Oxen For Some Time**

CAPE TOWN, SOUTH AFRICA, May 10.—Any attempt to sell gasoline farm tractors in South Africa to-day will meet with heavy resistance because the price of gasoline is \$1 per gallon, which makes it prohibitive for farm cultivation. Kerosene is selling at half this price, but if the wear and tear on an engine burning kerosene is greater than that using gasoline, and the same efficiency is not obtained from kerosene, it is a problem to see how it will be economical to use kerosene.

That a tractor is pretty expensive to operate here in addition to the fuel cost is evident because of the great use of oxen for agricultural purposes. The farms are so large in area that it costs very little to feed the oxen, so that farm cultivation with them is cheap no matter how much they are used. Many farmers consider oxen a good investment, even if they are only worked a few days of the year and the remainder of the time are kept grazing.

While the South African farmer will continue to use oxen for many years to come there is certain to be an opening for a suitable farm tractor at the conclusion of hostilities in Europe. There are several South African distributors who are giving personal investigation to the tractor situation, and while they do not expect actively to take up sales for some time they feel certain that the day of the tractor in South Africa is sure to follow the closing of the war. Large farmers are certain to take on a few for experimental purposes, and these will form the beginning of the tractor business.

### Fordson Reports Misleading

LONDON, ENGLAND, June 20.—The circulation of derogatory reports with regard to the performance of Fordson tractors is heard from time to time, and it is unfortunate that these continue to receive attention in many places.

Persons circulating such reports must be ignorant of the exhaustive tests to which these tractors were submitted before the British government permitted itself to purchase 6000 of them. They must also be ignorant of the success this tractor achieved in the competitions arranged by the Food Production Department. They apparently are not aware that these tractors worked 24 hours a day in actual plowing before the government decided to purchase them.

The best answer to the suggestion that the Fordson is not successful when using kerosene for fuel is the fact that these tests were accomplished on kerosene, and the British government after exhaustive trials has continued to use kerosene as the fuel in all of the Fordson tractors.

Six acres were plowed in 44½ hours with a consumption of 1.84 gal. of kerosene per acre. This was made under official observation. The gallon referred to is the British Imperial gallon, which is one-fifth larger than the American gallon.

### England Unifying Transportation

LONDON, ENGLAND, June 4.—England is wrestling with the problem of unifying as well as effecting national control of all forms of transportation. At a recent meeting of the Transport Workers' Federation it was proposed that a National Board of Communications be formed, the constitution of which would be equal representation of employees and the state. This board will take over and administer all inland passenger, mail and merchandise transportation. It would embrace transportation by highway, railroad, water and air.

### World-Wide American Trade Organization

LONDON, July 6.—A world-wide organization of bodies interested in American foreign trade may result from steps recently taken by the American Chamber of Commerce in London. On the ground that nothing short of intelligent co-operation can prevent waste of effort in the end, this chamber has invited about twenty of the leading American foreign trade organizations both in the United States and abroad to work out a practical plan for close co-operation.

### Permits for Use of Roads

LONDON, ENGLAND, June 19.—After Sept. 1 no person in England will be permitted to use a vehicle for the transportation of merchandise on the highways except in accordance with the terms of a permit granted by the Road Transport Board. This is one of the first tangible steps in the complete co-ordination of the vehicles on the highway system.

The official order known as Road Transport Order 1918, issued June 4, specifies that all persons owning or having under their control any vehicle used for the transportation of merchandise by highway shall, before July 31, make a return on the prescribed blank, giving details of the vehicles, their load capacities, and the work for which they are normally used. The only exception to this order is agricultural vehicles and horse-drawn vehicles having a load capacity of less than 1680 lb.

### To Secure Widespread Interest in Export Trade

LONDON, July 6.—To secure a greater personal interest among prominent American business men in every city for American export trade, the American Chamber of Commerce in London is asking secretaries of Chambers of Commerce throughout the United States to give it the names of members interested either in export trade or in our general relations with Great Britain.

## Lack of Ships Hurts South America

**Merchants Can't Move Goods Out and Cars Can't Come In—Expect Improvement**

BUENOS AIRES, ARGENTINA, May 20.—Shipping conditions are the greatest problem that the Argentine distributors have to cope with to-day. There is the difficulty of the Argentine merchant getting ships to move his products, and added to this the export tax that the government levies on all goods exported. Notwithstanding this situation, the good crops of the past season have done much to overbalance the bad conditions following the railroad strikes which began last November. Business conditions are not what they should be, which is partly due to the export situation, and also to the restricted imports. Many stocks of goods are being rapidly absorbed, and prices are increasing every day.

The automobile distributors in Argentina are coping as well as they can with these generally unfavorable conditions, and are looking forward to increased shipments of automobiles, trucks and accessories from America. It is hoped that good shipments will be forthcoming in October so that the coming summer selling season will be favorable.

The numerous strikes have not been without their favorable side, and during the past 10 months, which has been the period of strikes, the automobile distributor has had the opportunity of demonstrating to the Argentine public that the automobile is a practical and essential vehicle. Some of the more enterprising distributors sent cars all over the country and were able to get a great deal of propaganda out of this. Studebaker was one of the leaders in this movement.

Gasoline is now selling at 90 cents a gallon, which, taken in conjunction with the high price of tires, has materially increased the cost of operating a car. The scarcity of gasoline has had a depressing effect, but there are assurances that the United States will supply all that is necessary. Lower powered cars and those economical in fuel are bound to have greater selling opportunities than those which are heavy consumers of gasoline and are heavy users of tires. Shipments of gasoline reaching Argentina before October, or even during November and December, will have a very beneficial effect on the sale of automobiles during the coming spring and summer.

### Hardcastle and Rochette Partners

BUENOS AIRES, ARGENTINA, June 1.—P. A. Hardcastle, Overland distributor for Argentina, has formed a partnership with E. Rochette, who was formerly in charge of the Overland business for all South America. For over 2 years Rochette has been making his headquarters in Buenos Aires. Hardcastle will continue actively in the business.



## 15 Tractor Makers on Exhibition List

### Implement Manufacturers Also Reserve Space for Salina Farming Demonstration

NEW YORK, July 5—Fifteen manufacturers of farm tractors and four makers of plows and other implements have reserved space for the National Tractor Farming Demonstration which is to be held at Salina, Kan., July 29 to Aug. 2. It is expected that the list will be lengthened from week to week, and that the accessory exhibition will be even more comprehensive than has been the case in the past. Following is the complete list of exhibitors to date:

#### Tractors

Avery Co. ....	Peoria
Square Turn Tractor Co. ....	Chicago
Hart Parr Co. ....	Charles City
Holt Mfg. Co. ....	Peoria
Nilson Tractor Co. ....	Minneapolis
Moline Plow Co. ....	Moline
Dauch Mfg. Co. ....	Sandusky
Parrett Tractor Co. ....	Chicago
Russell Co. ....	Massillon
Gile Tractor & Engine Co. ....	Ludington
Advance Rumely Thresher Co. ....	La Porte
Aultman & Taylor Machine Co. ....	Mansfield
Rock Island Plow Co. ....	Rock Island
Gray Tractor Co. ....	Minneapolis
La Crosse Tractor Co. ....	La Crosse

#### Implements

P. & O. Plow Co. ....	Canton
Oliver Chilled Plow Works. ....	So. Bend
John Deere Plow Co. ....	Moline
Grand DeTour Plow Co. ....	Dixon

Following are the complete rules and regulations for the National Tractor Farming Demonstration:

1. Public demonstrations shall begin at 1 o'clock and end at 3, unless other hours are announced by local committee at least 24 hours before starting time. Private demonstrations may be held in the forenoon from 8 o'clock to 11.30.

2. No exhibitor shall be allowed more than one tractor of each size and type on the field during the public demonstrations doing the same kind of work. He may have one or more machines performing different operations, namely, one plowing, one disking, one seeding, etc.

3. Size of land for each tractor exhibitor for plowing demonstrations will be determined by the average number of plow bottoms pulled, the width of plows and speed of machine as given in company's catalog. Each tractor exhibitor must plow out dead furrow to its left.

4. All plows on any given gang must be set at the same depth and kept there during the day's demonstration. This depth will be announced daily by the general manager. (Plows found operating otherwise will be ordered from the field for the balance of the day's work.)

5. All exhibitors will be allotted land in the same field or adjoining fields during each day's demonstration. Land for private demonstrations will be provided daily, in one field or adjoining fields.

6. In all public demonstrations the motor or tractor must not be run at more than 10 per cent above its catalog plowing speed. Tractors may be run on high gear with normal engine speed when disking, harrowing, seeding, etc.

7. Positions on field first day will be arranged by lot, in following manner: Drawing to take place at 10 A. M. Monday, the opening day of demonstration, by serial numbers representing total number of exhibitors.

Position on field for the first public demonstration will be according to numbers, starting 1, 2, 3, 4, etc.

The total number of exhibitors will be

divided into same number of divisions A, B, etc. "A" will occupy preferred position on first day public demonstration, and "B" preferred position on second day, etc.

Exhibitors who do not have representatives at drawing, the drawing will be done for him under the direction of the general manager.

Each exhibitor will be required to finish his land daily in a workmanlike manner, and assist in plowing the end lands as directed by the general manager.

8. Each field plowed will be surveyed and staked ready for afternoon demonstrations. These fields will be tested for the drawbar pull of a 14-inch plow, plowing at the specified depth previous to the demonstration. All manufacturers will be furnished information relative to drawbar pull so they can better determine the number of plows to use on each gang.

9. Each tractor shall bear a placard, to be furnished by the chief observer, showing the brake horsepower of the engine, the revolutions per minute, the plowing speed in miles per hour, and the kind of fuel used and its Baume test. Tractors using more than five per cent of gasoline shall be classed as burning gasoline and be so placarded.

10. All tractors on the demonstration field belonging to one exhibitor must be kept on or along the land allotted him for that day's demonstration, until the hour designated by management for returning to headquarters.

11. No machine will be allowed to operate with special equipment other than that designed for practical use with same. No spectacular methods will be permitted on the part of salesmen or others to attract crowds. The demonstration must speak for itself.

12. Each tractor exhibitor will have the privilege of burning any kind of fuel he desires, but no one will be permitted to burn fuel of higher gravity test than that used by his competitor burning the same kind of fuel. All exhibitors will be required to obtain fuel from one source, such to be designated by general manager.

13. No time will be required of exhibitors to make movie pictures or group photographs for commercial purposes. Manufacturers can arrange to get photographs during the demonstration if they desire. Any manufacturer or representative of farm or trade papers, or news agency will be allowed to have their official photographer on the grounds to get pictures for their own use.

14. Manufacturers will be privileged to make brake horsepower, drawbar pull, and such other efficiency tests as they desire. All such tests desired should be reported to the general manager not later than July 15, so that a sufficient number of Prony brakes, dynamometers and other apparatus can be provided. These early announcements will also be necessary in order that a suitable number of competent judges and sufficient acreage can be provided for all who desire to make tests.

15. The results of all tests made at the demonstration shall be furnished to the exhibitors only and such exhibitors may publish the results as official from the management of the demonstration. No official report of any tests made will be kept by the general manager, judges or the association except by permission of the exhibitor making the tests.

16. Manufacturers will be privileged to exhibit not more than two belt-driven machines in connection with their exhibition.

17. Arrangements will be made for daily demonstrations showing use of tractors harrowing, disking, seeding, and other farm operations, demonstrating general utility of the tractor. The rules governing these demonstrations will be the same as those applied to plowing.

18. The interpretation and enforcing of these rules shall be left to the local manager of each demonstration and the general manager of the demonstrations.

19. Each company exhibiting at these demonstrations shall appoint one manager, who will be expected to report to the general manager not later than 8 o'clock each morning for instructions and information regarding the day's work. This manager of exhibits will be held accountable for the work of his company and no instructions will be issued to any one else, nor will requests, instructions, or complaints be recognized from any one but this exhibit manager. He shall wear a badge furnished him, specifying his being official exhibit manager.

20. Each exhibitor will be expected to keep plows, tractors, etc., around his tent arranged in first class order, and the land allotted him for exhibiting purposes free from circulars, rubbish, etc., such as will be distributed around headquarters daily. They will also be expected to use care at all times in operating machinery with respect to its safety for all visitors. The management will appreciate co-operation of these exhibit managers in all matters.

21. Each entrant will sign the rules and thereby agree to live up to the rules and co-

## Store Door Delivery for New York

### James S. Harlan of Interstate Commerce Commission Outlines Plan for Shipments

NEW YORK CITY, July 8—The greatest step yet taken to eliminate the serious l. c. l. railway freight terminal congestion in New York City was made here to-day by James S. Harlan, Interstate Commerce Commissioner, who outlined a plan for the delivery of all l. c. l. freight direct from the terminals to the consignees without the formality of any notices of arrival. At first the plan contemplated handling only the incoming shipments and these will be delivered to the consignees on their dates of arrival and stored in public warehouses if the consignees refuse to accept them and pay the freight and delivery charges when they are delivered at their doors.

The entire mercantile district of the city will be divided off into zones and all the trucks delivering the freight will leave from the various terminals with full loads to be delivered in one of the zones. Each truck used in the work will be registered and will be under the supervision of a city drayage director who will have general supervision and control for the consignee of the trucking of freight from pier or freight station after it has been placed on the pier or freight station floor by the carrier.

Only registered trucks will be used to deliver the goods and full loads will be carried by each truck when it leaves the freight station or pier.

The system as proposed may be put into effect in this city by Aug. 15, 1918, and will prevent consignees from utilizing railroad cars, piers and freight stations as warehouses by taking advantage of the 48-hr. demurrage-free period heretofore in effect.

Although for the present, the system is to be only applied to incoming shipments, Commissioner Harlan believes that in the natural course of events, the many benefits will result in its being extended to include a pick-up service for outgoing goods. The whole system is to be largely self-governed and there probably will be a carriers' committee, a shippers' committee and a draymen's committee for the purpose.

operate with the committee in every way to make the tractor demonstration a success.

22. The field manager shall have authority to order from the field any machine whose operator does not comply with the rules, and, further, any exhibitor who is manifestly disregarding the rules will not have land laid out or furnished for him on the succeeding days, or until such time as he has met the conditions.

23. No exhibitor joining the national demonstration will be permitted to exhibit until he has given correctly the price that he is in position to furnish tractors at regular production, the correct weight of tractors, and all data pertaining to their construction and rating, minimum and maximum speed at which the motors are to run, and the committee has the right to have any such machines placed under test to prove the correctness of the data that are furnished.

# Gasoline Production Increases

Record Output in April—Ten Months Figures for Production and Stock on Hand

WASHINGTON, July 8—The production of gasoline in April of this year was the largest that the country has ever known. It was more than 23,000,000 gal. greater than the production in March and more than 80,000,000 greater than the output of April, 1917. The daily average production for April, 1918, was 9,779,872 gal.

According to figures just issued by the Bureau of Mines, the stock of gasoline on hand at the refineries on April 30, 1918, was 509,197,134 gal., or 17,185,252 gal. less than was on hand one month previous, but it was 163,997,939 gal. greater than the stock on hand on July 30, 1917.

Crude oil production in April showed a very slight drop which, in view of the fluctuations in the production curve, is almost negligible. The decrease amounted to only 38,108 bbl. when compared with the output for March. The 26,201,554 bbl. of crude produced in April constitutes an output greater by about 4,000,000 bbl. than that of February. The stock of crude on hand April 30 was greater than that on hand at any other recent time except March 31, 1918.

The curves accompanying show how the production and stocks on hand of crude oil and gasoline have varied since July, 1917. The following table gives the amount of crude and distillates on hand at refineries on April 30 and March 31:

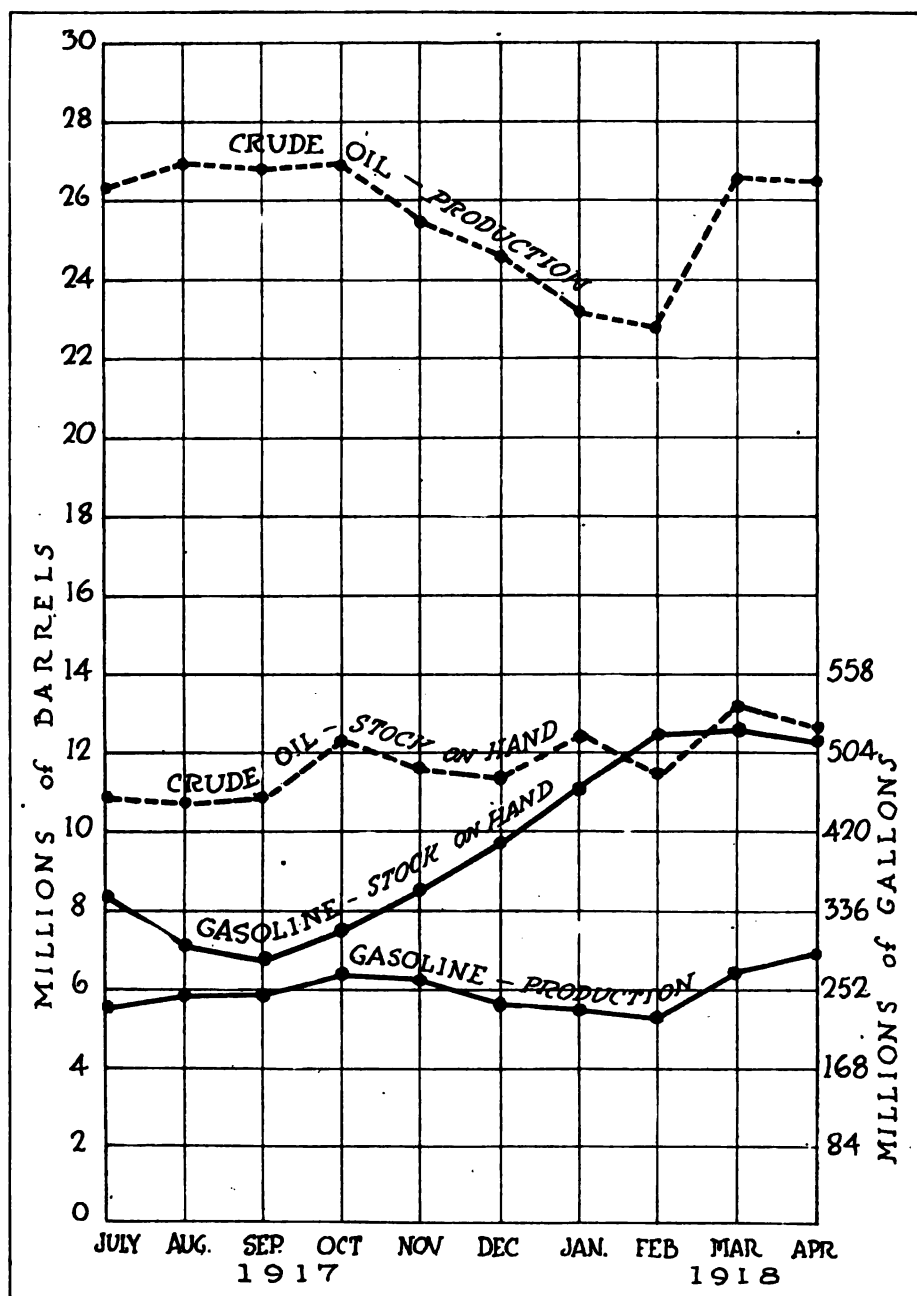
1918	Total April 30, 1918	Total March 31, 1918
Crude run (bbl.)	12,600,062	26,239,662
Oil purchased to be re-run (bbl.)	954,205	3,696,372
Gasoline (gal.)	509,197,134	269,627,968
Kerosene (gal.)	393,527,476	151,228,007
Gas and Fuel (gal.)	471,644,479	587,985,804
Lube (gal.)	144,383,212	69,308,351
Wax (lb.)	151,228,317	43,957,019
Coke (ton)	13,109	44,248
Asphalt (ton)	101,328	56,901
Misc (gal.)	248,260,551	94,865,148

## Plenty of Gasoline If Not Wasted

WASHINGTON, July 9—There is no shortage of gasoline. The gasoline supplies are ample to take care of our war and normal requirements if we will practise sane conservation in this country.

These statements were made to-day by W. Champlin Robinson, Director of Oil Conservation, United States Fuel Administration. The demand for gasoline for airplanes and trucks with the American Expeditionary Forces is constantly growing, and will necessitate continually increasing shipments overseas.

The present stocks are now ample to supply the war needs and allow the normal rational consumption to continue.



Production and stocks on hand of crude oil and gasoline for the past ten months

But waste of gasoline must cease, stated Mr. Robinson, in order that we may be able to continue normal rational consumption in this country and amply meet our war requirements.

There is no suggestion of enforced curtailment of gasoline or lubricating oils in the minds of the Fuel Administration.

There is no suggestion of limiting the use of passenger cars, despite newspaper reports to the contrary.

There is a decided opposition by the Fuel Administration, however, to the careless wasteful handling of gasoline as exists at present in this country, and the Fuel Administration warns that unless the waste is eliminated possible restrictions may have to be inaugurated to insure sufficient gasoline and oil for our war needs.

The Fuel Administration will soon issue a poster to every garage and distributor of oil and gasoline, pointing out

five important methods of preventing waste, as follows:

- 1—That the use of gasoline for cleaning parts be abolished.
- 2—That all leaks in gasoline lines on passenger cars, gasoline tanks, gasoline tank hoses and nozzles, etc., be stopped.
- 3—That careless handling of the gasoline tanks and hoses creating unnecessary waste through spilling be stopped.
- 4—That the tops of gasoline tanks be kept tight.
- 5—That motorists shut off their engines when not driving.

## Plenty of Gasoline if Not Wasted

PLAINFIELD, N. J., July 8—The Wright-Martin Aircraft Corp., Long Island City, has purchased the Plainfield (N. J.) plant of the Bosch Magneto Co. The plant has not been used for some little time. It is not stated for what purpose Wright-Martin will use it.

## Happy Farmer Equipment To Be a One-Man Outfit

LA SALLE, WIS., July 6—A line of farm machinery specially designed for use with the Happy Farmer tractor so that one man can operate the tractor as well as the machinery is being developed. The line will consist of gang plow, disk harrow and power-lift seed drill. The control levers on these pieces of machinery will be such that they can be operated by the tractor driver, thus making the machinery a one-man outfit. The LaCrosse Tractor Co. is working on a production schedule of 4000 tractors this year.

### Overland Factory Being Enlarged

TOLEDO, July 5—The Willys-Overland Co. is building additions costing \$307,430 to its Toledo plant. The largest addition is to be a 300-ft., one-story structure, costing \$225,000, to be fitted as a machine shop for making 8-in. shells, under a new contract recently awarded the company. Other additions are a boiler room, costing \$65,430, and an extension to one of the factory offices at a cost of \$15,000. All have been necessitated by the large demands upon the company by the government.

### Perfex Radiator to Expand

RACINE, WIS., July 8—The Perfex Radiator Co., Racine, Wis., expects to begin work Aug. 1 on its new plant, to be 125 x 300, three stories, and cost more than \$100,000.

### New Shop for Federal

MILWAUKEE, July 8—The Federal Pressed Steel Co., which is devoting much capacity to the manufacture of shells for anti-aircraft guns and other munitions, will build a new machine shop, 100 x 252, at its works on Keefe Avenue, at North Pierce Street, Milwaukee. The project will involve a total expenditure of more than \$125,000 in buildings and equipment.

### Geuder, Paeschke & Frey Adds

MILWAUKEE, July 8—The Geuder, Paeschke & Frey Co. has broken ground for a new galvanizing and pickling shop, 50 x 45, at its main works at Fourteenth Street and St. Paul Avenue. The unit will cost about \$15,000 completely equipped.

### Coast Branch for Hyatt

NEW YORK, July 8—The Hyatt Roller Bearing Co. of Chicago has opened a branch office in San Francisco, from which Pacific Coast trade will be handled. A. W. Fisher will be in charge of the branch.

### Gerlinger to Double Capacity

MILWAUKEE, July 8—The Gerlinger Steel Casting Co. has started work on the construction of additions which will increase the capacity more than 100 per cent. The company has been operating electric steel foundry exclusively for

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

several years, but has been engaged in the steel foundry business for many years. The main addition will be 80 x 171 x 200, and will be equipped with a new 5-ton Moore electric furnace. The present equipment consists of one ¾-ton and one 1½-ton Snyder electric furnaces.

### Austin Developing Farm Tractor

CHICAGO, July 6—The F. C. Austin Corp. has for some time been developing a farm tractor which it expects to start production on this fall, and to build in quantities. This company has for years been a large manufacturer of road machinery, the manufacture of which is continuing, but a new factory is being built for tractor production. Technical details are not available, but it is expected the tractor will sell somewhere between \$1,600 and \$2,000.

### O'Neil Paint Expands

MILWAUKEE, July 8—The O'Neil Oil & Paint Co., 297 East Water Street, Milwaukee, a large refiner and wholesaler of motor oils, gasoline, etc., has increased its capital stock from \$350,000 to \$500,000 to accommodate the growth of its business. At the annual meeting several employees were elected vice-presidents in appreciation of faithful service. Harry C. Topp, assistant treasurer and credit manager, was elected treasurer to succeed William E. Krause, who resigned July 1. The official personnel now is: President, George F. O'Neil; vice-presidents, L. D. O'Neil, James S. Motter, Frederick C. Fowler and Roy H. O'Neil; secretary, H. W. Houghton; treasurer, Harry C. Topp; assistant treasurer, P. M. Lauf.

### Stroh Castings Enlarges Plant

DETROIT, July 6—The Stroh Castings Co. announces the conclusion of plans to add a second plant. The old Denby Motor Truck Co. factory at 22 Dubois Street has been taken over. This has 25,000 sq. ft. of floor space, and will be devoted exclusively to cleaning, grinding, inspection and shipping. The space formerly occupied by these departments will be used for moulding, and the plant will have a capacity of 100 tons of castings daily, 90 per cent of which will be taken by the Government.

### Wilcox Making Army Tents

TOLEDO, July 5—The M. I. Wilcox Co., manufacturer of radiator covers, is working on a government order for tents at the new plant, No. 3, which is a three-story building with basement, and contains 20,000 sq. ft. of floor space.

## United States Carburetor Breaks Ground for Plant

OMAHA, July 6—Ground has been broken for the first unit of the factory buildings to be occupied by the United States Carburetor Co. The company, which is capitalized at \$500,000, is manufacturing a kerosene carburetor, 15,000 of which already have been contracted for, and the output of the factory, about 500 a day, has been sold for some time ahead. The factory will be located on the belt line facing Florence Boulevard. The first structure will be 125 x 125, and will house 200 men. The officers of the company are: President, Henry R. Gering; vice-president, A. C. Marshall; secretary, T. R. Murphy; treasurer, Henry T. Goos.

### Automotive Sales Co. Incorporates

DETROIT, July 6—The Automotive Sales Co. has been incorporated and will conduct an automotive manufacturers' sales agency, with offices at 554 Book Building. W. L. Mack, formerly sales manager of the Shakespeare Co., Kalamazoo, Mich., is president. A. H. Doolittle, for the last 3 years sales manager for the Zenith Carburetor Co., Detroit, is treasurer and manager. The company will sell entire factory outputs and handle all factory sales of the Shakespeare company, Copeman Lubricating System and Connecticut Electric Clock, as well as several other automotive specialties.

### Lapeer Tractor-Truck Plant Complete

LAPEER, MICH., July 6—The new plant of the Lapeer Tractor-Truck Co. was completed last week. It is a two-story structure, 60 by 200 ft. Machinery is being delivered and the plant is expected to be completely equipped within the next 2 weeks. The capital stock of the company is \$100,000, practically all of which has been subscribed for by Lapeer people. The officers of the company are: President, W. H. Tucker; vice-president, C. W. Smith; secretary, E. E. Mix; treasurer, R. T. Carpenter.

### Schweppe & Wilt Enter Machine Tool Field

DETROIT, July 8—The Schweppe & Wilt Mfg. Co. has entered the machine tool field, and has taken over the business and part of the equipment of the Wilt Engineering Co. This latter concern was an engineering and developing company which brought out several new types of machine tools, which the Schweppe company will now manufacture, in addition to its standard automobile parts. The company has greatly increased its floor space.

GRAND RAPIDS, July 8—The Rapid-Change Wheel Co. has been incorporated with a capitalization of \$50,000. The company will make a supplemental hub. The officers are: President, John S. Noel; vice-president, J. Seman; secretary, Louis Dolan; treasurer, H. Hagen.



## Couzens to Run for Mayor— Resigns as Head of Police

DETROIT, July 5—James Couzens, former vice-president and general manager of the Ford Motor Co., and for the past 2 years commissioner of police, has resigned the latter office to become a candidate for mayor.

George Woelfel, Jr., secretary to Commissioner William M. Webster, of the National Association of Automobile Accessory Jobbers, has resigned and will leave the work of the jobbers' association July 13.

N. W. Meyer, former sales promotion manager of the King Auto Sales Co., Detroit, has been appointed sales manager of the Detroit branch of the Roedding Signal Tail Light, Grand Rapids.

O. M. Brede, assistant secretary of the Detroit Section, Society of Automotive Engineers, has enlisted in the aviation section of the United States Army and has left for the aviation repair depot at Lovefield, Dallas, Texas. Mrs. Brede will fill the vacancy during the period of his enlistment.

T. L. Loose, formerly with the Hendee Mfg. Co., Springfield, Mass., is now manager of the Canton spring and axle plants of the Standard Parts Co., succeeding J. B. Childe, who will go to the general offices of the company in Cleveland.

W. L. Woodward, assistant manager of the rim and tube plant of the Standard Parts Co., became the manager of that factory July 1, succeeding J. C. Manterach, whose resignation was effective that date.

B. R. Winborn, until recently sales manager of the Perfection heater division of the Standard Parts Co., has been appointed general manager of that division.

Curtiss Wadleigh has been appointed manager of the New England branch of the Republic Tire Co., succeeding W. S. Carleton, who has entered the government service.

Roy S. Fraser has been placed in charge of the New England branch of the Pennsylvania Tire & Rubber Co., taking the place of Wallace O. Durrell, who has joined the United States Army.

Frank B. Crockett has resigned from the C. P. Rockwell Co., Boston, Mass., to take charge of the New England territory for the H. J. Koehler Co.

Prescott C. Ritchie has been appointed district representative of the Westinghouse Electric Mfg. Co., with headquarters in Indianapolis. He succeeds H. S. Johnson, who has resigned.

J. B. Clarkson, managing director of Hope Gibbons Sons & J. B. Clarkson,

## Men of the Industry

*Changes in Personnel and  
Position*

Wellington, New Zealand, dealer in automobile accessories, who is now in England, expects to sail from there in time to arrive in New York about July 10.

### Palmer to Manage Permalife

NEW YORK, July 8—C. B. Palmer has been elected general manager of the Permalife Storage Battery Co., Poughkeepsie, N. Y., and will have full charge of the business during the absence of President W. H. Lyall, who is in class 1A of the draft and expects soon to enter government service. Mr. Palmer was formerly secretary, treasurer and general manager of the Duchess Mfg. Co., Poughkeepsie, and for the past 2 years has been president of the board of directors.

Major B. H. Gitchel has been appointed chairman of the industrial relations section of the Aircraft Production Board, succeeding C. P. Neill. Major Gitchel is at present assistant in the office of the Secretary of War. Mr. Neill becomes chairman of the Railway Board of Adjustment No. 2.

G. Stanley Porter, who was connected with the Jackson Rim Co., Jackson, Mich., for the past 5 years, will have charge of the fabricated steel wheel department of the Hayes Wheel Co. of the same city.

L. K. Cooper has been appointed sales manager of the Chevrolet Motor Co. of St. Louis with headquarters at the St. Louis plant. He has been assistant to the sales manager of the Chevrolet Motor Co. of New York.

Charles Schenck, who has been with the Budd Wheel Corp., Philadelphia, for the past 2 years, has resigned as manager. His future plans have not been announced.

T. C. Woodin has been appointed sales manager of the Champion Spark Plug Co., Windsor, Ont.

F. W. Henderson has been elected president of the Signal Motor Truck Co., Detroit, to succeed A. C. Burch, resigned, to become vice-president of sales and a director of the Clyde Cars Corp., Clyde, Ohio.

C. C. Winningham has resigned as advertising manager of the Hudson Motor Car Co., Detroit, but retains his stock interests. He has not announced his future plans. It is said that no successor will be appointed during the war.

## R. H. Johnston Elected Vice-President of White

NEW YORK, July 8—R. H. Johnston, who has been manager of the New York branch of the White company since 1910, and has been actively connected with the company for the past 15 years, has been elected a vice-president. He will immediately transfer his headquarters to Washington, and is to be succeeded as New York manager by William H. Moore of Pittsburgh.

### Deliver 5000 Class B Trucks

WASHINGTON, July 6—Slightly more than 5000 class B standard army trucks have been produced and delivered to the Government to date. Production of the B truck, which is 3-ton capacity, is between 75 and 100 per day. Production has been slightly hampered by some delays in parts manufacture.

### Open Bids for Kitchen Trailers

WASHINGTON, July 8—Bids will be opened this week from automobile manufacturers for the 15,000 1½-ton kitchen trailers which will shortly be purchased. These trailers will be for delivery in September or October. Bids were requested in quantities of 500, 1000 and 2000, insuring wide distribution of the orders.

### Refinery Plans Four Buildings

CLEVELAND, July 5—The newly organized Cleveland Smelting & Refining Co. has broken ground for the first of a cluster of units, which will be a storage building, 60 by 140 ft., to cost in the neighborhood of \$20,000. Three other buildings, each 60 by 120 ft., will be erected later. These will be a refining room, blast furnace and copper room.

### New Incorporations

MILWAUKEE—Badger State Sales Co.; capital stock, \$25,000; to deal in new and used motor vehicles; incorporators, Herbert F. Krueger, Milo E. Winkie and others.

MILWAUKEE—O'Neil Oil & Paint Co.; amendment to increase capital stock from \$350,000 to \$500,000.

MILWAUKEE—Crude Oil Gas Burner Co.; amendment to change corporate style to Crude Oil Gas Systems Co. J. L. Marshall, president; J. C. Pinney, Jr., secretary.

RACINE—Racine Mutual Automobile Insurance Co.; no capital stock; to underwrite motor vehicle coverage on mutual plan.

CHICAGO—The Perfection Truck Tire Co.; capital stock, \$25,000; incorporators: F. H. Drury, W. A. Hamilton and W. L. Pollard.

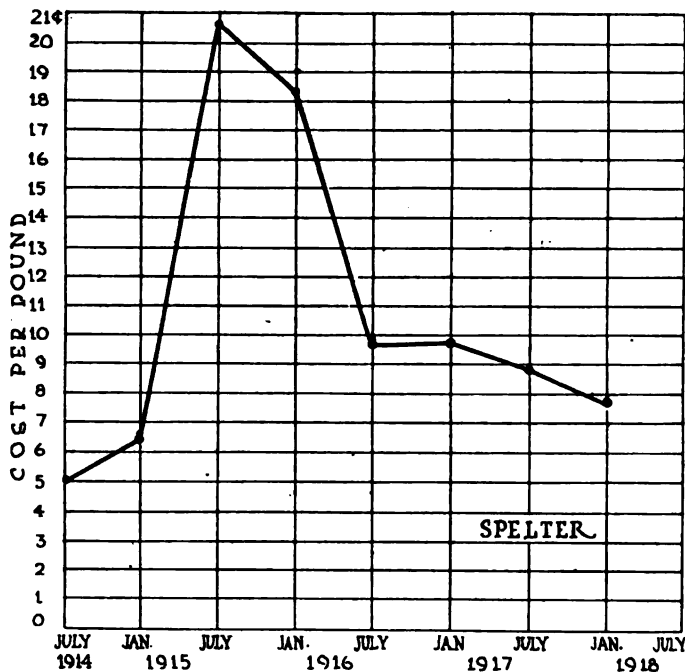
### Dividends Declared

The Chevrolet Motor Co. declared its regular quarterly dividend of 3 per cent, payable Aug. 1 to stockholders of record July 15.

## AUTOMOTIVE MATERIALS MARKETS

## Material Market Prices

<b>Acids:</b>		<b>Copper:</b>	
Muriatic, lb. ....	.02-.03	Elec., lb. ....	.26
Phosphoric, ct. ....	.35-.39	Lake, lb. ....	.26
Sulphuric (60), lb. ....	.11		
<b>Aluminum:</b>		<b>Fabric, Tire (17½ oz.):</b>	
Ingot, lb. ....	.33	Sea Is., combed, lb. ....	1.65-1.70
Sheets (18 gage or more), lb. ....	.40	Egypt, combed, lb. ....	1.20-1.30
Antimony, lb. ....	.13	Egypt, carded, lb. ....	1.15-1.25
<b>Burlap:</b>		Peelers, combed, lb. ....	1.05-1.20
8 oz. yd. ....	.19	Peelers, carded, lb. ....	.95-1.05
10 oz. yd. ....	.23½-.23¾		
		<b>Fibre (¼ in. sheet base), lb. ....</b>	.50



Variations in the price of spelter since July, 1914, based on the average daily quotations each month

<b>Graphite:</b>		<b>Brown, crepe, thin, clear, lb. ....</b>	.60
Ceylon, lb. ....	.07½-.25	Smoked, ribbed sheets, lb. ....	.62
Madagascar, lb. ....	.10-.15		
Mexican, lb. ....	.02½-.08¼	<b>Para:</b>	
<b>Lead, lb. ....</b>	.07½-.08¼	Up River, fine, lb. ....	.68
<b>Leather:</b>		Up River, coarse, lb. ....	.40
Hides, lb. ....	.19-.33	Island, fine, lb. ....	.59
<b>Nickel, lb. ....</b>	.40	Island, coarse, lb. ....	.27
<b>Oil:</b>		Caucho, ball, upper, lb. ....	.40
Gasoline:		Caucho ball, lower, lb. ....	.36
Auto., gal. ....	.24	Sheffac (orange), gal. ....	.70-.76
68 to 70 gal. ....	.30	<b>Spelter</b>	.04½
<b>Lard:</b>		<b>Steel:</b>	
Prime City, gal. ....	2.20	Angle beams and channels, lb. ....	.03
Ex. No. 1, gal. ....	1.45-1.48	Automobile sheet (see sp. table).	
Linseed, gal. ....	1.65	Cold rolled, lb. ....	.06½
Menhaden, gal. ....	1.05	Hot rolled, lb. ....	.03½
<b>Petroleum (crude):</b>		<b>Tin</b>	.94-.95
Kansas, bbl. ....	2.25	<b>Tungsten, lb. ....</b>	2.40
Pennsylvania, bbl. ....	4.00	<b>Waste (cotton), lb. ....</b>	.12½-.17
<b>Rubber:</b>			
Ceylon:			
First latex pale crepe, lb. ....	.63		

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only. Per 100 lb.	Primes when seconds up to 15 per cent are taken. Per 100 lb.	Seconds arising.
Automobile body stock.....	\$5.95	\$5.85	*See Note
Automobile body stock, deep stamping .....	6.20	6.10	
Automobile body stock, extra deep stamping .....	6.45	6.35	
Hood, flat fender, door and apron, or splash guard stock.....	6.05	5.95	
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20	
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45	
Automobile Sheet Extras for Extreme Widths:			
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.			
Nos. 19 to 21 over 36 in. to 44 in., 30c. per 100 lb.			
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.			
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.			
Black sheet extras to apply to narrow widths.			
Oiling, 10c. per 100 lb.			
Patent leveling, 25c. per 100 lb.			
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.			

\*Ten per cent less than the invoice Pittsburgh price for corresponding primes.

## Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co. ....	63	64	-23½
*J. I. Case T. M. Co., pfd. ....	80	86	..
Chalmers Motor Co., com. ....	3½	5	-1
Chalmers Motor Co., pfd. ....	25	35	..
*Chandler Motor Co. ....	81	83	+1
Chevrolet Motor Co. ....	136	138	+4
*Fisher Body Corp., com. ....	35	45	+5
*Fisher Body Corp., pfd. ....	82	87	-2
Fisk Rubber Co., com. ....	55	58	..
Fisk Rubber Co., 1st pfd. ....	98	102	..
Fisk Rubber Co., 2nd pfd. ....	78	83	-20
Firestone Tire & Rubber Co., com. ....	89	91	..
Firestone Tire & Rubber Co., pfd. ....	93	95	..
*General Motors Co., com. ....	157	160	+3
*General Motors Co., pfd. ....	81½	82	..
*B. F. Goodrich Co., com. ....	44½	45	-½
*B. F. Goodrich Co., pfd. ....	97½	100	-1
Goodyear Tire & Rubber Co., com. ....	166	169	-1
Goodyear Tire & Rubber Co., pfd. ....	97	97½	-1½
Grant Motor Car Corp. ....	2½	3	½
Hupp Motor Car Corp., com. ....	3	3½	½
Hupp Motor Car Corp., pfd. ....	78	80½	-½
International Motor Co., com. ....	29	35	..
International Motor Co., 1st pfd. ....	55	65	..
International Motor Co., 2nd pfd. ....	35	43	+3
*Kelly-Springfield Tire Co., com. ....	49	50	-1
*Kelly-Springfield Tire Co., 1st pfd. ....	79	87	..
*Lee Rubber & Tire Corp. ....	18	20	..
*Maxwell Motor Co., Inc., com. ....	31	31½	+3
*Maxwell Motor Co., Inc., 1st pfd. ....	57	58	..
*Maxwell Motor Co., Inc., 2nd pfd. ....	21½	22	+1
Miller Rubber Co., com. ....	103	105	+4
Miller Rubber Co., pfd. ....	92	95	+3
Packard Motor Car Co., com. ....	117	120	..
Packard Motor Car Co., pfd. ....	93	96	..
Paige-Detroit Motor Car Co. ....	18	20	..
Peerless Truck & Motor Corp. ....	14	16	..
Portage Rubber Co., com. ....	102	105	+3

	Bid	Asked	Net Ch'ge
Reo Motor Car Co. ....	13	15	..
*Saxon Motor Car Corp. ....	8½	9	+½
Standard Motor Construction Co. ....	11½	12½	-1½
*Stewart-Warner Speed. Corp. ....	57½	58½	..
*Studebaker Corp., com. ....	46½	47	+½
*Studebaker Corp., pfd. ....	85	90	..
Swinehart Tire & Rubber Co. ....	55	62	-3
United Motors Corp. ....	33½	34	-1
*U. S. Rubber Co., com. ....	59½	60½	+1½
*U. S. Rubber Co., pfd. ....	104½	106½	+1½
*White Motor Co. ....	41	42	..
*Willys-Overland Co., com. ....	20	20½	..
*Willys-Overland Co., pfd. ....	81½	83	..

\*At close July 6. Listed N. Y. Stock Exchange.

## OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	Bid	Asked	Net Ch'ge
ACTIVE STOCKS			
Auto Body Co. ....	16½	..	..
Bower Roller Bearing Co. ....	..	135	..
Chevrolet Motor Co. ....	..	..	..
Commerce Motor Co. ....	5½	5½	+½
Continental Motor Car Co., com. ....	92½	..	..
Continental Motor Car Co., pfd. ....	14	14	..
Edmunds & Jones, com. ....	80	80	..
Edmunds & Jones, pfd. ....	178	..	..
Ford Motor Co. of Canada. ....	12½	12½	..
Hall Lamp Co. ....	113	120	+7
Michigan Stamping Co., com. ....	93½	93	+½
Motor Products	19	..	..
Packard Motor Car Co., com. ....	13½	13½	+½
Packard Motor Car Co., pfd. ....	..	..	..
Paige-Detroit Motor Car Co. ....	..	..	..
Prudden Wheel Co. ....	..	..	..
Reo Motor Car Co. ....	..	..	..

# Scientific Tests for Headlamps

## New York Develops Laboratory Method and Will Certify Anti-Glare Devices

NEW YORK CITY, July 10—A sane effort has been made by Secretary of State Francis H. Hugo of New York, to test headlights for the purpose of determining whether they should be classed as glaring or not. Instead of a state evolving its own scheme, Secretary Hugo has for some months been working with a special committee of the Society of Automotive Engineers and another committee from the Society of Illuminating Engineers. A long line of laboratory experimentation has been carried on, and the result is that glare is to be tested according to the strength of the light at a distance of 100 and 200 ft. in front of the car.

While all of the experimental work was conducted in the laboratory it will be possible with a foot-candle meter to make tests on darkened streets of any city. The entire scope of the law is based on tests with such instruments. This is the first time in which a scientific method of tests has been developed, and one in which the personal equation is almost entirely eliminated.

The New York State law which makes compulsory the elimination of glare provides also for the testing of headlamps by the Secretary of State. The Secretary of State, following a conference between makers of glare eliminating devices and representatives of the S. A. E. and the Society of Illuminating Engineers, has laid down the following specifications to which devices must conform to be acceptable:

- 1—The candlepower must be at least 1200 at a distance of 200 ft. in front of the car and at a point between the roadway and 42 in. above it.
- 2—The candlepower must not exceed 2400 at a distance of 100 ft. in front of the car and at a point 60 in. (or any higher) above the road.
- 3—The candlepower must not exceed 800 at a distance of 100 ft. in front and 7 ft. to the left of the center of the car at a point 60 in. above the road.

According to the provisions of the New York State law, a manufacturer of headlamp glare eliminating devices may submit samples to the Secretary of State for testing. These will be tested according to a standard method and with instruments which are standard and have been developed for this specific purpose. If the devices conform to the specifications previously mentioned a certificate to that effect will be given the manufacturer. If the devices cannot be made to conform to the specifications using the standard bulbs prescribed by the specifications but are O.K. with bulbs of another candlepower, the device may be passed with corresponding limitations.

Any manufacturer of glare eliminating

devices may submit samples of his product to the Secretary of State for testing. The law provides a fee of \$50, payable to the Secretary of State, for the work.

Following is the complete text of "Specifications for Headlight Tests":

### SPECIFICATIONS FOR HEADLIGHT TESTS

#### General Conditions of Acceptability

For the purpose of test the intent of the New York State law dealing with automobile headlights and providing that front lights shall be so arranged, adjusted and operated as to avoid dangerous glare or dazzle, and so that no dangerous or dazzling light, projected to the left of the axis of the vehicle when measured 75 feet or more ahead of the lamps, shall rise above 42 inches on the level surface on which the vehicle stands, such front lights shall be sufficient to reveal any person, vehicle or substantial object on the road straight ahead of such motor vehicle for a distance of at least 200 feet, is deemed to be complied with if the following conditions are fulfilled:

1. Any pair of head lamps under the conditions of use must produce light which, when measured on a level surface on which the vehicle stands at a distance of 200 feet directly in front of the car and at some point between the said level surface and a point 42 inches above this surface, is not less than 1200 apparent candlepower.
2. Any pair of head lamps under the conditions of use shall produce light which, when measured at a distance of 100 feet directly in front of the car, and at a height of 60 inches above the level surface, on which the vehicle stands, does not exceed 2400 apparent candlepower, nor shall this value be exceeded at a greater height than sixty inches.
3. Any pair of head lamps under the conditions of use shall produce a light which, when measured at a distance of 100 feet ahead of the car, and 7 feet or more to the left of the axis of same, and at a height of 60 inches or more above the level surface, on which the vehicle stands, does not exceed 800 apparent candlepower.

#### Conditions of Laboratory Test

In order to determine whether any particular device conforms to these requirements, it shall be subjected to laboratory tests according to the following specifications:

#### Number of Samples

Two pairs of samples of the device submitted shall be subjected to test. In the case of front glasses, the sample shall be of 9 1/4 inch diameter, when practicable.

#### Reflectors and Incandescent Lamps

The reflectors used in connection with the laboratory tests shall be of standard high-grade manufacture of 1.25 inch focal length, with clean and highly polished surfaces and as nearly truly paraboloidal in form as practicable, and as approved for this purpose by the National Bureau of Standards.

The incandescent lamps used in connection with the laboratory test shall be of standard high-grade manufacture and as approved for this purpose by the National Bureau of Standards.

#### Adjustments by Manufacturers' Representative

The manufacturer of the device shall be given due notice of the date and place of test. Manufacturers' representatives present at the test shall be privileged to adjust their devices in any way which represents an ordinary and legitimate adjustment, including tilting the lamps or reflectors, which can be carried out by purchasers of the device, or such adjustment may be made by the laboratory expert acting on the instructions of the manufacturer. The character of the adjustments so made shall be carefully noted and stated in the report as manufacturer's adjustment.

#### Tests

The tests shall be as follows:

- Test 1. Four-point test of pairs of samples. A pair of testing reflectors, mounted similarly to the head lamps on a car, shall be set up in a dark room at a distance of not less than 60 feet nor more than 100 feet from a vertical white screen. If a testing distance of 100 feet is taken, the reflectors shall be set 28 inches apart from center to center, and if a shorter testing distance is taken, the distance between reflectors shall be proportionately reduced. The axis of the lamps shall be parallel and horizontal, or as tilted in accordance with manufacturer's adjust-

ment. The intensity of the combined light shall then be measured with each pair of samples in turn, with the reflectors fitted with a pair of each of the following types of incandescent lamps, in turn.

- (1) Vacuum type, 6-8 volts, 17 mscp., G-12 bulb.
- (2) Gas-filled type, 6-8 volts, 20 mscp., G-12 bulb.

The lamps shall be adjusted to give their rated candlepower. Measurements shall be made at the following points at the surface of the screen:

A In the median vertical plane parallel to the lamp axes, on a level with the lamps.

B In the same plane one degree of arc below the level of the lamps.

C In the same plane one degree of arc above the level of the lamps.

D Four degrees of arc to the left of this plane and one degree of arc above the level.

In an acceptable device both pairs of samples shall conform to the following specifications for observed apparent candlepower.

Points A and B. At least one of these points the apparent candlepower shall not be less than 1200.

Point C. The apparent candlepower shall not exceed 2400.

Point D. The apparent candlepower shall not exceed 800.

Provided, however, that if the test indicates that a device which is unacceptable with either of the test lamps will come within the specifications with lamps of another candlepower or of the other type, the device may be passed with corresponding limitations as to the incandescent lamps to be used in connection with it. Test 2. Complete test of single sample.

A single sample taken as an average representative of the device as manufactured, shall be submitted to a complete test with a vacuum incandescent lamp of 17 candlepower, 6-8 volt rating in a G-12 bulb. This test shall show its light distribution characteristic by actual measurements made according to recognized and exact methods.

#### Distribution of Samples

One pair of the samples submitted shall be retained by the testing laboratory for purpose of future reference and as sample of construction, and the other pair shall be returned to the office of the Secretary of State.

#### Report

The report of the tests shall be rendered in duplicate to the Secretary of State, and shall be signed or initialed not only by the expert making the test, but also by an executive officer of the institution making the test.

It shall include a statement by the testing laboratory as to whether the device when properly applied substantially complied with Section 286 of the Highway Law and shall suggest the maximum candlepower to be used with the same, and as to the other conditions necessary in the operation of the device, in such a way that it will comply with the requirements of this specification.

#### Distribution of Truck Weights

(Continued from page 48)

faster vehicle. Of course, quality of steel used also is a very important factor, but it would be difficult to say whether alloy steel springs are more used in large trucks than in small trucks.

Propeller shaft proportional weights are not affected by load capacity. The average value for this part is 1.45 per cent. Many of the larger trucks have double propeller shafts, and both of these, as well as the universal joints in the transmission line, are included in this figure.

#### First American-Built Handley-Page Bombing Plane Launched

(Continued from page 46)

produced in the whole year of 1915." And on the Liberty engine, the present director of airplane building placed an uncompromising endorsement which has much weight coming from a man of Mr. Ryan's well known conservatism and capacity for getting at facts.



**General Engineer Depot Contracts**

WASHINGTON, June 28—The following awards have been made by the General Engineer Depot, United States Army:

June 19, 1918

Champion Spark Plug Co., Toledo, Ohio; spark plugs.  
Duff Mfg. Co., Pittsburgh, Pa.; automobile jacks.

June 20, 1918

Penberthy Injector Co., Detroit; valves and injectors.

**Medical Contract for Prest-O-Lite**

WASHINGTON, June 26—A contract has been issued by the Surgeon-General of the Army to the Prest-O-Lite Co., Indianapolis, Ind., for laboratory apparatus.

**Ordnance Contracts Awarded**

WASHINGTON, June 28—The Ordnance Department has placed contracts with the following companies:

Nash Motors Co., Kenosha.  
Four Wheel Drive Auto Co., Clintonville, Wis.  
Russel Motor Car Co., Buffalo.  
Willard Storage Battery Co., Cleveland.  
Chicago Pneumatic Tool Co., New York.  
Timken Detroit Axle Co., Detroit.  
Detroit Steel Castings Co., Detroit.  
Commerce Motor Car Co., Detroit.  
Dodge Brothers, Detroit.  
Aluminum Casting Co., New York.  
Packard Motor Car Co., Detroit.  
Pyrene Mfg. Co., New York.  
The White Co., Cleveland.  
Wilson Body Co., Detroit.  
Holt Mfg. Co., Peoria, Ill.  
Motor Trucks (Ltd.), Brantford, Ontario.  
The Miller Rubber Co., Akron.  
Willard Machine Tool Co., Cincinnati.  
Four Wheel Drive Auto Co., Clintonville, Wis.  
The Nash Motors Co., Kenosha.  
Columbia Steel & Shafting Co., Pittsburgh.  
Moline Pressed Steel Co., Moline.  
Simplex Tool Co., Woonsocket.  
North & Judd Mfg. Co., New Britain.  
Olympian Motors Co., Pontiac.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Aluminum Co. of America, Pittsburgh.  
Ford Motor Co., Philadelphia.  
Hugh Lyons Co., Lansing.  
Van Dorn Iron Works, Cleveland.  
West Steel Casting Co., Cleveland.  
Logansport Castings Co., Logansport, Ind.  
McKinnon Chain Co., Buffalo.  
Nash Motors Co., Kenosha.  
Elsemann Magneto Co., Brooklyn, N. Y.

**Contracts**

International Harvester Co. of New Jersey, Chicago.

C. I. Best Gas Traction Co., Dayton.  
American Automobile Accessories Co., Cincinnati.

Maxwell Motor Co., Dayton.

WASHINGTON, July 3—The Surgeon-General of the Army has approved the following contracts:

Plymouth Rubber Co., Canton, Mass., rubberized fabric.

Tyer Rubber Co., Andover, Mass., surgical equipment.

U. S. Rubber Co., New York, basins.

WASHINGTON, July 3—The Bureau of Supplies and Accounts of the Navy has placed the following contracts:

Wayne Oil Tank & Pump Co., Fort Wayne, tanks.

Packard Motor Car Co., Detroit, trucks.

Detroit Forgings Co., Detroit, forgings.

Rome Brass & Copper Co., Rome, N. Y., rods, sheets, tubes.

Wayne Oil Tank & Pump Co., Fort Wayne, measuring pumps.

Ford Motor Co., Detroit, twelve Ford cars.

Becker Milling Machine Co., Hyde Park, Mass., milling machinery.

WASHINGTON, July 3—The Willys-Overland Co., Toledo, Ohio, has a contract with the Ordnance Department for the manufacture of 2927 75-millimeter guns and carriages, according to a letter from Major-General Crozier, Chief of Ordnance, to Senator J. W. Weeks, published in the Congressional Record.

WASHINGTON, July 3—The General Engineer Depot of the War Department has placed the following contracts:

The Acme Rubber Co., Trenton, fire hose.

Arcadia Trailer Corp., Newark, spare parts for trailers.

Goodyear Tire & Rubber Co., Philadelphia, steam hose.

Goodyear Tire & Rubber Co., Dayton, nozzles for fire hose.

Splitdorf Electric Co., Newark, electric parts.

Westinghouse Co., Schenectady, engine parts.

**Navy Contract Awards**

WASHINGTON, July 5—The Bureau of Supplies and Accounts of the Navy Department has placed the following contracts:

Lawrence Bros. Co., South Gardiner, Me., airplane spruce.

Morse & Buffman Co., Providence, airplane spruce.

Van Blerck Motor Co., Washington, gas engines.

WASHINGTON, July 6—The General Engineer Depot, War Department, has placed the following contracts:

Hendee Mfg. Co., Springfield, bicycle and motorcycle tools.

Arcadia Trailer Corp., Newark, N. J., tire-pressure trailers.

Detroit-Trailer Co., Detroit, reversible trailers.

Highway Trailer Co., Edgerton, Wis., reversible trailers.

Thermold Rubber Co., Trenton, hydraulic compressed brake lining.

WASHINGTON, June 29—The General Engineer Depot of the War Department has let contracts as follows:

Acme Road Machinery Co., Frankfort, Ky., portable stone bins.

American Road Machinery Co., Philadelphia, Pa., portable bins.

Goodyear Tire & Rubber Co., Akron, airplane fabric.

August Zimmermann, Washington, speedometers.

**Reo Speedwagons for Canadian Service**

LANSING, MICH., July 6—The Reo Motor Car Co. will deliver under contract to the Canadian Government 185 Reo speedwagons, eighty-five of which will be used for ambulance purposes. For ambulance work the government buys only the chassis, fitting on its own especially made ambulance bodies. The remaining part of the contract will be used for general transportation purposes in hospital work. The speedwagon ambulances will transport wounded men from the transports to hospitals in the interior. The delivery of the Reo speedwagons will make a total of 400 such vehicles in government service in the Dominion.

**Calendar****RACING**

July 27—Chicago. Chicago Speedway.  
Aug. 3—Uniontown. Uniontown Speedway Assn.  
Aug. 10—Providence, R. I.  
Aug. 17—Sheepshead Bay.  
Sept. 2—Uniontown. Uniontown Speedway Assn.  
Sept. 7—Chicago. Chicago Speedway.

Sept. 21—Sheepshead Bay.  
Oct. 5—Cincinnati. Cincinnati Speedway.

**SHOWS**

July 29-Aug. 4—Salina, Kan. National Tractor Demonstration. Auspices of National Implement and Vehicle Assn.  
Sept. 14-21—Chicago. Automobile

and Accessories War Exposition, Municipal Pier.  
Oct. 14-27—Dallas, Tex. Seventh Annual Texas Automobile Show. Texas State Fair.  
Oct. 16-18—Ottawa, Ont. International Plowing Match, Tractor and Farm Machinery Demonstration. Experimental Farm.

**ENGINEERING**

Sept. 2—Cripple Creek, Colo. American Institute of Mining Engineers.  
Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.



features, and a part of its circulation, have been merged with

# AUTOMOTIVE INDUSTRIES

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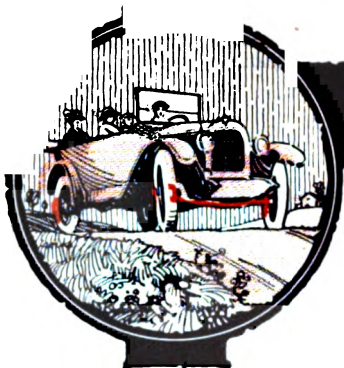
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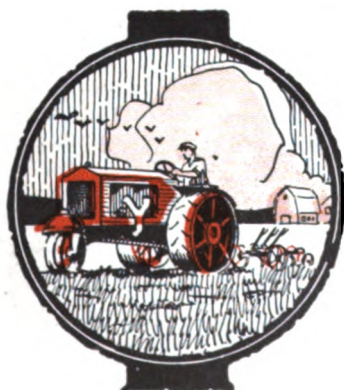
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# AUTOMOTIVE INDUSTRIES

## AUTOMOBILE

VOL. XXXIX

NEW YORK—THURSDAY, JULY 18, 1918—CHICAGO

No. 3

## Commercial Aviation in Our Foreign Trade

Mail Parcel Post and Light Express Service to Europe and  
South America a Certainty—Quick Conversion of  
Fighting Planes to Planes of Commerce

**A**LTHOUGH no definite program for industrial reconstruction measures following the close of the war has been formulated, industries are already looking forward to that period. This is especially true of the aircraft manufacturer who is preparing for the greatest possible output and who recognizes that with the close of the war the demand for planes will quickly cease unless industrial consuming channels are developed. Already England has announced what might be taken as an indication of her aerial policy. She has planned mail routes by air from London to Australia by way of India, which will bring Bombay, Sydney and Melbourne a matter of days from London as compared with weeks. These will be extended to Canada, Africa and some islands of the ocean.

Reports filtering from Germany indicate that she is awake to aviation possibilities in commerce after the war. It is reported she already has blueprints of huge commercial machines for long-distance flying that will not be limited to mail routes or parcel post service, but that are ideally suited for light express matter.

### Germany a Serious Trade Rival

The value of such a program in controlling foreign trade cannot be over estimated. Germany must be looked upon as a serious trade rival. This is chiefly true in aviation because she has been a leader in standardizing aircraft. The work of America in

standardizing automobiles has proved an object lesson to Germany. Germany seems to have taken our standardization lesson, hook, bait and sinker for her commercial aviation program. She has standardized her war airplane program. This will make her a trade factor of first importance and one that we cannot afford to stand idly by and passively watch.

### Commercial Airplane Service Needed

The necessity of commercial airplane service as related to the United States must not be overlooked. With South America there is urgent need for such a mail service. There is a broad field for such a parcel post service and there is almost a limitless field for such a service as carrying light express and merchandise.

Take the case of Argentina as an example of how an air service can work out. At present the City of Buenos Aires is approximately 22 days by steamboat from New York. There is no reason why these 6000 miles should not be covered in 15 days or perhaps 17 were fast steamboat lines organized. Undoubtedly competition after the war will bring such about. But 2 weeks from New York to Buenos Aires is a slow mail service for the conduct of important business. This means an inside limit of 6 weeks from the time a letter leaves an inland manufacturing city in America until a reply can be received from a merchant in Buenos Aires. There is not sufficient flexibility in this for good business

transactions. Cable rates are almost prohibitive, but while cables are largely used they are resulting in an increase of the retail price of American commodities in Argentina, which is not good business in meeting the products of cheaper European labor. Cable charges of over \$50 have been added to some retail automobile prices in a few cases.

With an airplane mail service covering the 6000 miles between New York and Buenos Aires, it will be possible to cut the present 22 days to at least 5 or 6 days at the outside. This means one-third the time required for mail that is needed at present. The value of this saving of time is almost incalculable to the American merchant as well as to the Argentine merchant.

### Airplane Must Supplement Ships

It will be literally impossible for America to establish its trade supremacy in South America and hold that trade which has been handed to us by the war without meeting our European competitors on the same basis of mail service that Europe will offer. Our increased number of merchant ships will not be sufficient to offset the advantage that an aerial mail service will give to Europe.

The conclusion of the war will without doubt find us with great shipping facilities. Our present ship-building program, together with the curb on the submarine indicates this. We must prepare to use this shipping tonnage to the greatest advantage. The airplane must supplement the cable service and the boat service in this respect.

Crossing the North Atlantic in an airplane has taken the spot-light position of accomplishment which for years was occupied by the North Pole. The person first crossing the North Atlantic in an airplane will compare with Peary, Scott, Amundsen and other great Polar discoverers. Conviction is gaining every week that the flight across the North Atlantic may be an accomplishment before the end of the year. Already rewards of \$60,000 have been offered for the first aviator making such a flight.

### Flight to South America is Simple

The airplane flight to South America should be much safer and much simpler than that across the North Atlantic. The heavy seas and storms of the North Atlantic are entirely lacking in the equatorial Atlantic. For days this part of the ocean is as calm as a mill-pond. This is of great value in trans-ocean flying. Undoubtedly the shore-line route could be followed once

the South American continent is reached, which would be at some point adjacent to the Amazon or further north if necessary. Land routes across South America would be very difficult because of the sparsely populated areas of country and the lack of competent repairmen to care for a machine. On the other hand, the coast-line route should be relatively safe for large hydroplanes or flying boats.

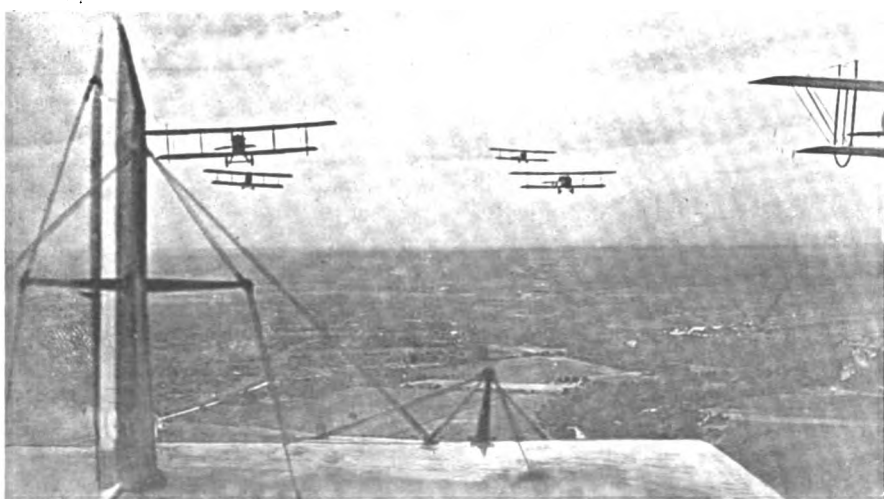
Airplanes designed for war work would be readily convertible into vehicles of commerce. The conversion is much easier than that for land vehicles. It is rather difficult to adapt a land vehicle such as a tractor intended for hauling field guns over soft land into any useful field of commerce because these tractors would scarcely be used under anything approaching parallel conditions in peace times. With the airplane the conversion is different. They all travel through the air. It will simply be a question of changing the arrangements for carrying the load and load space. A machine adapted for carrying large quantities of bombs can, without great difficulty, be converted into a plane suited for carrying mails or express. This service gives indication of being a channel through which quick use can be made of our great quantities of bombing planes that are now being planned to manufacture. It will also apply to the larger or super-bombers which may be brought out before the termination of the war.

Trade conditions between Europe and America, which are certain to follow the war, will be vastly altered because of airplane service. So far as commerce is concerned the week will be reduced to a day. Mails which formerly took a week from New York to London, Paris and Berlin will be carried in a day. Undoubtedly valuable express packages will be similarly accelerated in transit. It is almost impossible to conceive the advantage that one country will have which possesses such service on a commercial basis over other countries that are not prepared to meet it.

### Military Planes To Become Merchant Planes

Once the North Atlantic has been bridged, so to speak, by the airplane, a new military relationship will have been set up. The isolation of America by

the North Atlantic will have ceased to exist. Within 24 hours a hostile nation in Europe will be able to seriously injure, and to quite an extent destroy the industrial portions of some cities. America must build to meet these requirements. Military planes of today will be merchant planes of peace days.



American training planes flying in formation at Kelly Field, San Antonio, Tex.

# The Effect of Long Working Hours on Industrial Efficiency

Indications and Measurement of Fatigue—How Hourly and Total Output Have Been Increased by a Reduction of Hours of Labor—  
Some Recent British Experiments

**T**HAT the initial indications of fatigue and the correct measurement of its extent at any moment lie in its objective rather than in its subjective symptoms is one of the first principles of industrial efficiency in so far as it pertains to the individual operative. In determining when fatigue begins to affect the efficiency of an operative or a group of operatives or the amount that that efficiency has been impaired by it, the thing to be studied is not the operative but rather production, the output for some definite unit of time.

Before an operative *feels* tired physically or mentally he is tired industrially. His capacity to produce is reduced perceptibly before the subjective symptoms of fatigue are evident in his bodily sensations. Industrial fatigue is usually fatigue of the nervous system, not muscular fatigue, and it is caused not by the exhaustion of a latent supply of energy, as is sometimes thought, but rather by an accumulation of the products of chemical changes involved in physical exertion.

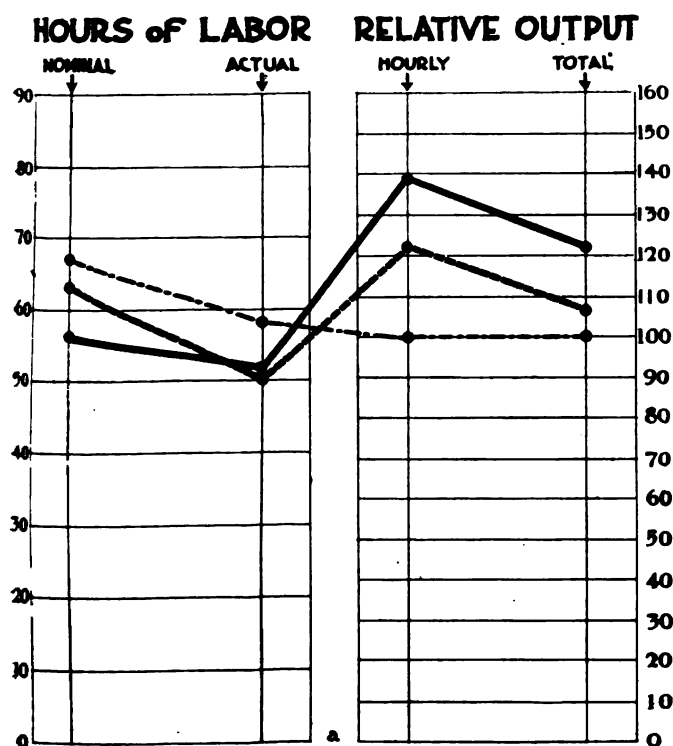
Fatigue is cumulative in effect, if sufficient rest intervals are not provided between periods of work. Opportunity must be given for the dissipation of the products

accumulated within the system during the hours of labor. Accumulated fatigue, the result of a continued overtaking of an individual's capacity, affects other portions of the nervous system and may cause, and usually does, a diminished quickness of response and a dulling of the senses of sight or hearing. These correlated symptoms indicate what is known as associated fatigue and are forerunners, not easily detected, of the more apparent indications of staleness which is commonly observed where hours of labor are too long, rest intervals too short and holidays or "days off" not sufficiently frequent.

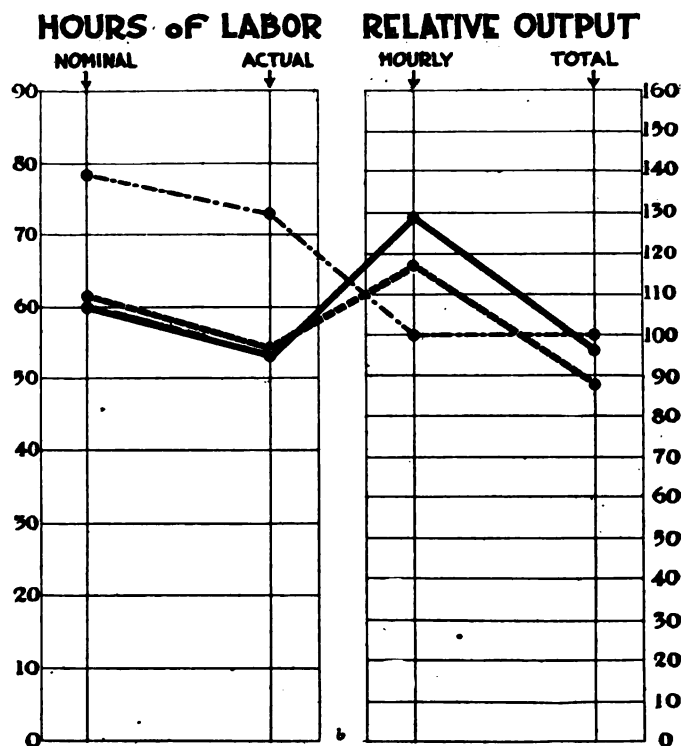
Where staleness exists there will also be found poor "time-keeping," as the British call it, and a marked tendency toward a general indulgence in more strong drink than is good for the well-being of the worker.

It is because of these facts that beneficial results measured in terms of output capacity have been observed, in many cases, when the length of working hours has been reduced and the length of rest intervals and frequency of holidays increased.

In connection with munition work, the British Health of Munition Workers has made a most thorough study of



Case 1—Women turning fuse bodies



Case 2—Women cutting a screw thread

The four points in each of the three test periods on the two scales for each case are connected together by distinguishing lines, the lighter broken line being used to connect the points for the first period, the heavy broken line, to connect the points for the second period and the continuous line to connect the points for the third period. By following these lines the relationship of the nominal and actual hours of labor and the relative hourly and total outputs for each period may easily be observed and comparison made with the other periods

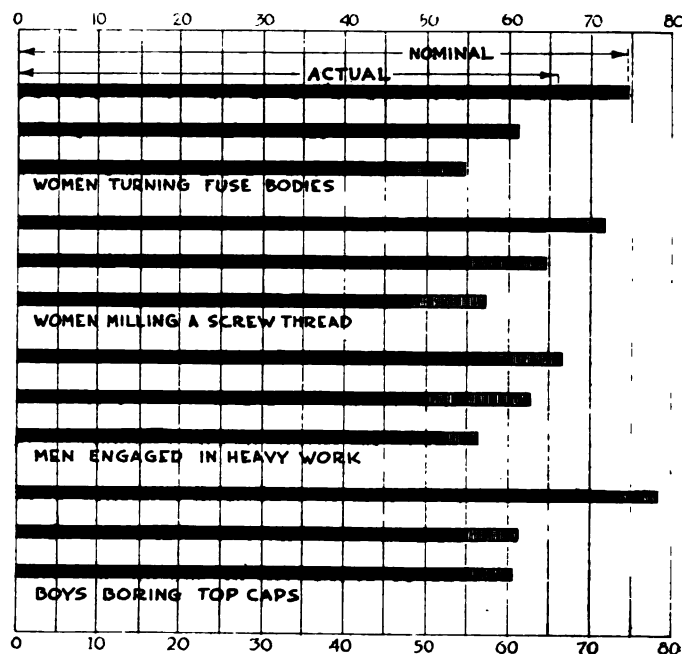


the effects of hours of labor on production and has developed some most interesting illustrations of what can be done toward increasing general industrial efficiency by decreasing the length of time during which operatives are called upon or permitted to work.

They had a good opportunity to make improvement in conditions as they existed at the time the tests were begun and to observe the effect, in extreme cases at least, of the scientific application of easily discovered physiological facts to the problem of obtaining industrial efficiency. It was common for men to work 14 hours a day for 6 days of the week and then work 10 hours or so on Sunday. Women worked 12 hours a day. The hours of labor were so long when the country awoke to a realization of the fact that productive efficiency was being seriously impaired that the committee, in recommending a working week not to exceed 65 to 67 hours for men and 60 hours for women was urging such a material reduction that those not familiar with the reasons which prompted the recommendations felt that output would be sure to suffer.

Several concrete cases illustrating how both hourly output and total output were actually increased when the number of hours of the working week were reduced are shown on these pages by means of charts and comparative lines drawn to scale to represent relative lengths of working periods and quantities of output.

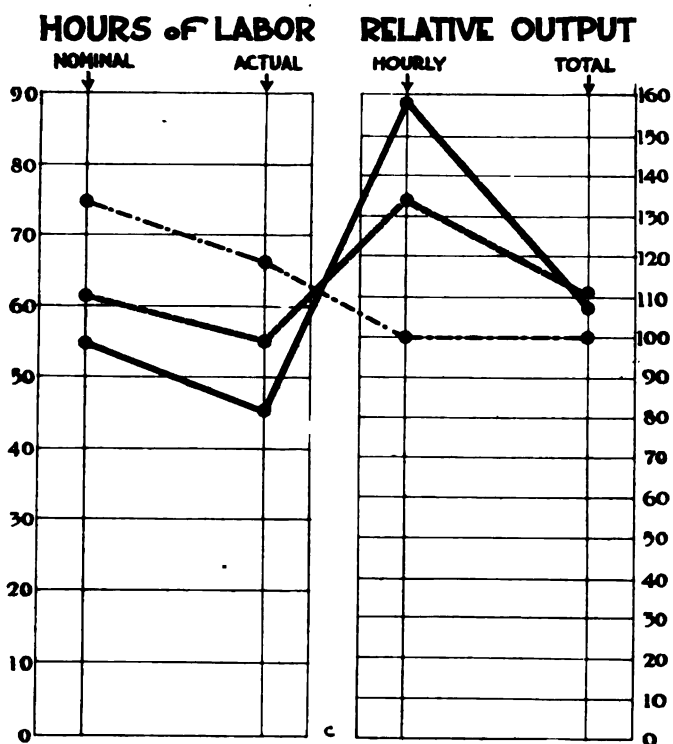
Even though we have long known that "all work and no play makes Jack a dull boy," the results obtained in some of these cases are little short of startling. This is true not only of the way in which output rate and total output increased when working hours were shortened, but in one of the cases it is also true of the manner in which the difference between nominal and working hours became smaller. In this particular case, which is that of men doing heavy work, there was a slight increase of actual hours of labor when the nominal hours were reduced below a certain point. Owing to a discontinuance of Sunday work, the general attendance of the operatives was



Showing the relationship of the actual working hours per week to the nominal as the number of hours in the working week was reduced in each of the four cases here considered

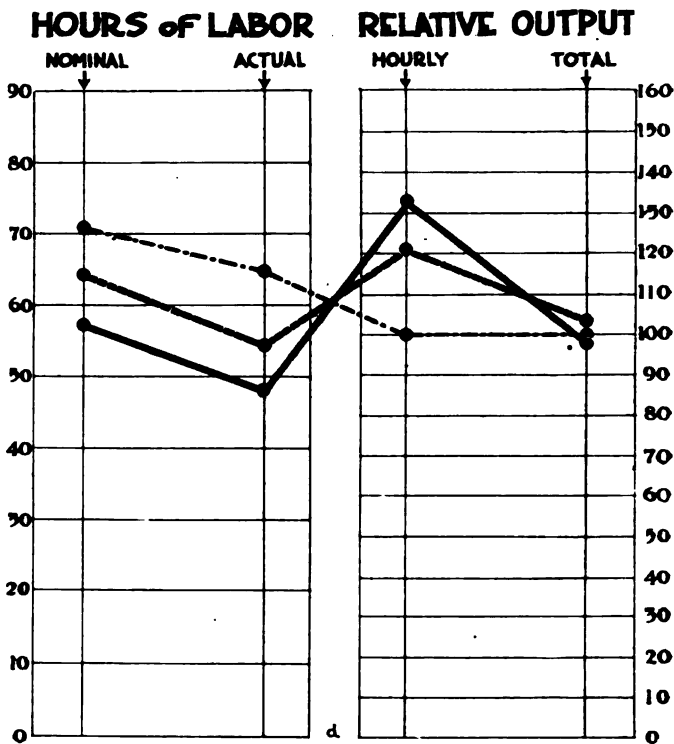
so much improved that the average for the actual hours worked was higher than it had been before.

It is not at all likely that we can secure so great a benefit from a reduction of working hours as they did in Great Britain because of the fact that our hours of labor are less per week on the average than they were and still are there. But there is food for serious thought in the experience of our British brothers and the suggestion, at least, that by giving more study to our own individual cases with British experiences in mind, we may be able still further to increase our industrial efficiency or at least



Case 3—Men engaged in heavy work

The same kinds of distinguishing lines are used in the diagrams above to connect the four points for each of the three test periods as are used in the illustrations for cases 1 and 2. The light broken line indicates the first period, the heavy broken line, the second period, and the continuous line the third period



Case 4—Boys boring top caps

avoid falling, as they did, into the mistaken belief that the way to increase output is to work longer on the job.

The data used in all of the cases taken up in the diagrams accompanying were gathered in large and recently constructed munitions plants in which the working conditions were as good as they are anywhere today. The lighting, heating and ventilation were provided by modern equipment and were regarded as fully adequate according to present standards. There were canteens where refreshments were obtainable and opportunity was provided for their use. All the operatives included were on piecework at a high rate and were not under trade union restrictions as to output. There was therefore every inducement and favorable conditions as to environment for maximum production.

In the first case women were engaged in turning aluminum fuse bodies which is rated as "moderately heavy labor." They stood all day at turret lathes and performed seven boring and cutting operations on each piece. The work required close and constant attention as much of it was of a delicate character and as a result there was no great opportunity for relaxation. One hundred women, each of whom had reached maximum production after approximately 3 weeks' training and some experience in the production department and had worked during at least 15 of the 24 weeks over which the tests extended, were included. Before the period during which the tests were made, working hours had usually been between 75 and 80 per week with no Sunday work in the second week of each month. In the case under consideration the first period was made up of 6 weeks and there was Sunday labor in five of them. During the second period of 8 weeks the women worked on three Sundays for a few hours each. Unfortunately for some reason the attendance was extremely poor during the third period, so much so that while the hourly output rate increased from 134 to 158, a jump of nearly 18 per cent, the relative total output fell from 111 to 109. If the ratio of actual hours to the nominal of the second period had been maintained in the third, and there seems to be no particular reason why it should not have been, the relative total output would have been increased from 111 for the second period to 117 for the third.

It was the conclusion of the committee that "a 50-hour week yields as good an output as a 66-hour week and a considerably better one than a 75-hour week" when women are engaged in moderately heavy lathe work.

We have, in the second case, an instance in which the rate of output is largely regulated by the speed of the machines employed. For four-fifths of the time the operatives stood idly by watching their semi-automatic machines run. Every minute or so they removed one fuse body and inserted a new one, an operation which required only a few seconds. The work was light and called for but little physical exertion and not such close application as did the turning of the fuse bodies considered in the first case. The period of this test was 24 weeks also and the work of twenty-one women was included. The hourly output varied very much as it did in the first case, but not to so great an extent, because, as has been pointed out, the speed of the machine was practically the determining factor.

It is in the third case—that of men engaged in heavy work—that the most interesting results were obtained. The work consisted of sizing fuse bodies. It is considered one of the most fatiguing kinds of munition work. Each piece is subjected to four separate operations. While no particular skill is required, a heavy continuous strain is imposed on the muscles of one arm and shoulder and also on the back. The lifting of the pieces is almost always done with one hand as the operators prefer to keep the

other hand dry as it is used for running a tap through the piece to cut a thread and the oily condition of the piece makes it harder to do this if both hands are used in lifting it. The averages of twenty-seven men were used in making the calculations in this case.

A most interesting point in this case is that in spite of the fact that the nominal hours were reduced in the third period, the actual hours worked were more than they were in the second period. There were also some remarkable increases in relative hourly and total output. It will be noted that the relative hourly output increased from 100 to 122 and then to 139 when the nominal hours were reduced from 66.7 to 62.8 and then to 56.5 and that the relative total output increased from 100 to 106 and then to 122, the latter unusual jump being due in part to the increase in the actual hours worked.

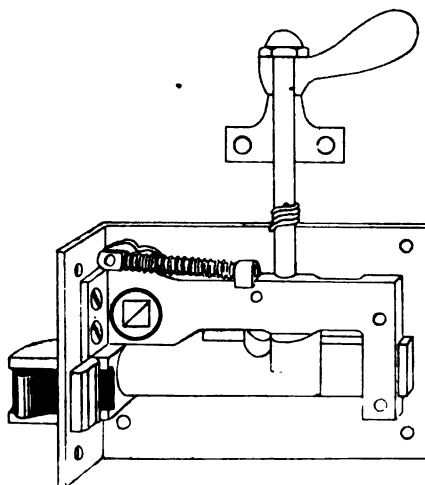
As only seventeen boys of from 15 to 18 years of age were included in the fourth case the data derived are not so comprehensive. The process on which the boys were engaged, namely, boring top caps, involved the use of semi-automatic machines and the speed of these machines very largely determined the rate of output. There were two clamping and unclamping operations every 15 seconds and these operations consumed about 2 seconds. A substantial increase was noted in relative hourly output with a reduction of hours of labor, but because attendance fell off for some unaccountable reason during the second period the relative total output also showed a decrease. In the third period with practically no change in hours from the second, the relative total output very closely approached that of the maximum working period.

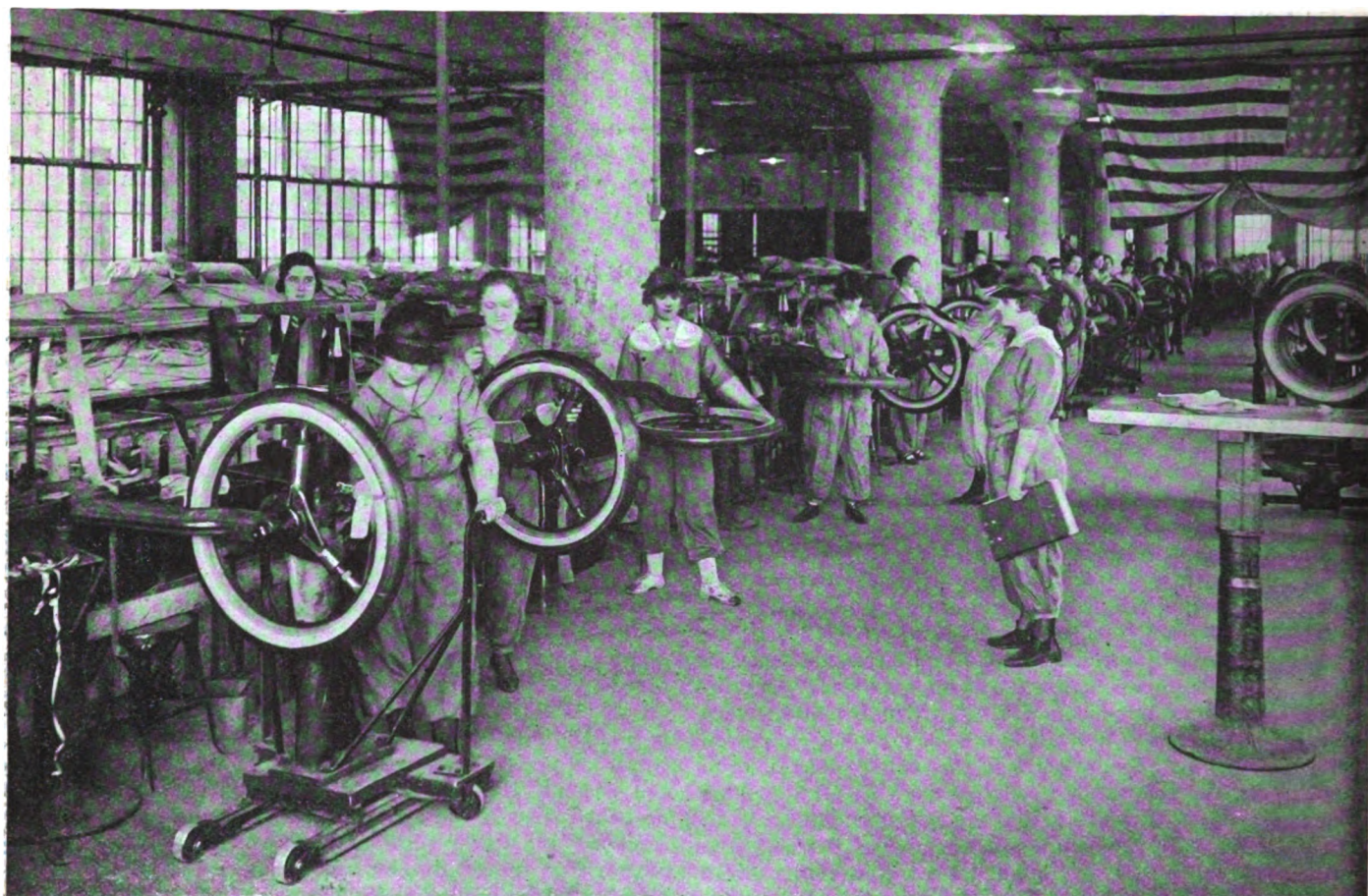
These and other similar tests convinced the British authorities that reductions of from 7 to 20 hours per week could be made below what had been considered the necessary working schedules for maximum production without loss of total output. They have accordingly revised their schedules and production is again expressed by an upward curve.

## Anti-Rattling Door Lock

THE Ottinger anti-rattling device as incorporated in some of the locks manufactured by the English & Mersick Co., is designed to prevent door rattle without the use of rubber bumpers on the jamb. It consists of a cam inserted in the bolt, and the ejecting pressure behind the bolt is utilized to force the cam against the holding portion of the striker.

At the beginning of its movement the cam is embedded in the bolt so that there is no pressure to be overcome in opening or closing the door except that behind the bolt. It is not necessary to slam the door. As the bolt passes behind the striker the inner end of the cam is forced in and the outer end emerges from its recess in the bolt until it bears tightly on the striker, thus holding the door firmly.





*With the aid of a lifting jack, women are able to work efficiently in the tire-finishing department of the Morgan & Wright plant*

**A**T the plant of Morgan & Wright, in Detroit—a branch of the U. S. Tire Co.—women are employed in many departments where the work done taxed the endurance of the strong, able-bodied men who formerly did it. On the heavier work they are found not quite so efficient as men, but the company has been obliged to use them on such work because of the shortage of male help. All together there are employed in this plant 500 women who have taken the places of men, and it is the general opinion of those in charge of the various departments that they do the work better than the men did.

Through its development department the company is constantly improving its equipment with a view to reducing physical exertion as much as possible, not only for the benefit of the women but for the men as well. This improved equipment has already enabled the company to place women on certain kinds of work which were formerly of a character altogether too strenuous for them.

A trip through the factory discloses women engaged in a wide variety of occupations. They work in the tire-finishing room, in the flap department, in the wire room, in the department where cord tires are made, in the shipping room and warehouse; they make beads for tires, and work in various other capacities.

A striking example of what women can do in the way of hard physical labor is provided in the final inspection room. Here a pile of heavy tires is deposited at the feet of the women, from which they take one at a time and place it upright upon two large spools sunk in a table before which they work. The tires are revolved on the spools and carefully inspected for defects. The operation is repeated to inspect the other side, after which the tire is properly stamped and thrown on another pile.

Despite the fact that the weights of the tires vary

## Improved Equipment of Additional

**Morgan & Wright Have Installed Many**

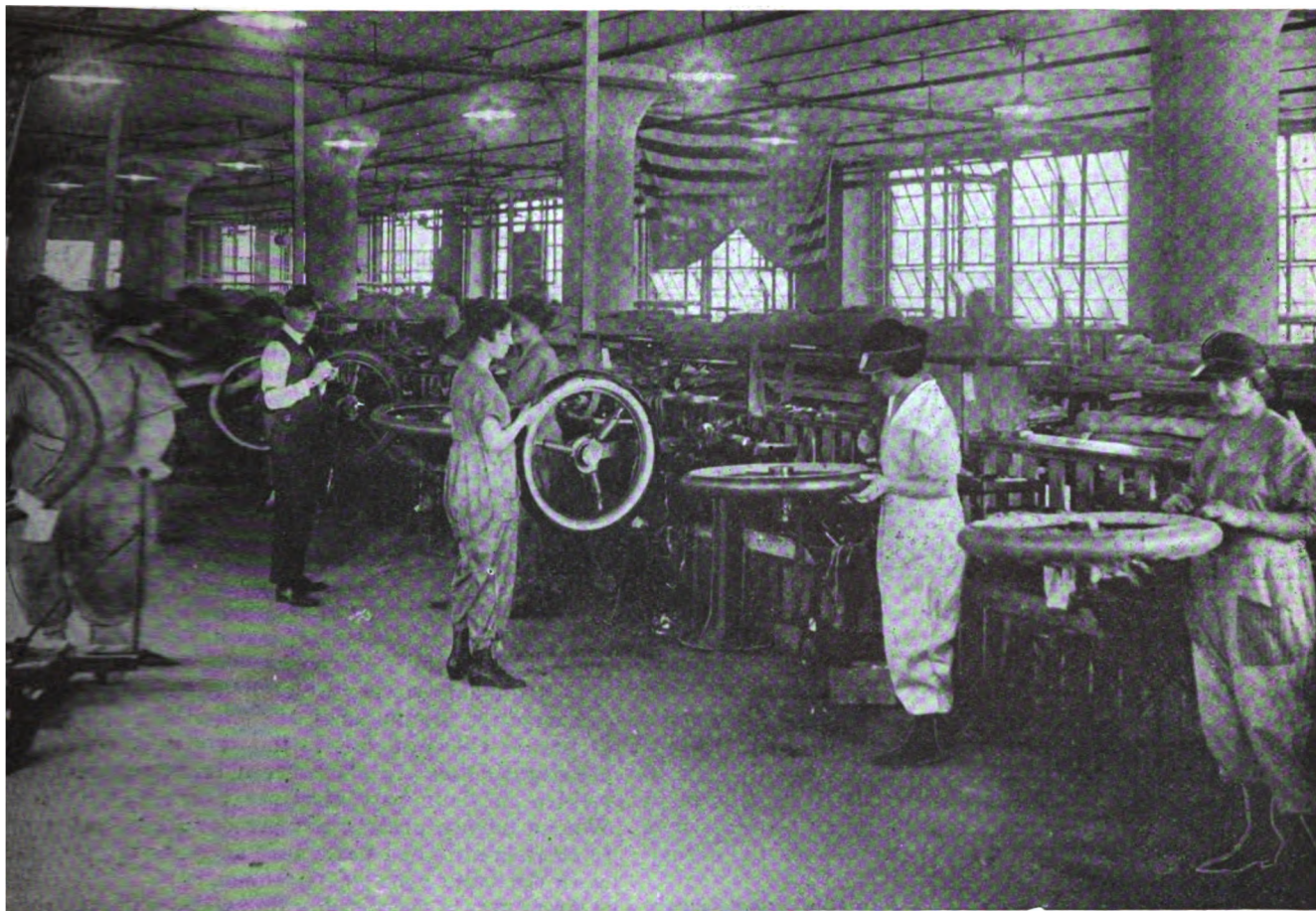
from 14 to 20 lb. each, and that an average worker handles between 400 and 500 tires a day, the women find very little difficulty in the work. They lift nearly 8000 lb., or 4 tons, daily, and when it is remembered that this is only half of the operation, that it is necessary to throw the tires again on another pile after inspection, the task seems astounding. Yet they manage it with apparent ease.

With the aid of a lifting jack—a device developed from an idea of an employee—the physical effort required for the work in the finishing room was reduced to such a degree that the company was enabled to place women at work there. It may be mentioned here that the company encourages employees to make suggestions that facilitate work or result in its being done more efficiently. Awards are offered for the best suggestions.

The work in the tire-finishing department consists of applying several strips of fabric and gum over the tires as they come from the tire building room. Only 3, 3½ and 4-in. sizes are handled by women. The tires are brought into the department on trucks which are fitted with T-shaped steel uprights from which the tires are suspended. When the worker is ready to start on a new tire she approaches the loaded truck with a lifting jack.

As the worker turns a wheel at one side of the jack an arm is raised. This is guided under the nearest tire, lifting it off the T-shaped fixture on the truck. The lift-





*When the tires are adjusted on the finishing buck, the worker is ready to apply three plies and four gum strips entirely by hand*

## mits Employment men Workers

### g Devices to Lighten Their Work

vice, which is mounted on casters, is then pushed to the worker's bench; the tire is lowered, and transferred to a finishing buck—a steel wheel having weighted spokes. When properly adjusted on the finishing buck the woman starts at once to apply various strips of fabric. After three plies have been put on, four strips are next applied, the last of which is the

these operations are performed by hand. As each is applied the finishing buck is given a vigorous causing it to revolve. While thus in motion a is held against the strip for the purpose of making it adhere securely. The edges are then cut off with a sharp knife. The next six layers are applied in the same manner. The lifting jack is again used in removing the tire and placing it on a truck.

is work was formerly done entirely by men; in fact, men have not replaced all the men in this department. There are still a number of men employed at this work. It is in this department that women were first introduced in the plant. This was in May, 1917, when several were taken on. They proved so satisfactory that the company was encouraged to add more from time to time, and now there are a large number engaged in this department each shift.

in connection with  
women are

in the tire-finishing department to supply the workers

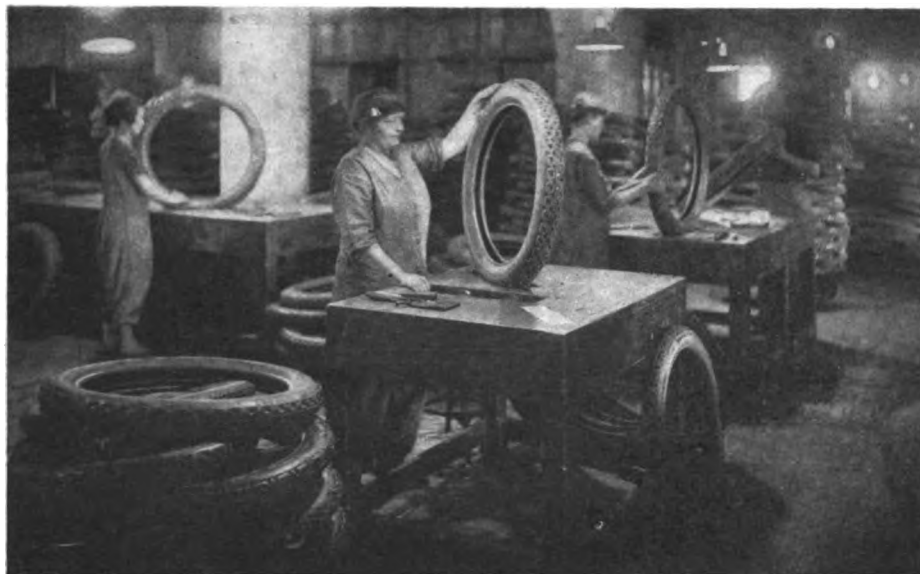
with stock. It is necessary for these stock girls, as they may be called, to be extremely familiar with the various kinds of strips and their names, so that when a worker calls for a certain kind there will be no delay in supplying him or her with the required piece. Women have completely replaced men in this line of work; they supply stock to men as well as to the women. This work is comparatively light, and can be performed satisfactorily.

To give the reader a clearer conception of the operator's work in the wire room, where the basis for beads is made, it may be well to first describe the machine on which the operation is performed.

The machine wraps with tape a coil of wire which passes over two spools, one above the other. In order to keep the wire taut while in the process of being wrapped, there must be a tension between the spools. This is accomplished at the will of the operator, who sits on a seat at the end of a bar projecting from the machine. This seat acts in conjunction with the lower spool. As the operator sits down her weight bears down on the bar and simultaneously lowers the spool. When the bar is relieved of its weight, or, in other words, when the operator rises off the seat, the bar springs up, causing the spool to slide upward.

The spools must be in this relieved position to permit the coil of wire to be put over them. As soon as it is adjusted, the operator sits down, tightening the coil over the spools, and commences the operation of winding. Then the operator is obliged to stand up again before she can disengage the wrapped coil.

It takes less than 10 seconds to wrap a coil and about as long to release the finished coil and adjust a new one. This means that the operator must sit down and jump up once every 20 seconds, or three times a minute. This is



*In the inspection room women examine first one side and then the other of each tire*

equal to 180 times an hour, and, estimated on an 8-hr. basis, amounts to 1280 times that a woman must move up and down during a day's work. Women are as efficient as men in this work and are very rapid.

The coils of wire are made and soldered by women in the same room. The coiling is done by an operator in a standing position, while the work of soldering is accomplished by a seated worker.

The next two steps in the manufacture of beads, wrapping and trimming, are also performed by women. About six persons are used on this work in one shift.

Many women are employed in the pocket department, the latest department to experiment with the use of female labor. The most difficult task in this department is that of carrying what are called books. These consist of a supply of fabric for cord tires, placed in layers on boards about 8 ft. long. At first, every worker was obliged to handle her own supply of books. The women—one at each end—would carry these from the source of supply to their racks, but it was found later that this work was too heavy for women, so men are now used to carry the books for the women as they require them.

#### **Work of Heavy Character**

The work in this department consists of taking a piece of fabric from a book, cutting it the required length, and stretching it over a large drum of equal circumference, one layer over another, until a certain thickness is attained. These bands are then removed from the drum and conveyed to another department, where they are put over a tire core by men.

In other departments where women are employed the work is of lighter character. A number of women are engaged in the cutting of treads; several are used to trim the uneven fabric edges from the rubber tread, while others cement the ends together; another group makes patches for repair kits; still others stamp sizes and names on inner tubes, and others work in the packing room, where the product is boxed.

A great number of women are engaged as inspectors in numerous departments. As the finished casings are finally inspected they are sent to women who check their serial numbers and weigh each tire.

The company made extensive experiments with the training of help for the various kinds of work. Two years ago, with the training of men in mind, it estab-

lished a vestibule school, but after 6 months' trial it was abandoned. It did not prove successful. Despite the fact that the vestibule idea is working to advantage in machine shops, it is felt by the company that it cannot be made to operate efficiently in the rubber industry. At the Morgan & Wright plant it was found better to train students among the other workers. The students develop faster, and have a greater opportunity to grasp efficient methods and acquire short cuts, which come to them more slowly in the vestibule school.

It was noted that students graduating from the school, when entering regular production, could not keep up with the supply of work; they were always behind. As they are now trained—with the regular workers—women are taken out of the student class after 6 or 7 weeks. It has been found that

they are much quicker to learn than men.

Excepting the students, the women get the same rate of pay as the men, but in the aggregate their earnings are slightly less. In a number of instances, however, they receive in their pay envelopes as much as some men. Women have a greater number of actual working hours to their credit than men; they are much steadier. They work the same 8-hr. shifts as men.

Great care is exercised in the selection of women. Both the employment manager and the matron interview them. After being hired, a woman is taken by the matron to the department where she is assigned to work, and is made to feel as much at home as possible. There are two matrons, one for night duty, the other for day. The matron always aims to be with the girls at lunch hour. Special rest and locker rooms are provided, to which the women may retire at any time during their working hours.

## **Employee Group Insurance**

**U**NDER the shifting conditions existing to-day the employer is ready to adopt any good plan that promises to keep down his labor turnover. One of the latest and most popular forms of welfare work is group insurance. This new form of insurance was launched early in 1911.

Group insurance has been called "an employer-employee mutual benefit proposition," says a report of the Committee on Industrial Betterment of the National Association of Manufacturers. The plan contemplates that the employer shall insure his whole body of employees, as a group, bearing the entire cost of carrying the insurance, which is made especially low. If the group includes more than 100 a medical examination is not required. Of course, there must be no unusual hazards in the business, the factory conditions must be wholesome and the risks as a whole desirable.

Since the employer pays the insurance premium, the workman loses his insurance when he leaves his job. The new workman takes on insurance with his new position.

The unit for group insurance may be the year's salary or earnings up to \$3,000 for any individual. It may be arranged for the beneficiary to receive this in twelve monthly payments, thus continuing the family income for a year after the death of the worker. Instead of the salary unit a fixed amount, as \$500 or \$1,000 may be taken for each individual. Where the smaller unit is taken there is usually a provision to increase the benefit \$100 with each year of service until a certain limit has been reached.

# A New Chassis Lubrication System

A Scheme by Which Oil Is Fed to Bearings by Wicks—Quantity Fed Is Regulated by Localized Compression of the Wicks—Large Supply of the Lubricant Easily Carried

**F**OR some time it has been apparent that a better lubricant than grease is desirable for such parts of passenger cars and trucks as spring bolts, brake shafts, brake connections, radius rod connections, drag links, spring shackles, etc.

The tendency of grease to harden in its way with age, as well as its tendency to take the path of least resistance when forced by pressure to bearing surfaces, have been serious drawbacks to its use as a chassis lubricant. The grease works out of the bearing, possibly at one of the ends, without being

distributed over the surfaces to be lubricated, and it also works out of the grease cup around the cap.

Some of the materials used in making grease have very small lubricating value, if any, which means that not all of the material fed to bearing surfaces serves to lubricate them. A considerable amount of dirt of one kind or another is usually fed to the surfaces to be lubricated with the grease and, owing to the conventional manner of exposing the grease containers, in shops and garages, the efficiency of grease is farther reduced. There are other inconveniences connected with the use of grease. So many grease cups used on passenger cars and trucks are located so inaccessibly that they are slighted even by operators attempting to take proper care of them. It is a very laborious task to keep grease cups filled, and to screw them down as required, owing to the many points to be lubricated. These various difficulties have led many to investigate oil as a chassis lubricant, with a view to cutting down the number of points to be looked after in keeping a chassis lubricated, to secure capacity for lubricants to last a comparatively long time, and also to secure a lubricant that has a higher efficiency than grease.

## Oil Not an Ideal Lubricant

Oil, while not an ideal chassis lubricant, possesses a certain number of outstanding characteristics that are not to be found in grease. It is easily distributed over bearing surfaces, is capable of sustaining very heavy bearing loads, reduces friction to a minimum, and is generally a better lubricant than grease. It can be fed in proportion to requirements, tending toward automatic lubrication; it admits of greater cleanliness; if necessary, sufficient lubricant can be carried for several weeks' requirement, and the same oil as used in the engine can be used throughout the car.

The chassis lubrication scheme illustrated by the accompanying drawings has been evolved by Carl S. Peterson, chief

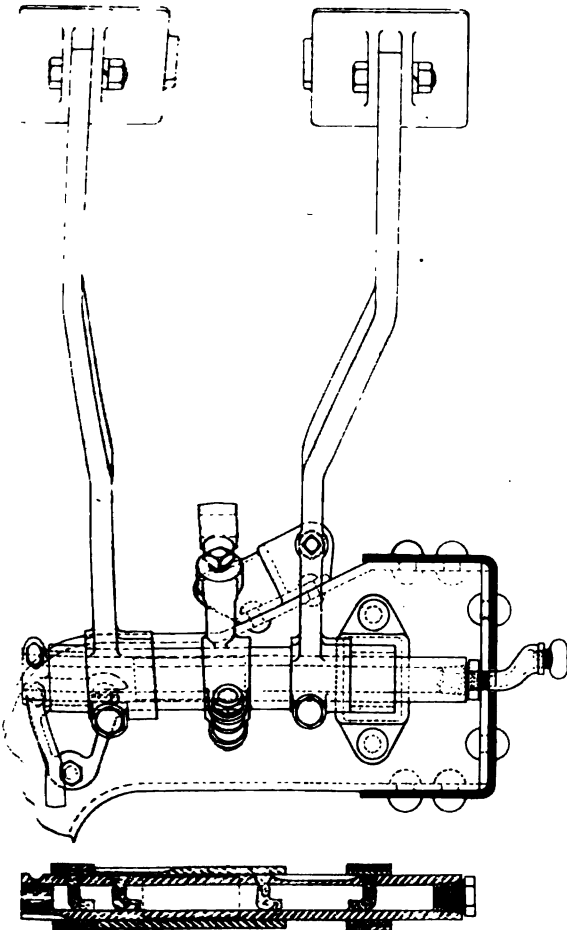


Fig. 1—Clutch and brake assembly showing four bearing surfaces lubricated from same reservoir with one point of filling

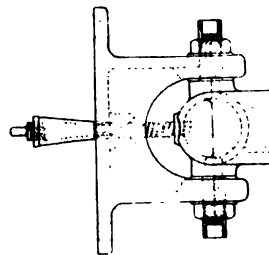


Fig. 2—Clutch throw-out yoke assembly showing how two bearings and two clutch throw-out rollers are lubricated from one reservoir with one point of filling

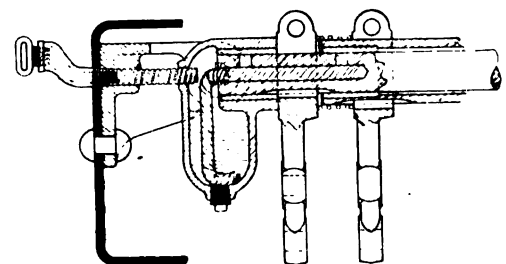
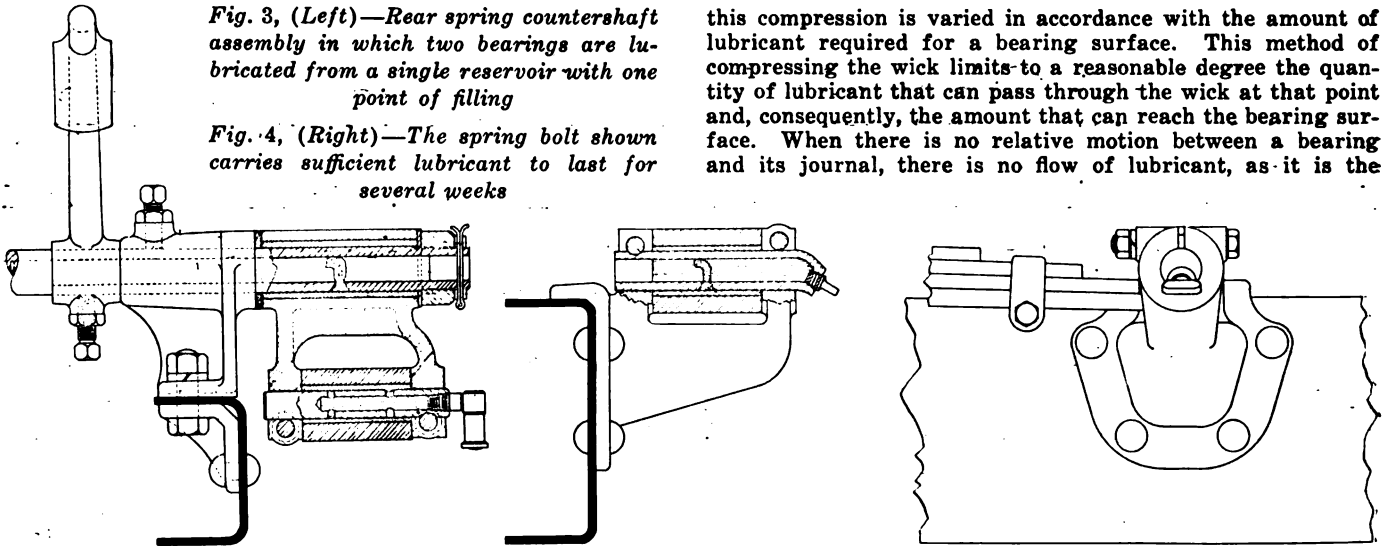


Fig. 5—The brake countershaft assembly in which oil is employed as a lubricant



Fig. 3, (Left)—Rear spring countershaft assembly in which two bearings are lubricated from a single reservoir with one point of filling

Fig. 4, (Right)—The spring bolt shown carries sufficient lubricant to last for several weeks



engineer of the Lippard-Stewart Motor Car Co., Buffalo, N. Y. The system consists of a wick suspended in a reservoir of oil through a conical shaped hole, which reservoir is formed in the hollow part of a tubular shaft or cast integral with frame brackets, etc. The sharp edge formed at the small diameter of the conical hole acts as a barb that grips the wicks tightly and makes it impossible to pull them out from the outside without destroying them. It holds the wick so firmly that it is quite hard to push it into the reservoir. It is claimed that a wick will stay in position always when once properly applied.

#### Oil Fed by Capillary Attraction

The oil is fed to the surfaces to be lubricated by means of capillary attraction, yet the amount supplied can be regulated. The point where the sharp edge of the small diameter of the conical hole grips the wick compresses it, and

this compression is varied in accordance with the amount of lubricant required for a bearing surface. This method of compressing the wick limits to a reasonable degree the quantity of lubricant that can pass through the wick at that point and, consequently, the amount that can reach the bearing surface. When there is no relative motion between a bearing and its journal, there is no flow of lubricant, as it is the

#### Grease Cups Eliminated

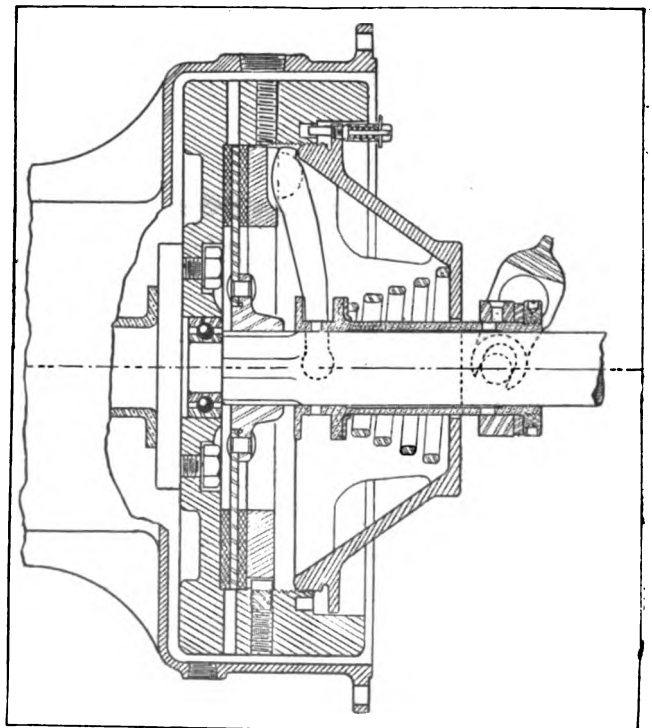
On one model of truck where this lubrication scheme is now used, 18 grease cups are eliminated. These were located under the foot boards. The points at which the lubricant has to be replenished are reduced to 5, and these are all located outside the frame.

Fig. 5 shows the brake countershaft assembly for a truck that does not employ the same scheme for feeding the oil to the bearing as just described, but is interesting in that oil is employed for lubrication. The trunnion bearings shown eliminate any chance of the brake countershaft and tube binding from frame weave when the truck is passing over irregular road surfaces.

## Golden, Belknap & Swartz Plate Clutch

A PLATE clutch running in oil has been brought out by the Golden, Belknap & Swartz Co. of Detroit. As shown in the sectional view herewith, the flywheel web forms one of the driving members, the other being constituted by a plate adapted to move endwise on keys secured to the inside of the flywheel rim. Between these driving members are located the driven steel disk and two rings of wire woven asbestos. The clutch disks are clamped together by three radially disposed double armed levers which are pivoted on the driving ring. Their outer end takes purchase against the inner edge of the clutch cover, and their inner end rests in a groove on the clutch control sleeve which is pressed into the position of engagement by a heavy volute spring inside the clutch cover. The clutch sleeve passes through a central opening in the cover and at its outer end carries a nut against which bears the clutch control collar. The clutch can be adjusted for wear by screwing the cover farther into the flywheel rim and this adjustment can be locked.

ONE result of the war is likely to be the forcing of Spain into the ranks of producers of ferromanganese. By a recent Anglo-Spanish agreement it was stipulated that Great Britain should supply to Spain ferromanganese to the extent of 120 tons per month, which was shared among the various producers of steel. Deliveries were interrupted by the war, and in consequence some six electrometallurgical companies took steps to produce the article themselves. The companies indicated are the Altos Hornos de Viscaya, the San Francisco del Desierto, the Fabrica de Mieres, the Altos Horno de Malaga, the Fabrica de la Senora Urigoitia in Araya, and the Metalurgica Duro-Felgueta.



Golden, Belknap & Swartz plate clutch

# Electric Steel Making\*

Shutting Off of Foreign Supply Has Developed Industry in America—Production in 1917—Cold Melt and Electrically Refined Steel—Details of the Heroult Process

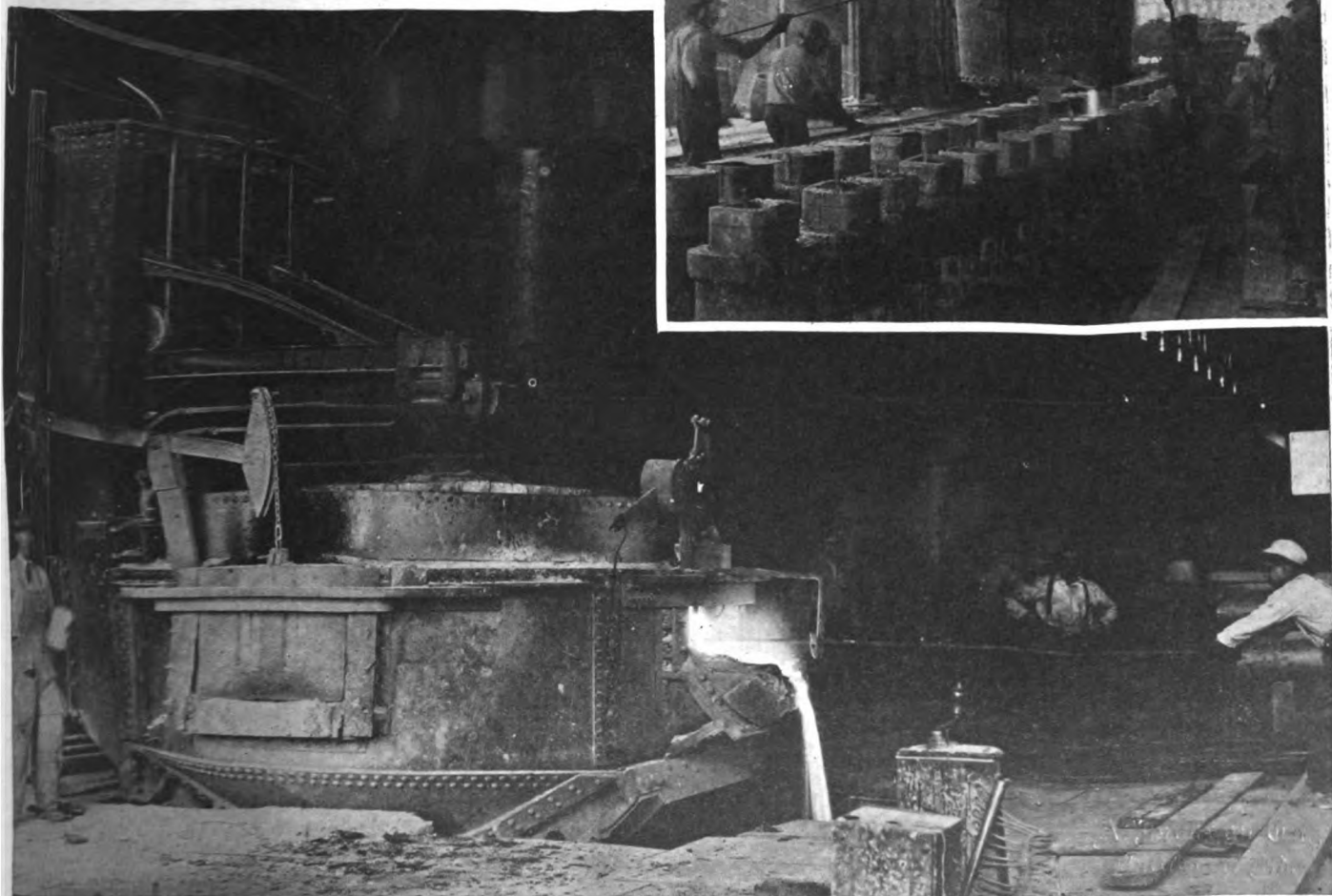
By Arthur V. Farr

**I**T would seem that a word of appreciation is due the forging industry of this country for the co-operation extended to the American steel manufacturers, especially apparent since the beginning of the war. The cutting off of the steel supply from abroad made it necessary for American manufacturers to make steel which had previously been imported. The assistance rendered the steel manufacturers by the forging concerns during the first attempts at making these steels (many of them complicated alloys requiring special manufacturing methods) has proved invaluable.

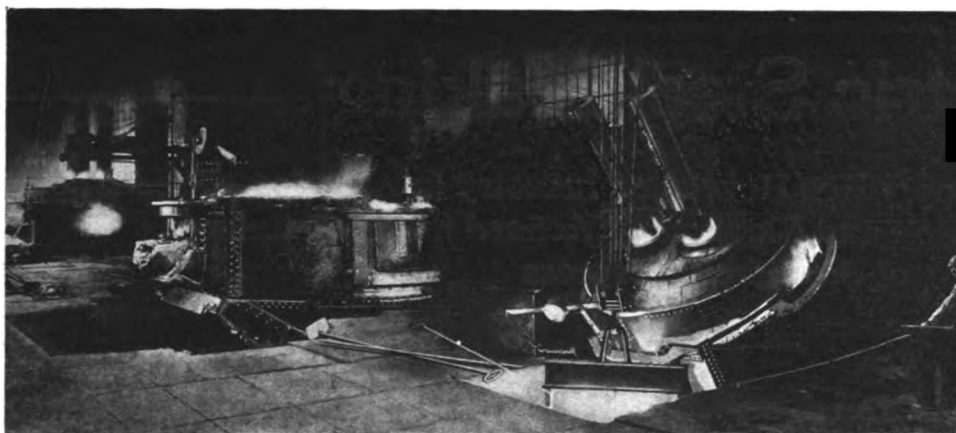
We believe that this co-operation has reacted favorably on the American forging industry, enabling it to serve most effectively our military requirements, the automotive and allied industries, and to render a service that has prevented any lessening of quality or production. I quote from a report that I wrote less than a year ago, following a visit to a large forging company: "They inform me that they are now get-

ting better steel than they ever got from Germany, better in uniformity and better in physical results after heat treatment. They say that they will never go back to foreign steels." I doubt not but that this experience has been typical of a large number of forging companies during the last three years. Certain it is that the full exchange of ideas, criticisms and suggestions between forger and steel maker has enabled the forger to get a domestic source of supply and

\*Paper presented at the fifth annual meeting of the American Drop Forge Association, Buffalo, June 21st, 1918. The author is the sales manager of The Hess Steel Corporation, Baltimore, Md.



"Slagging off." Above: Pouring the ingots



Battery of 6-ton electric furnaces. Samples showing qualities of electric steel

to meet the exacting requirements of the day on a better basis than ever before.

America has been known as a producer of steel in quantity, and it has been but recently that the *quality* element has been emphasized. The continued production of quality steels is making America's reputation symbolic of both quantity and quality.

#### U. S. Leads in Production

A new-comer in the industry and a factor in the production of higher grade steels is the electric furnace method of production. Starting with 10 electric furnaces in 1910, the growth in the number of installations has been rapid, until May 1, 1918, saw 239 furnaces either in operation or in the course of construction in this country, with a production for 1917 of 235,000 gross tons. The United States has not only maintained its commanding position as a producer of electric steel, but the record of 1917 emphasizes this leadership. The United States and Canada are producing at the present time probably a little less than half of the world's output.

The industry has grown so rapidly and has become so important a factor in the forging industry that it might be advisable to review briefly the method of making electric steel and to call attention to some of the salient qualities of the product of the electric furnace as applied to the forging industry.

Electric steel is made either by melting a cold charge and refining it in the electric furnace, known as "cold melt electric steel," or by refining in the electric furnace the molten charge from the open hearth or Bessemer or a combination of both. This latter method is applicable especially to furnaces of capacity of ten tons and upward, the cold melt method not having proved successful to date in the large units.

#### Cold Melt Method for Small Units

For units of less than ten tons capacity the cold melt method predominates. This is due largely to the simplification of equipment and the assurance of electric steel quality. Although there is economy in duplex or triplex methods of making electric steel, certain it is that plants equipped exclusively with electric furnaces cannot be accused of merely "washing" the open-hearth steel in the electric furnace. It cannot be gainsaid that satisfactory steel can be produced by the open hearth electric furnace method, provided, of course, that sufficient time is allowed for refining in the electric furnace. Perhaps this point is best illustrated by the present-day attitude taken by some steel purchasers. A request for quotation was sent by a large purchaser of chrome steel and contained the following: "If you are not in position to quote on either electric or crucible steel, we prefer that you disregard the inquiry, as we do not care to consider open-hearth steel or open-hearth with electric furnace refinement." While this attitude cannot be considered as typical, it shows the discrimination that particular purchasers have found necessary to exercise in safeguarding the quality of their product.

The electric furnace, as known in this country, is a metallurgical instrument for the making of steel by means of electric arcs formed between electrodes or between electrodes and the metal bath. It consists essentially of a steel tank lined with refractory materials and fitted with working doors, spout and tilting arrangements for pouring and slagging off. Carbon or graphite electrodes of suitable section are inserted through the roof or sides and are adjustable. A high-tension electrical supply is brought into a transformer house adjoining the furnace and transformed down to about 100 volts for use at the electrodes.

The heat generated by the electric arcs makes possible any desired temperature up to the fusion point of the best refractory materials. The temperature in the furnace is under the control of the operator, and it is changed as the refinement of the steel progresses.

We will describe briefly the method of manufacture of cold melt electric steel in a 6-ton Heroult electric furnace, which is representative of the majority of installations in this country.

#### Process Divides Into Two Periods

The process of manufacture may be divided into two periods, namely, (1) melting and oxidizing, and (2) recarburizing and reducing.

It appears paradoxical to remove carbon during one period and add it during another, but this is necessary in order to oxidize the phosphorus. Furnaces for reducing phosphorus are lined with basic material, such as magnesite or dolomite. Limestone is charged into the furnace with the scrap. The rust on the scrap furnishes the oxygen, and sometimes ore or roll scale is charged to augment this supply. The slag formed oxidizes the phosphorus which then combines with the lime, forming calcium phosphate. Carbon, silicon, manganese and sulphur are also oxidized to a greater or less extent by this slag.

As an illustration of the furnace reactions that take place the following schedule is given, showing the various stages in the making of a heat of electric steel. The steel to be made was a high carbon chrome steel used for balls for ball bearings.

#### Furnace, 6-ton Heroult

11.50 a. m. Material charged.	
Boiler plate .....	5980 lb.
Stampings .....	5991 lb.
	11971 lb.
Limestone .....	700 lb.
12.20 p. m. Completed charging.	
(Current switched on.)	
3.20 p. m. Charge melted down.	
Preliminary analysis under black slag analysis:	
C. Si. Su. Ph. Mn.	
.06 .014 .032 .009 .08	



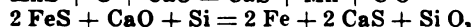
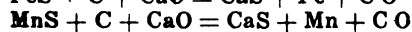
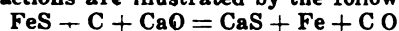
3.40 p. m. The oxidizing (black) slag is now poured and skimmed off as clean as possible to prevent re-phosphorizing and to permit of adding carbonizing materials. For this purpose carbon is added in the form of powdered coke, ground electrodes or other forms of pure carbon.

#### Deoxidizing Process

The deoxidizing slag is now formed by additions of lime, coke and fluorspar (and for some analyses ferrosilicon). The slag changes from black to white as the metallic oxides are reduced by these deoxidizing additions, and the reduced metals return to the bath. A good finishing slag is creamy white, porous and viscous. After the slag becomes white some time is necessary for the absorption of the sulphur in the bath by the slag.

The action of desulphurization in the electric furnace is as follows:

After the bath is oxidized as described above the slag acts on the metallic sulphides, eliminating them by forming calcium sulphide, which is taken up by the slag. The desulphurizing actions are illustrated by the following equations:



The white slag disintegrates to a powder when exposed to the atmosphere and has a pronounced odor of acetylene when wet.

Further additions of recarburizing material are made as needed to meet the analysis. The further reactions are shown by the following:

3.40 p. m. Recarburizing material added.

130 lb. ground electrodes,  
25 lb. ferromanganese.

Analysis:

C.	Si.	Su.	Ph.	Mn.
0.76	0.011	0.030	0.008	0.26

To form white slag there was added:

225 lb. lime,  
75 lb. powdered coke,  
55 lb. fluorspar.

4.50 p. m. Analysis:

C.	Si.	Su.	Ph.	Mn.
0.75	0.014	0.012	0.008	0.28

Note the reduction of the sulphur content.

During the white slag period the following alloying additions were made:

500 lb. pig iron,  
80 lb. ferrosilicon,  
9 lb. ferromanganese,  
146 lb. 6 per cent carbon ferrochrome.

The furnace is now rotated forward to an inclined position and the charge poured into the ladle, from which in turn it is poured into molds.

5.40 p. m. Heat poured.

Analysis:

C.	Si.	Su.	Ph.	Mn.	Cr.
0.97	0.25	0.014	0.013	0.33	0.70
Ingot weight poured .... 94 per cent					
Scull ..... 2.7 per cent					
Loss ..... 3.3 per cent					

Total current consumption for the heat, 4700 kilowatt-hours, or 710 kilowatt-hours per ton.

#### Ingot Cast in Inverted Molds

Electric steel, because of its density, should be cast in inverted molds with refractory hot top to prevent any possibility of pipage in the body of the ingot. In the further processing of the ingot, whether in the rolling mill or forge, special precautions are taken in the heating, in the reduction of the metal and in the cooling.

There is a growing tendency for forging concerns to demand to know the structure of the steel that they are using. This is distinctly a forward step and points the way to accurate heat treatments and more satisfactory results. The demands of high power guns, airplane engines with weight well below three pounds per horsepower, safe, lightweight automobiles, all necessitate the use of the proper kind and

weight of steel. These results can only be obtained by the use of properly selected grades. (In line with this tendency, it may be interesting to examine at close range some typical cold melt electric steels. The results indicated are average and such as can be obtained or improved upon in practical experience.)

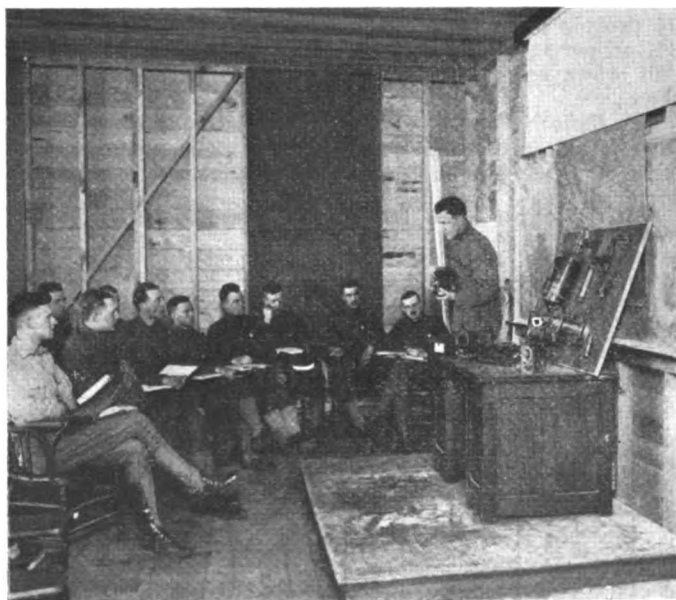
In this paper no attempt has been made to compare at length the relative merits of open hearth and electric steel. I do not believe that is necessary, because results in service, day in and day out, have thoroughly established the superiority of electric steel. Individual laboratory tests do not always square with results in the field, but it is the latter that are wanted. One forger expresses his experience tersely as follows: "We can get physical properties much easier with electric steel." Ten years of experience in this country and in Europe indicate that electric steel in its natural qualities is equal to crucible steel and superior to the steel ordinarily made in the open hearth.

The rare purity of the heat derived from the electric arc, combined with definite control of the slag in a neutral atmosphere, explain in part the superiority of electric steel. Commenting on this recently, Dr. H. M. Howe stated that in the open hearth process you have such atmosphere and slag as you can get, and in the electric you have such atmosphere and slag conditions as you desire.

The ultimate consumer in a large measure is the court of last resort, determining what steels shall be used in the manufacture of his product. It is the ultimate consumer who realizes that the best materials obtainable are none too good, and the drop forger, knowing this and that the difference in cost of steels is small compared with the labor, forging equipment and after expense put upon forgings, finds that it is economy to use high grade electric steel.

The question "What will the forging business be after the war?" is one that the American forging industry is facing to-day. Reports that Germany is exhausted, that her working men are anemic from starvation, that her railroads and manufacturing plants are run down, and that she will be far behind when the commercial race begins after the war, may well be suspected of being a rather coarse form of German propaganda. War, instead of exhausting Germany's industrial and trading potentialities, has actually organized Germany for commerce. The vast majority of the plants that are working to capacity on wartime production can be turned promptly to commercial production. It seems safe to expect that we will have keen competition to face after the war.

#### Instruction of Aviation Students



Instruction of aviation students in the working principles of magnetos at the University of California's Signal Corps Military Aviation School

# How Moisture Affects the Strength of Aircraft Fabrics\*

Tests on Cotton, Linen, Balloon Fabric, Tire Fabric and Cords—Variations in Tensile Strength With Differences of Moisture Regain

By G. B. Haven

IT is a well-known fact that cotton and linen are hygroscopic to a marked degree, gathering to themselves automatically a large percentage of their dry weight in the form of moisture. The effect of this "regain" upon the tensile strength is very pronounced. In thick, heavy fabrics such as those used for tires, the strength may be augmented to the extent of 50 per cent or more by the presence of this moisture of regain. In light wing fabric the increase is naturally of less amount, but there is, however, a decided effect in all of these fabrics from this cause.

It is the object of this paper to describe a series of experiments conducted by the author with the able assistance of Mr. Philip O. Yeaton of the Mechanical Engineering staff at the Institute of Technology. All of the work here described was performed in the Textile Testing Laboratory within the last year and forms part of the course of instruction given to detachments of the navy, studying airplanes at the institute.

## Description of Fabrics

Five fabrics may be classed under the general title, "Aircraft Fabrics":

(a) *Wing Cotton*.—Two classes of cotton wing fabric are advocated by the United States Government bureaus, one woven of two-ply No. 60 yarn and the other of three-ply No. 80 yarn. The weight of these fabrics is from 4 to 4.5 oz. per sq. yd. The yarn is generally mercerized under tension and from 70 to 80 threads per inch of width are employed in both warp and filling. The following tests were made upon the three-ply No. 80 mercerized fabric having a weight of approximately 4 oz. per sq. yd.

(b) *Wing Linen*.—The wing linen imported into this country from Ireland, France and Belgium has generally about 94 threads per inch in warp and filling and weighs about 3½ oz. per sq. yd. It passes from a creamy white color to a dull brown and may be found in grades much heavier than the above.

(c) *Balloon Fabric*.—Balloon fabric is made by calendering and vulcanizing thin sheets of para rubber upon fine cotton cloth. One, two or three plies of cloth may be employed.

\*Abstract of paper read before the American Society for Testing Materials.

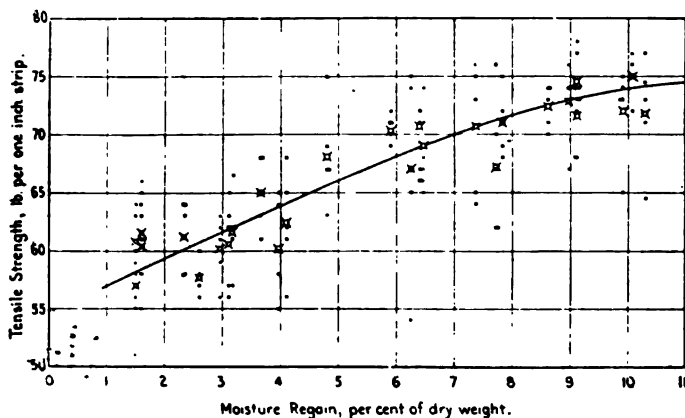


Fig. 1

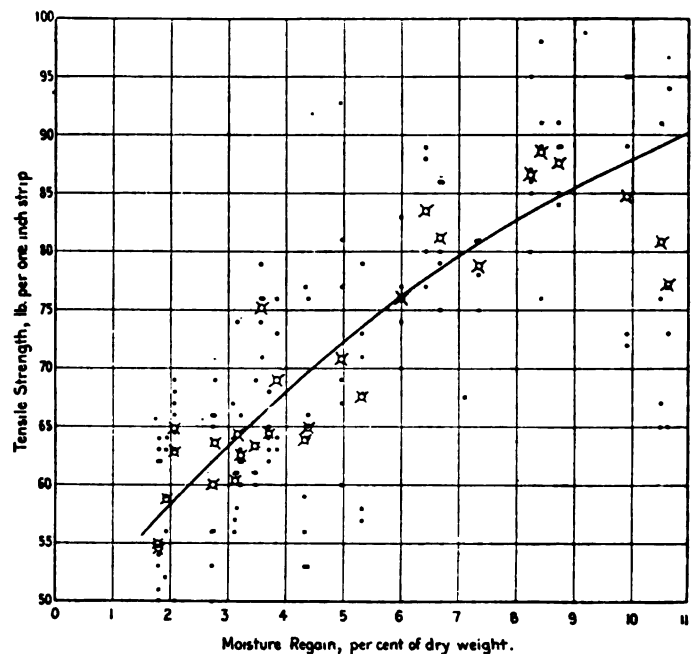


Fig. 2

With two or three plies, the direction of the threads in the fabrics is made to form an angle of 45 deg. with one another in order to localize tears. The cloth count varies from 120 to 160 threads per inch of width in warp and filling. That used in the following tests had quite uniformly 133 threads per inch in warp and filling. The fabric was two-ply with a nominal weight of 11 oz. per sq. yd. Other fabrics of this class range from 4 to 15 oz. per sq. yd. The ply which has its warp threads in the direction of the length of the fabric as rolled is called the "parallel-ply" and the one with its threads at 45 deg. with the roll length, the "bias-ply."

(d) *Tire Fabric*.—Woven tire fabric has been widely standardized with 23 threads per inch of width in warp and filling. The threads are made of No. 23 yarn plied eleven times. The weight is generally 17¼ oz. per sq. yd.

(e) *Cords*.—Cord tire fabric, or "cords" as it is frequently called, has 23 warp threads per inch of width. These cords are cabled, that is, made up of three strands, and each strand of five primary No. 23 yarns. Thus the warp threads are virtually 15-ply yarns. In order to assemble the warp threads or cords in order, filling threads of single No. 23 yarn are inserted to the number of 2½ per inch. The warp threads are thus loosely held in order until placed in the tire. The weight of this fabric is about 10.1 oz. per sq. yd.

The highest grades of cotton are used in all these fabrics. Sea Island, imported and domestic Egyptian and the better classes of Peeler are generally specified. The cotton is generally combed in process of manufacture.

The facilities of the Institute of Technology for research in this direction are as follows:

(a) A testing room of about 5000 cu. ft. capacity, with

heavy concrete walls and floors and tight doors and windows.

(b) A Park's humidifying system in the testing room with automatic control. This apparatus will raise the humidity to a set figure and hold it there with but little variation.

(c) An Emerson electric conditioning oven with thermostat control. The latter is adjustable to any reasonable figure and has a limit of variation of 2 deg. Fahr. plus and minus. The oven contains eight aluminum weighing baskets carried on turntables. On the oven roof is mounted a pair of fine balances weighing to 0.1 grain. Any basket may be linked to the scale pan and weighed without opening the oven door. The links and baskets are tared by dead weights on the scales so that the net weight of the sample is obtained without subtraction. The oven is thoroughly ventilated while in operation.

(d) Three Scott testing machines were employed, having capacities ranging from 50 to 800 lb. The clamp jaws were of the flat-hinged type wider in all cases than the strip of fabric under test. The distance from the machines to the oven door was 3, 6 and 8 ft. respectively. The speed of the testing machine jaws was 12 in. per minute in all cases.

(e) *Balances.*—All the weighings for the plots were made on Becker Analytical balances to 0.01 grain. Great care was expended in securing the last significant figure in the weighings.

(f) *Weighing Bottles.*—In order to hold specimens at stable humidity while weighing, bottles of thin glass with airtight ground-glass stoppers were employed. Their capacity was 40 cc. and they easily accommodated four or five of the strips to be tested.

(g) *Wet Room.*—Where extremely high humidity regains were desired, recourse was had to a room without windows in the basement of the institute. This room is kept continually as near 100 per cent relative humidity as possible by an American humidifier. In the exposures made in these tests the apparatus was shut down to avoid spray until the relative humidity was not over 95 per cent. The specimens were hung 6 ft. away from and 2 ft. above the level of the humidifier.

In addition to the above, the usual complement of cutting, counting and measuring apparatus was available. All the specimens were accurately measured off in width by means of a Lowinson thread micrometer over an illuminated field of ground glass.

#### Specimens

All the specimens were cut to the definite length and width given in Table I.

TABLE 1—DIMENSIONS OF SPECIMENS

Kind of Fabric	Specimen		Raveled to	Distance Between Jaws, in.
	Length, in.	Width, in.		
Wing cotton	7	1 1/4	1 in.	3
Wing linen	7	1 1/4	1 in.	3
Balloon	6	1 1/2	Not raveled	3
Woven tire	7	1 1/2	23 threads	3
Cords	16	One cord		10

Preliminary tests developed the following facts:

1—The duration of heat in the oven effects the tensile strength of balloon fabric and woven tire fabric as shown in Table II.

TABLE 2—EFFECT OF HEAT ON TENSILE STRENGTH OF COTTON FABRICS; OVEN TEMPERATURE 220-230° F. Average Tensile Strength, lb.

Time in Oven, hr.	Woven Tire Fabric	Two-Ply Balloon Fabric
2	186.6	75.5
3	187.6	72.8
4	182.2	72.8
5	185.8	69.5
6	185.6	74.8
7	190.2	72.5
8	188.2	73.8
9	184.4	72.5
10	181.8	...
11	190.4	...
12	187.0	...
13	186.0	...
14	185.0	...

2—The average tensile strength of conditioned samples of woven tire fabric was 287.4 lb. as compared with 289.4 lb. for dried and reconditioned samples.

3—The average tensile strength of samples of Courtrai wing linen after conditioning 3 hr. was 99 lb. while the average tensile strength of samples dried 3 hr. in the oven was 67.3 lb.; samples dried 3 hr. and then reconditioned for 3 1/2 hr. showed average tensile strength of 99 lb. with a moisture

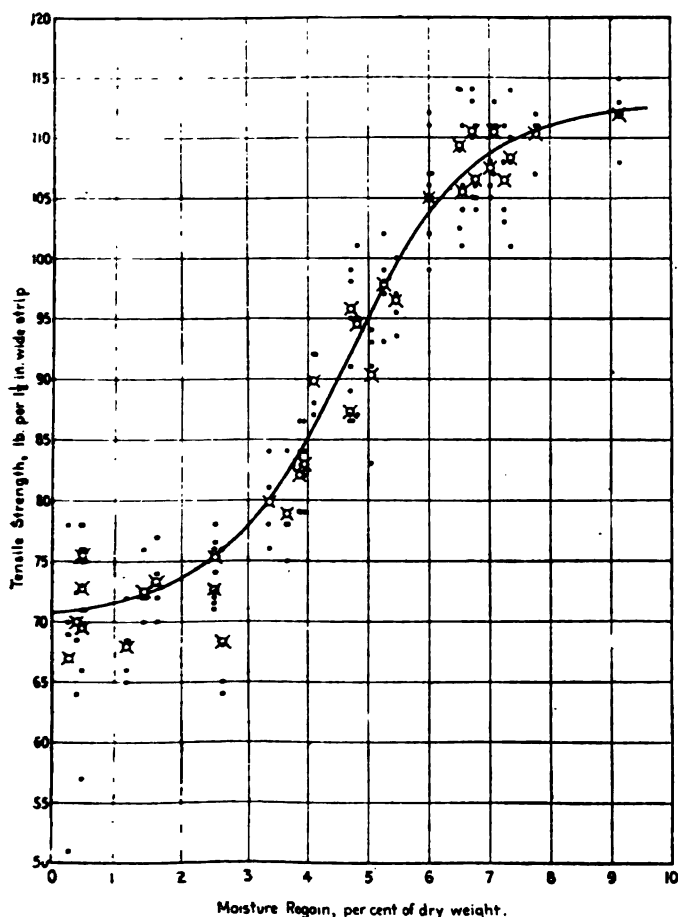


Fig. 3

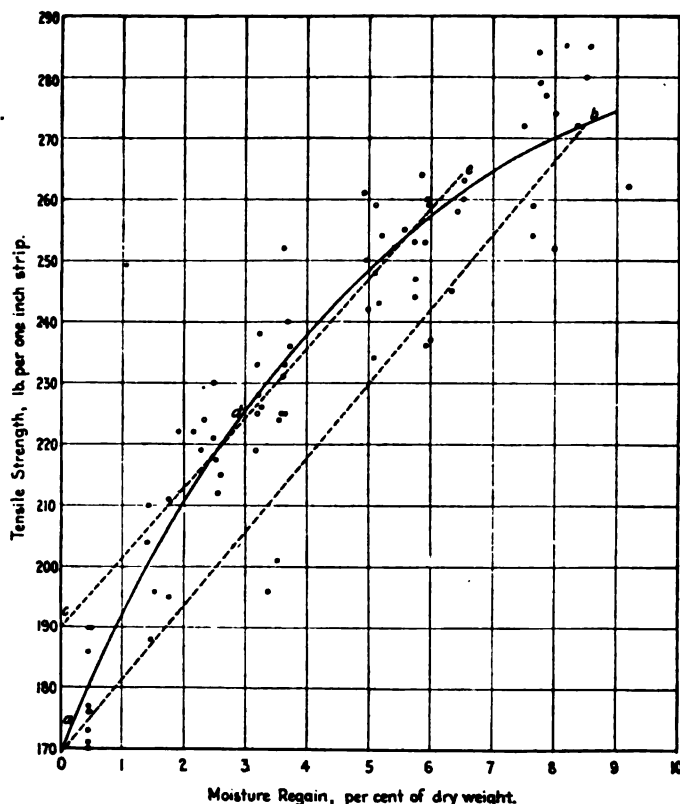


Fig. 4



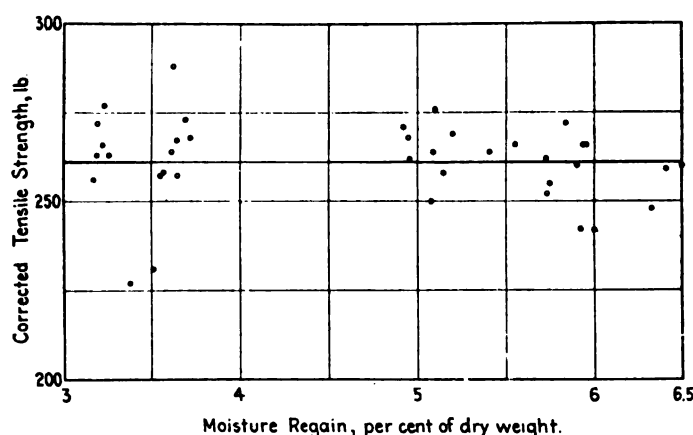


Fig. 5

regain of 7.94 per cent or 6 per cent increase in strength for each per cent of moisture absorption.

4—Dried and reconditioned samples of balloon fabric showed an average tensile strength of 101 lb. against 105.6 lb. for conditioned samples.

5—The effects of joints in balloon fabrics on tensile strength are as shown in Table III.

TABLE 3—TESTS OF JOINTS IN BALLOON FABRIC  
Average Strength, lb.

How Tested	Light	Medium	Heavy
With joint	90.8	100.4	103.6
Without joint	94.8	97.0	103.8

#### Methods

The humidity in the testing room was run up to a high figure. For most of the tests the temperature was 75 deg. Fahr. and the relative humidity 80 per cent. The samples of a given fabric were hung all at one time to the number of about 150 in the room and allowed to regain moisture for not less than 4 hr. They were then taken in groups of four or five and held in a hot oven for periods varying from 3 sec. to 20 min.

This operation graded the actual regain from a high figure practically to bone dryness. After removal from the oven the samples were placed between the leaves of a heavy book to keep the moisture as near stationary as possible until they were tested. They were broken in rapid succession, removed speedily from the machine and immediately inclosed in airtight glass weighing bottles. The interval between breakage and sealing in the bottles was not over 4 sec. Five samples of the linen and cotton were grouped as one test and weighed after breakage together. It was assumed that their humidities were all the same. For the balloon fabric four samples were grouped. Immediately after breakage the bottles and contents were weighed and the net weight of the fabric found by subtraction. The fabric was next taken from the weighing bottles and dried for not less than 2 hr. in the oven. The fabric was transferred from the oven baskets back to the weighing bottles inside the oven door by means of tweezers. No specimens were touched by the hands except a few of the balloon fabric. After cooling, the bottles were again weighed and the bone dry weight of the contents found by subtraction. From this the regains at the actual time of the tests were calculated in terms of the dry weight. It is believed that this method is as accurate as can be found for determining the moisture actually present at the time of breakage. For higher degrees of regain the samples were hung from 10 min. to 2 hr. in the wet room previously described where the relative humidity was about 95 per cent.

In the case of the woven tire fabric only one sample at a time was tested. This was first dried, then exposed to moisture in the wet room and lastly tested as above.

The results of the tests upon cotton wing, linen wing, balloon and woven tire fabrics are shown in Figs. 1, 2, 3 and 4, respectively. Their interpretation is evident. The several tests at a given humidity are denoted and their average is signified by the crossed circle.

It was found that it was very difficult in this thin fabric to test the samples, nominally "bone-dry," without a considerable

reabsorption of moisture. About 1.5 per cent regain occurred during the interval between removal from the oven and breakage. "Full regain" in an atmosphere slightly above standard was denoted by about 8 per cent absorption. Beyond this the absorption was obtained by exposure in the wet room at 95 per cent relative humidity. The average increase in strength from the dryest obtainable to 8 per cent regain was from 58 to 72 lb., or 14 lb., about 24 per cent of the bone-dry strength. This corresponds to about 3 per cent increase in strength for each added per cent of moisture. Twenty-four sets of tests made by the classes in airplane study at the institute upon this same kind of fabric showed an average increase of 26 per cent between bone dryness and full regain. The curvature of the plot does not take place within the region of usual regain and the line may be considered straight for all practical purposes. One hundred and thirty-three samples were broken in this fabric and only two were cast out as indicating "flaw breaks."

#### Wing Linen

The normal regain of raw flax fiber is often stated as 12.5 per cent of the dry weight. While this is doubtless true for a free condition of the material, the figures are much less for manufactured linen. Flax absorbs moisture much more quickly than cotton. Bone-dry samples tested, with great dispatch regained nearly 2 per cent of moisture before breakage. The normal regain for the fabric was about 9 per cent and the strength increase from about 55 lb. to 85 lb., or 30 lb. This represents about 54 per cent of the bone dry strength, a gain of 6 per cent in strength for each added per cent of moisture. Twenty-two sets of tests made by classes in aviation showed 40 per cent increase in strength. The degree of moisture regain in these tests was not so high as those performed by the author. One hundred and twenty-three tests were made on linen and five omitted in the plot. A few were made at yet higher degrees of moisture and indicated but little increase in strength, hence the line should bend down to the horizontal as it leaves the plot.

#### Balloon Fabric

The effect of moisture on rubberized fabrics is unique. The moisture is very much slower naturally in entering such material. Bone-dry tests can be conducted with an actual moisture reabsorption of less than 0.5 per cent before breakage. At low regains the moisture probably lies upon the outer surface and has but little effect upon the strength. At higher regains the moisture evidently penetrates the fiber and has a pronounced effect. From bone dryness to a full regain of 7½ per cent there is an increase of from 70 to 110 lb., or 40 lb. This corresponds to about 57 per cent of the dry strength, or nearly 8 per cent increase for each added per cent of moisture. The increase is not uniform, however, as the curve indicates. One hundred and thirty-nine breaks were made and none omitted on the plot.

#### Woven Tire Fabric

The term "standard regain" has generally been applied to the percentage of moisture automatically absorbed by raw cotton when exposed for a more or less lengthy period in an atmosphere at a temperature of 70 deg. Fahr., and a humidity 65 per cent of saturation. This quality has generally been stated as 8.5 per cent of the dry weight. While the above regain value is doubtless true for raw cotton exposed for long periods to high degrees of moisture, it is believed that for heavy grades of manufactured cotton, where free access to the air is less perfect and especially where the regain is artificially produced by exposure of but a few hours in a "conditioning room," the value seldom exceeds 6.5 per cent of the dry weight. It is therefore proposed from practical considerations, to define the "standard condition" of tire fabric as that at which a moisture regain of 6.5 per cent of the dry weight has been attained. Fig. 4 was the work of Messrs. Yeaton and Panettiere, performed under the author's direction in the Textile Laboratory at the Massachusetts Institute of Technology, and comprised accurate strength and regain determinations with the latter varying from zero to 9

(Continued on page 108)

# Recovery of Gasoline from Natural Gas

Machines Used in Plants of Standard Design—Industry About Fifteen Years Old and Growing Rapidly

IN investigating the general problems that relate to the petroleum industry of the United States, the Bureau of Mines has given considerable attention to the recovery of motive fuel from natural gas. Recent developments in gasoline power units and their increasing use have made it imperative that all fractions of petroleum, suitable for fuel in this type of engine, be conserved. The Bureau has issued a number of publications on this subject, the latest being Bulletin 151, on The Recovery of Gasoline from Natural Gas by Compression and Refrigeration, by W. P. Dykema. It treats of the compression and refrigeration process for the recovery of gasoline from natural gas from the viewpoint of the practical engineer and business man. Conditions of actual operation and the equipment in use are cited and described, so that operators and others interested can compare the variations and methods of treating natural gas for its gasoline contents, in the different fields, and also the conditions encountered, and the features that control the methods used.

The bulletin deals with the subject quite extensively, in more than a hundred pages of text and illustrations. It may be of interest here to reproduce the conclusions reached by the author.

## Raw Materials Affect Methods Used

The various hydrocarbons, and also the impurities, found in natural gas as it comes from oil or gas wells, have a direct bearing on the plant practice and treatment that will yield the most condensate. The more complete and thorough the tests made on the gas to determine its composition and physical characteristics are, the less chance there will be of those interested building and operating a compression plant that is not best suited for treatment of that particular gas.

Thus far the plants installed have been generally of standard design and equipment using the maximum safe pressures for which standard machines and fittings were built and temperatures obtainable by simple methods of water cooling, little consideration being given to the qualities of the gas to be treated.

Gas testing as followed at the present time is done only to determine if the gas can be profitably treated, and, if found so, a plant of general standard design is put in operation. It must be admitted that these plants as a whole, throughout the United States, have proved financially successful, but as a rule such success is due, in the writer's opinion, more to the fact that only the rich gas has been taken for treatment than to careful plant design and operation. The great increase in production at a few of the plants where the operators have studied the gas being treated and installed equipment best suited to its composition and characteristics indicates that gross waste is taking place at many plants of standard design. As more is learned of the best methods of treating natural gas in compression plants, gas of lower gasoline content can be and will be used in such plants.

## Treatment Should Change with Aging of Wells

At many plants visited no gas tests of any kind had been made since the original tests to determine whether the gas was rich enough in gasoline to warrant treatment. With the aging of the wells, the extension of gathering lines, and the installation of vacuum pumps, which often draw air into the gas lines, it is hard to believe that no variation in treatment was necessary if the best results were desired. Gravity tests of the gas used should be made from time to time at all plants. The results will indicate any changes in composition and usually whether air has been taken into the line. This

test, if made at different points in the treatment and on the treated gas may also indicate either a change in the character of the gas or that some part of the plant is not working as usual. Other tests, such as absorption and compression tests and analyses, made and recorded at regular intervals, have been of value in determining sources of trouble and indicating the need of experiments and of plant changes.

Experimenting with the entire plant or one complete unit by changing the temperatures and pressures and recording the results may lead to better recovery or a better product.

## Pressures and Temperatures

Gas from wells that are being and often have been gas-pumped for years, and are held under high vacuums is composed largely of the heavier vapors that would, unless vacuums were used, remain as liquid in the oil, and in treating such gas extreme pressures and temperatures are not necessary.

In eastern fields, where these conditions are most often found, single-stage plants working at a pressure of about 100 pounds and using such temperatures as can be obtained in submerged coils cooled by the natural temperatures of well or creek waters, give satisfactory recoveries and produce condensates with a gravity and vapor pressure as high as can be handled, either blended or unblended. In the same fields, however, plants treating gas from old wells not held under vacuum have found that not enough of the vapor carried by the gas can be condensed at pressures lower than 300 pounds to be profitable. The condensate produced at that pressure was exceedingly wild and in order to effect a maximum saving required blending as early in the process of precipitation as possible. It appears from the above facts that gas taken from wells held under high vacuum carries portions of the higher-boiling fractions, distilled from the oil under reduced pressures, that would otherwise have remained in the oil in the sands. The removal of the lighter fractions by this method has less effect on the gravity of the refined oil than would at first seem probable, because a marked percentage of these vapors undoubtedly came from oil left in the sands which in all probability will never be extracted, and also because the oil production from many small wells held under high vacuums is stored for days, and even weeks, in tanks, exposed to changes in atmospheric temperature, during which time the lighter fractions are lost to a greater or less extent. Under these conditions, relieving the oil of its lightest vapors before it is exposed to evaporation, or while still in the sands underground, would save these valuable products.

## Practice in Newer Fields

In the newer fields, in which the gas is still produced under widely varying rock pressures, a maximum plant pressure of 250 pounds is almost universally used, and refrigeration has often been found to increase production 10 to 50 per cent.

Besides the usual cooling with water, at some plants the gas is also cooled in heat interchangers, while still at the maximum pressures used, with expanded gas. The dry compressed gas is expanded adiabatically in the power cylinder of a steam engine, its temperature being lowered at times to  $-100^{\circ}$  F. In the heat interchanger the high-pressure gas is reduced to temperatures as low as  $-10^{\circ}$  F., which causes vapors not condensed in the water-cooled system to precipitate. It is the writer's opinion that many plant operators are overlooking gas expansion as a means of increasing the net production of their plants.

The treatment of natural gas for gasoline is unlike those

manufacturing processes in which the treated material may be stored and treated a second or third time after the first extraction or concentration of the desired portions, because the gas, after once coming to the surface, must be kept moving until treated and used as fuel or wasted to the atmosphere. Thus marketable fractions of condensate left in the gas after treatment are practically entirely wasted.

#### Condensate

The gasoline carried in natural gas and precipitated at different points in the treatment consists mostly of pentane and hexane, the fifth and the sixth members of the paraffin series, smaller proportions of heptane, the seventh member, and decreasing percentages, if any, of propane and butane, the third and fourth fractions. In condensates produced at high pressures and low temperatures, probably some propane and butane are present and with dissolved gas cause the high vapor tensions of some plant products. The amount of dissolved gas is probably of no importance, as far as volume is concerned, but there seems to be little reason to doubt that when the pressure on the condensate is relieved the gas has a decided tendency to cause boiling and agitation of the liquid, which, with boiling of the propane or the butane, causes losses not only of these constituents but also of some of the heavier members during weathering.

The gravity of the plant products as they come to the accumulator or the "make tanks" varies between 70° and 96° B., and the vapor tension, from 5 to 40 pounds.

The gravity and the vapor tension of the condensates as collected in the accumulator tanks of the successive stages become higher as the higher pressure and the lower temperature changes are reached. The products range from line drip or distillate with a gravity of 55° B., produced at atmospheric temperature and pressure, to condensate with a gravity of 105° B., produced in the accumulator tank at the expansion-engine exhaust, at -40° F., the gas having been reduced to a pressure of 10 pounds.

Experiments and the equipment of recent plants indicate that to remove the condensate from contact with the gas as soon as possible after precipitation and collection is the best practice. This is accomplished by the use of small automatic traps, which drain the liquid from the accumulator tanks as soon as collected. The liquid then passes through pipes to "make tanks," or storage tanks, the pressure being reduced on a small quantity of condensate at each dumping of the trap with the least possible agitation and consequent boiling. This method reduces transfer losses and those from sudden lowering of pressure on large amounts of condensate at one time. The automatic traps are used in transferring either raw or blended products from accumulator tanks to storage or "make" tanks at lower pressures.

#### Blending

Although some casing-head gasoline is shipped and used without being blended, most of it is mixed or blended with naphtha of lower gravity and vapor tension before reaching the consumer.

Condensate, although at times shipped unblended, is in the most modern plants and the latest practice blended as soon as possible after being formed, or even while in the process of precipitation. Some operators still ship their product partly blended or reduced in gravity and vapor tension to blending stations or refineries, but the general practice is to blend at some stage of precipitation or storage at the plant.

Blending at the plants is done in the storage tanks, the "make tanks," and the accumulator tanks, and at times in the coils while the condensate is still in process of precipitation and in contact with the high-pressure gas. Operators using these methods claim definite increases in production for each successively earlier point in the process of cooling and precipitation in the high-pressure units at which blending is accomplished.

Naphthas having an end point of approximately 400° F. are in general use as blending stocks, but at some plants where regular supplies of this stock could not be obtained, distillates having the end points and gravities of kerosene are used.

Some blending companies use with the usual naphthas small quantities of "straight" still-run California gasoline,

specific gravity 58° B., and Mid-Continent and eastern grades, specific gravity 66° to 68° B., in order to increase the proportions of those hydrocarbons of which the naphtha and the condensate contain only small percentages.

#### The Advancement of the Industry

Since the first commercial gas compression plants were established, about 15 years ago, in the eastern oil fields, marked advancement has been made in the mechanical and commercial phases of the natural gas-gasoline industry.

Up to about five or six years ago most of the plants consisted of the simplest forms of gas pumps, single-stage compressors, and cooling coils, were operated only on rich casing-head gas that would produce 4 to 6 gallons of condensate, and had a capacity of not more than 200,000 or 300,000 cubic feet daily.

At present plants are in operation treating 6,000,000 to 9,000,000 cubic feet daily of gas yielding as low as 1 gallon of condensate per 1000 cubic feet, using pressures of 250 and 300 pounds per square inch in two stages of compression, with elaborate systems of cooling the gas with water before compression and after each stage of compression. The water used is cooled below normal temperatures by induced aeration and radiation.

In some plants the gas is further cooled by expanding the dry treated gas through the cylinders of an expansion engine and using the cold expanded gas to cool the high-pressure gas from the water-cooled coils. Temperatures as low as 0° F. are often obtained, causing the precipitation of nearly all the condensable fractions commercially valuable for making gasoline.

### Definition of Hardness

IN France a method of testing hardness has been in use for sixty years or more which consists in dropping from a given height onto the material to be tested a small hammer or "monkey" with a pyramidal or conical point which causes an indentation of the material. Originally the reciprocal of the width of the indentation was taken as a measure of the hardness. In 1895 Lt.-Col. Martel in a paper presented to the Paris Congress on Testing Materials showed conclusively that the work expended in making the indentation is proportional to the volume of the indentation, irrespective of the form of the hammer point. If  $V$  is the volume of the indentation,  $P$  the weight of the monkey and  $F$  the height of fall, then  $D = PF/V$  is the Martel hardness number. It has now been shown by W. C. Unwin in an article in *Engineering* that the Martel hardness numbers are identical with the Brinell hardness numbers. In the Brinell test the standard ball is 10 mm. in diameter and the load 3000 kg. If  $P$  is the load and  $A$  the area of the spherical surface of the indentation then Brinell's hardness number is  $H = P/A$  in kilogram-millimeter units.

Unwin states that the reason for dividing  $P$  by the surface of the spherical calotte is not obvious, and it is not known that Brinell has given an explanation. He then proceeds to show mathematically that the Brinell number is identical with the Martel number and that hardness of a ductile material may be defined as (a) the work required to indent unit volume or (b) the ratio of a steady load to the spherical surface of a ball indentation.

MOTOR tractors are now being used to expedite farm work on a rubber plantation of some 20,000 acres in Sumatra, which is controlled by one of the largest tire manufacturing companies in the United States, says the *Commercial Motor*. Before the tractor was put into service it required 250 coolies to plough three acres a day; the tractor at present in use is cultivating 20 acres of land in the same time.

IN the key to the illustration which accompanied our recent article on the Gasograph, there occurred a number of errors. Fig. 2 indicated the compensating thermostatic arm, instead of the movement (though this arm is a part of the movement); Fig. 5 represented the gasoline level and not a pressure piston. We believe that with these corrections the operation of the device will be perfectly plain from the description.



## Representative Types of American Airplanes



*Curtiss model L triplane*



*L-W-F with Sturtevant engine*



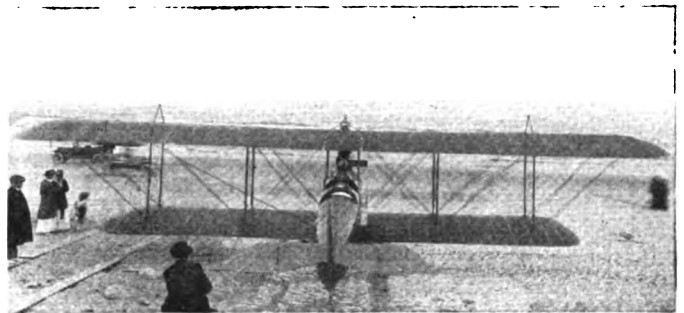
*Curtiss Twin JN*



*Martin training plane*



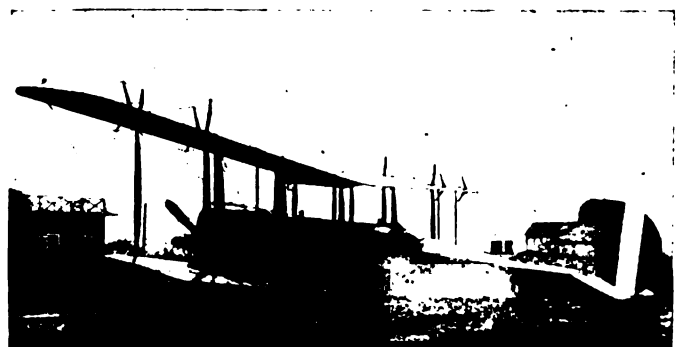
*Standard school machine*



*Standard J training plane*

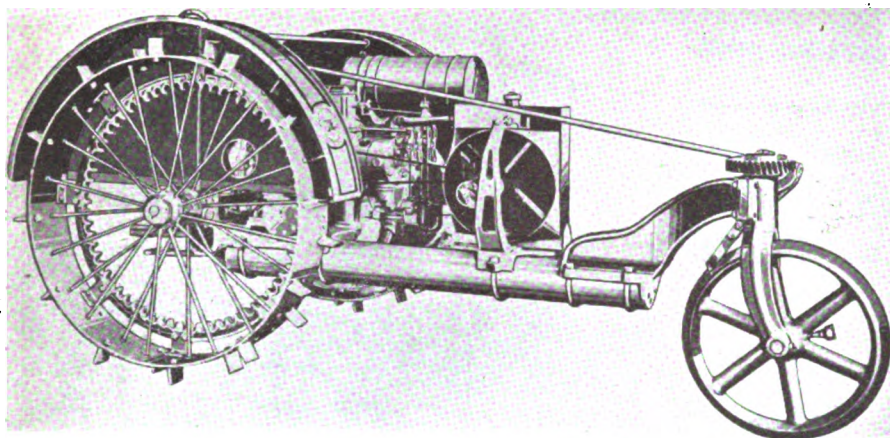


*The Liberty DH4*



*Curtiss mail machine*

# Larger Engine in Happy Farmer Tractor



*Side view of the Happy Farmer tractor*

**New Model Superseding Others Also Has New Oiling System and Longer Frame—Turning Radius Has Been Shortened**

**A**LL of the principal features of its previous models have been retained in the new model F Happy Farmer Tractor which has been brought out by the La Crosse Tractor Co. of La Crosse, Wis. The three-wheel construction, light weight, short turning radius and low center of gravity which characterized its forerunners are also found in the new model.

The changes which have been made include an increase in the bore of the cylinders to 6 in. and a lengthening of the pipe member of the frame which increases the length over all to 153 in. and gives a better balance to the tractor. To facilitate starting, a gasoline primer has been installed and the change from gasoline to kerosene is accomplished by means of a device which is practically automatic in operation.

Another new feature is an improved oiling system in which the lubricating oil is used three times and which makes it unnecessary ever to drain the crankcase. There has also been added a new centrifugal air cleaner of unusual design.

An engine of the twin horizontal, valve-in-head type of the company's own design is employed. It has a bore of 6 in. and a stroke of 7 in. The cylinders are cast in block. The engine has a normal speed of 750 r.p.m.

As will be seen from the drawings and photographs herewith the valves which are 2½ in. in diameter are operated by means of rocker arms of exceptionally substantial design which are actuated by long horizontal push rods extending from the camshaft inclosure which is located in the upper portion of the crankcase.

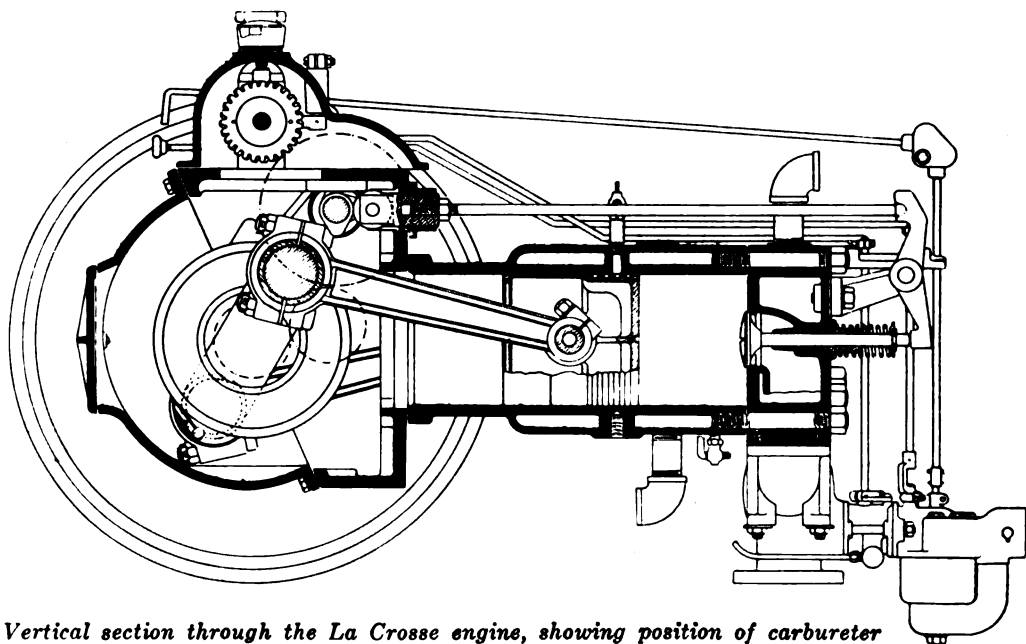
The short intake manifold is surrounded by the exhaust as a means of providing the necessary heat for the thorough vaporization of kerosene when that fuel is being used which is, of course, the major portion of the time, as gasoline is used only for starting purposes. The carburetor is a 1½-in. Kingston. The timing of the intake valve is such that a considerable vacuum is created in the combustion chamber before the valve is opened. This has the effect of causing

the vaporized kerosene to rush into the combustion chamber at high speed, and this reduces materially the time during which condensation can take place. The temperature of the mixture as it enters the combustion chamber is said to be from 40 to 50 deg. higher than that of the atmosphere.

The design of the removable cylinder heads provides for an ample jacketing about the valves. The combustion space is cylindrical in shape. The pistons are of the square type with four rings at the top and the piston pins are located centrally along their length. The latter turn in the pistons and are secured in the small end of the connecting-rods by means of clamping cap screws which fit within slots cut in the pins.

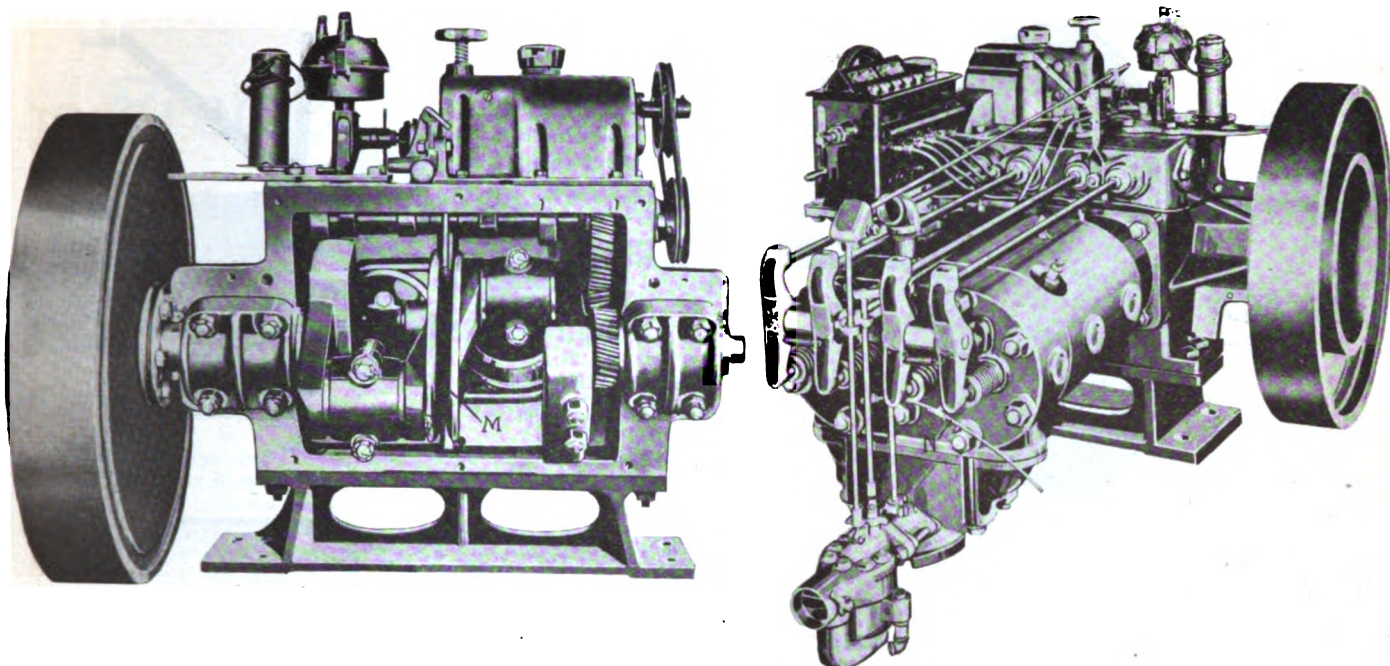
The crankshaft is drop forged, 2½ in. in diameter and has two main bearings 5½ in. long. The connecting-rods are 2½ in. by 3½ in. at the point of largest section and are 13 in. long between centers. The bearings are die cast with babbitt backed with bronze bushings.

A system of forced-feed lubrication is used employing a Madison-Kip five-lead oiler, which is driven by a belt. An original feature of the lubricating system is the use of a pressed steel oil ring centered on the crankshaft midway between the two bearings. This ring resembles two eccentric concave disks joined together. It is fitted with a double



*Vertical section through the La Crosse engine, showing position of carburetor*

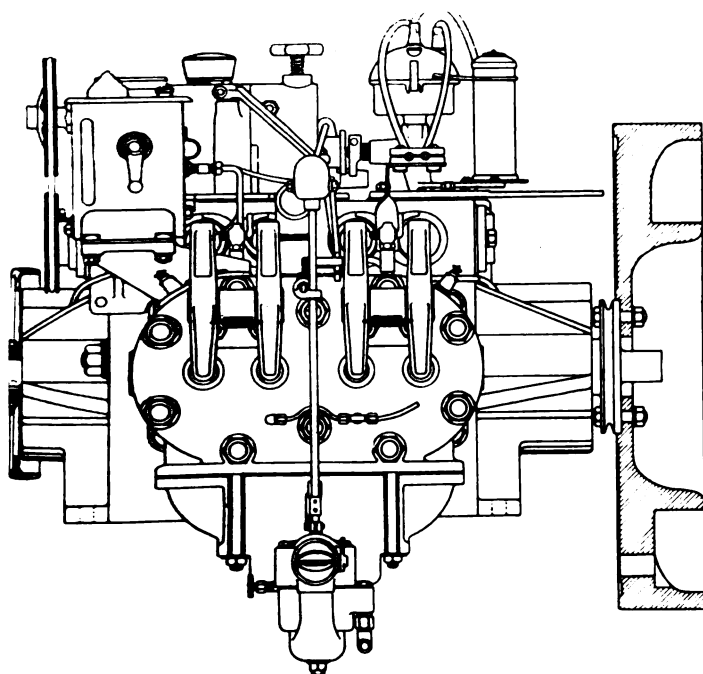




*La Crosse engine with front of crankcase removed, left, showing crankshaft and crankshaft bearings. M—Disk for patent oiling device. At the right is the front of the engine, showing the arrangement of the valves. N is the pipe for gasoline jet for starting*

flange at its periphery. As the oil is fed to this ring in a jet from the Madison-Kip oiler the eccentricity of the disks throws it from one side to the other. It is caught at the periphery and is fed by centrifugal force to the center of the main crankshaft bearings through holes drilled in the crankshaft.

As the oil runs from the main bearings it is caught in a sump at the bottom of the crankcase. Provision is made in the form of baffle plates to prevent any kerosene which may have worked by the piston rings from getting into this oil which is drained to the gear cases and from there conveyed mechanically to the final roller driving pinions. In this way the oil is used three times and at no time can it be mixed with kerosene. It can also be seen that this system makes it unnecessary ever to drain the oil out of the crankcase, as that matter is taken care of automatically.



*End view of La Crosse engine, showing valve rockers and ignition equipment*

The cooling system comprises a Spirex Modine radiator, fan and circulating pump. The radiator is mounted lengthwise at the front. The construction of the cylinders is such that there is a circulation of water between them and around the valves in the head. The cooling system has a capacity of 9 gal. The fan runs at a speed of 2100 r.p.m. A belt tightener is provided to insure that this speed is always maintained.

A contracting band clutch of the company's design is used. The gearset is of the sliding type and runs on Hyatt bearings in oil. In the differential the ring gear is not integral with the spider but is bolted on and is made of semi-steel. As is shown in one of the photographs, a differential brake is provided to assist in making short turns. In the drawings of the differential the method of lubrication for both the differential and the final roller drive pinions is shown. In the front sectional elevation view the pipe through which the oil runs from the motor crankcase is shown as are also the pipes which conduct the oil on the final stage of its journey from the troughs at the top of the differential case to the roller pinions.

The open bull pinions on the ends of the jackshaft are fitted with  $\frac{3}{4}$ -in. heat-treated steel rollers and mesh with the internal bull gears on the driving wheels to provide the final drive. A gear ratio of 42 to 1 is used. The bull gear is made of cast semi-steel in four segments which are interchangeable. They are attached to the wheels by  $\frac{1}{2}$ -in. bolts which are made a driving fit in order to prevent their working loose.

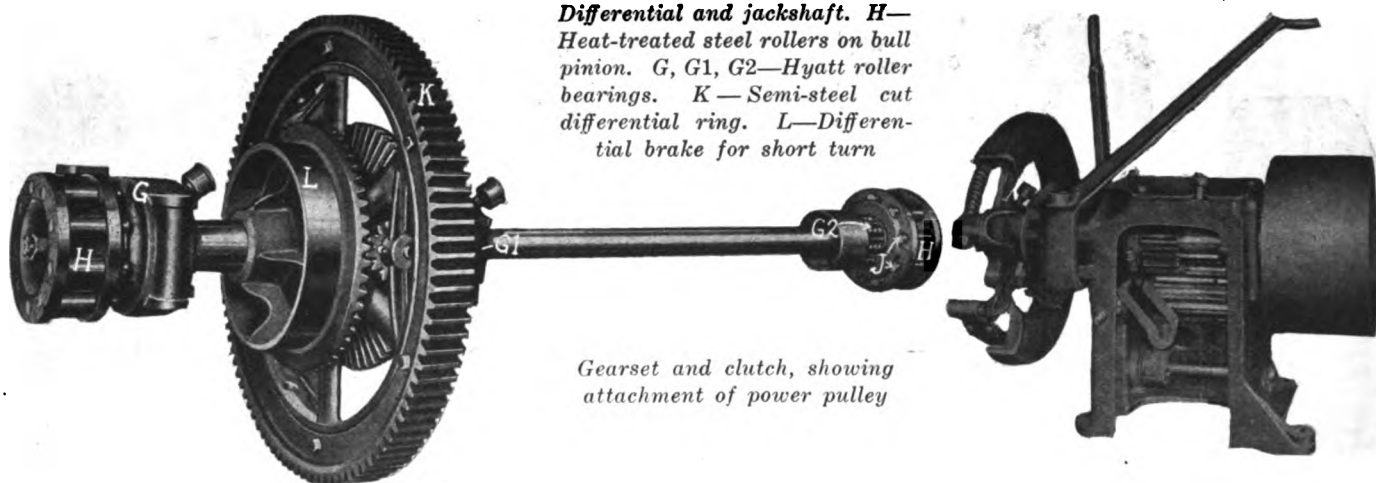
The bull gears are not inclosed but the pinions are provided with mud guards for protection and adequate lubrication is provided in the manner previously described.

The front portion of the frame is made up of a large diameter pipe supporting a cast bracket which carries the steering wheel yoke. A worm engages with a worm wheel secured to the steering wheel yoke and through this combination by means of a hand wheel the tractor is steered. The right drive wheel and the steering wheel run in the furrow when plowing, and steering is therefore said to be practically automatic.

One of the special features of the Happy Farmer Tractor is the centrifugal air cleaner used. It is a cylindrical dipper shape mounted against the front of the radiator with its large open end opposite the hub of the fan and held there by means of a spiral spring. The theory of operation is that the centrifugal action set up by the fan will throw dirt and dust away from its center leaving clean air to be drawn in through the cleaner and its connecting pipe to the carburetor.

The weight of the tractor is 3800 lb., 88 per cent of the weight being distributed on the drive wheels and 12 per cent

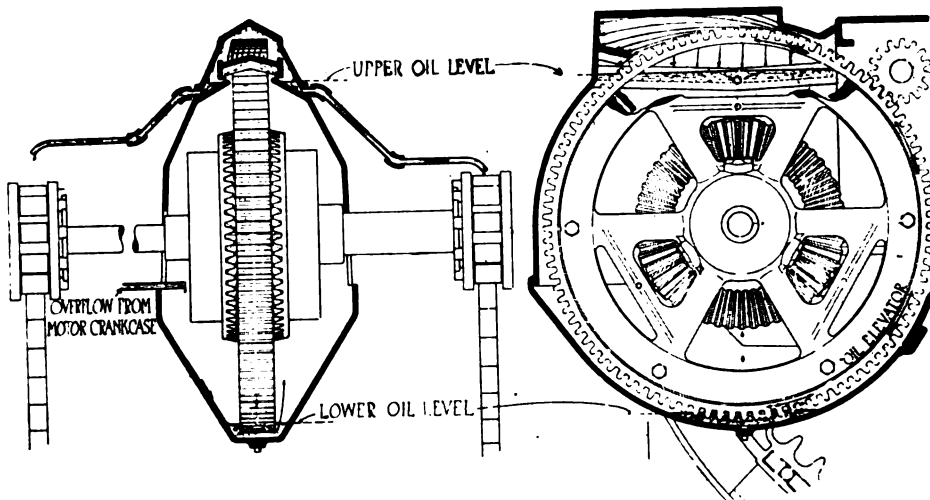




Gearset and clutch, showing attachment of power pulley

on the front steering wheel. It is rated at 12-24 hp. and is said to have a pull of 2000 lb. at a normal speed of 2½ m.p.h. The turning radius is 8½ ft. and by means of the differential brake referred to the tractor can be turned about practically pivoting on either driving wheel. The draw bar is of the swinging type, attached midway between the drive-wheels 16 in. from the ground, has a lateral adjustment of 30 in. and a vertical adjustment of 3 in. The tractor sells for \$1,075 f.o.b. La Crosse. The production for the current year is to be about 4000.

Right—The new Happy Farmer patent oiling system



## How Moisture Affects the Strength of Aircraft Fabrics

(Continued from page 102)

per cent. Seventy-five warp specimens were broken and none have been cast out.

The actual increase in tensile strength with moisture regain between bone dry and 8.5 per cent is indicated by the curved line *a b*. This is not a very abrupt curve, but approximates somewhat the straight dotted line *a b*. For the dotted line *a b* the rate of increase in tensile strength is 7 per cent for each added per cent of moisture for the fabric. This has led some testing laboratories to adopt a method of correction for moisture regain. The samples are weighed in their natural condition and broken in rapid succession before the moisture present can change. The broken specimens are then weighed again after drying in an oven. This gives a means of computing the regain which was present at the actual time of testing. To reduce the tensile strength to a condition of complete moisture regain, namely 8.5 per cent, it would be necessary first to divide the apparent strength by  $100 + (7 \times \text{actual regain percentage at test})$ , and then multiply by  $100 + (7 \times 8.5)$ . This is equivalent to reducing the strength of the sample to a bone-dry condition, on the assumption of 7 per cent strength increase for each per cent of regain, and then moving it up again on the same basis to a full regain of 8.5 per cent. Thus, if a piece of tire fabric gives an apparent tensile strength of 260 lb. and was found to contain 4 per cent regain at the time, its strength corrected for full regain would be,

$$\text{Corrected Tensile Strength} = \frac{260 \times [100 (7 \times 8.5)]}{100 + (7 \times 4)} = 324 \text{ lb.}$$

If tire fabric could be made to move readily from the bone-dry condition to full regain, the above method would suffice and give results very approximately correct. However, as a

matter of practical fact, manufactured cotton in its natural state rarely contains less than 3 nor more than 6.5 per cent regain. It has been deemed wise by the committee, therefore, to set up these arbitrary limits in order most nearly to meet working conditions. The full regain or "standard conditions" has therefore been set at 6.5 per cent in the proposed tentative standards of Committee D-18.

Between the above limits of 3 and 6.5 per cent regain the strength curve is more nearly approximated by the straight line *d e*, for which the rate of increase is very nearly 6 per cent of strength for each per cent of regain. For actual working conditions, therefore, the form of the correction equation should be,

$$\begin{aligned} \text{Corrected Tensile Strength} = \\ \frac{\text{Apparent strength} \times [100 (6 \times 6.5)]}{100 + (6 \times \text{Actual Regain at Test})} \end{aligned}$$

It is to be borne in mind that this formula is only applicable between regains of 3 and 6.5 per cent. It will not yield the bone dry strength at *c* on the assumption of zero regain, nor will it give full regain strength on the basis of 8.5 per cent regain.

The mathematics of Fig. 4 are as follows: In passing from bone dry to 8.5 per cent regain the increase in strength is from 170 lb. to 274 lb., or 104 lb. This represents 61 per cent of the dry strength or about 7 per cent increase in strength for each added per cent of regain. Between bone dryness and 6.5 per cent regain the strength increases by line *c d e* from a fictitious bone-dry strength of 190 lb. to 265 lb., or 74 lb. This represents 39 per cent of the imaginary dry strength of 190 lb. Thus within this range of 6.5 per cent regain there is an increase of 6 per cent in strength for each added per cent of moisture.

Fig. 5 shows the effect of correcting all the tests of Fig. 4 by means of the above formula. The straight line is the numerical average of all the tests so corrected.

# Predicting Strength and Efficiency of Airplane Propellers

Charts and Formulae for Calculating Horsepower Absorbed and Torque Delivered at Given Engine and Plane Speeds

By F. W. Caldwell\*

UNDER war conditions, when there is lack of time for extensive propeller trials and experimental work, we must be able to predict the performance of a propeller as to the horsepower absorbed at given airplane and engine speeds and as to its efficiency under these conditions. It is also necessary to make stress calculations for the purpose of predicting strength, since there is usually no opportunity for a destructive test before the propeller has to be put into production. The main purpose of this paper is to show how such calculations are made.

The first step is to choose a diameter. The chart, Fig. 1, shows the minimum diameter required to maintain the slip as low as 15 per cent. The chart also shows the maximum propeller speed that can be used for any given diameter and

\*Aeronautical mechanical engineer, Aviation Section, Signal Corps, U. S. Army.

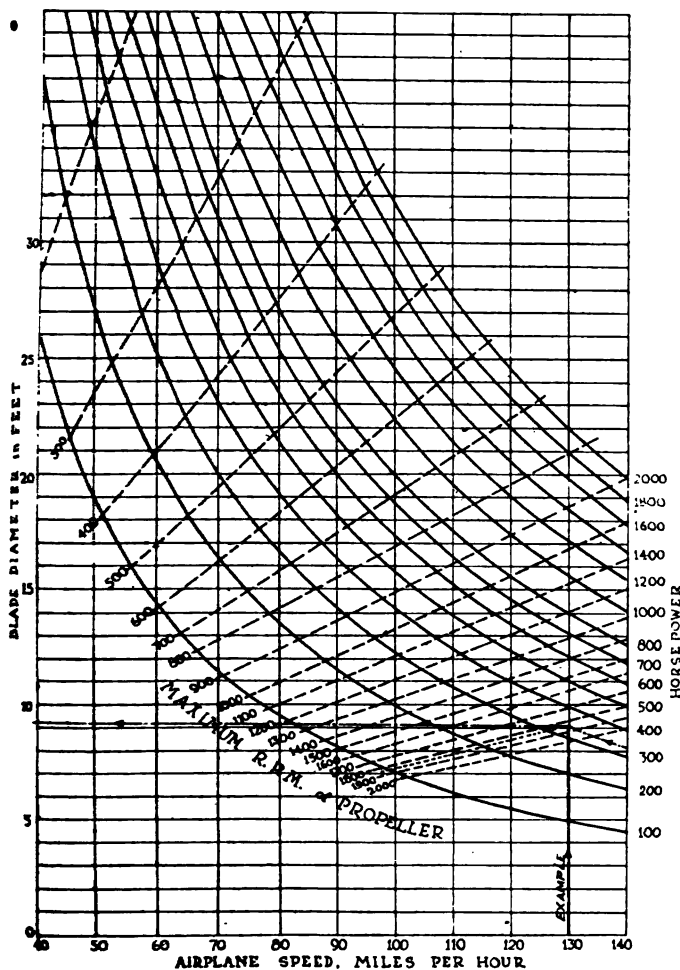


Fig. 1—Chart for determining propeller diameter for 15 per cent slip, and also maximum propeller speeds for given diameters and horsepower

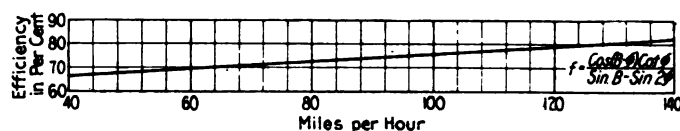


Fig. 1A—Propeller efficiency at various speeds of flight

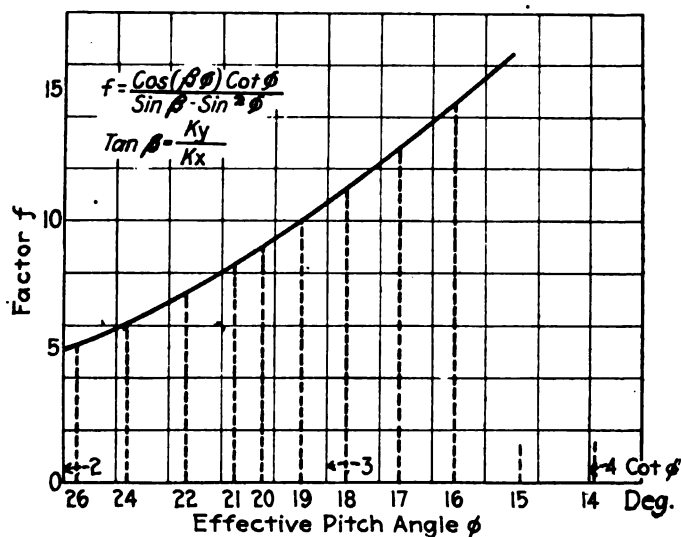


Fig. 1B—Values of factor f for various effective propeller pitch angles

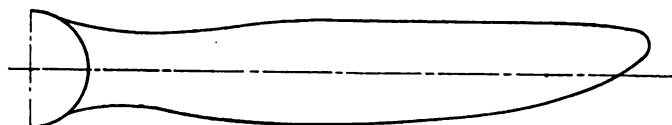


Fig. 2—Experimental blade form

horsepower. If the speed is greater than that shown as the maximum, a smaller diameter must be chosen for the propeller, and there is a consequent loss in efficiency.

The diameters given are minimum diameters for good practice. In general the diameter should be made as large as possible without making the blades so narrow that they will flutter excessively when wood construction is used. Plane designers should bear in mind the necessity of ample propeller diameter in laying out a power plant installation; an otherwise excellent design may be spoiled by limitations of clearance, resulting in too small a propeller diameter.

After determining the diameter, a blade form must be chosen. The question of the outline of the blade form is an unsettled one, since different blade forms are based on elaborate theories. The difference in efficiency of different blade forms is not great, but the difference in strength is considerable. The form shown in Fig. 2 is a fair one, both as to efficiency and strength.

The following nomenclature relating to propeller design will be used in this paper:

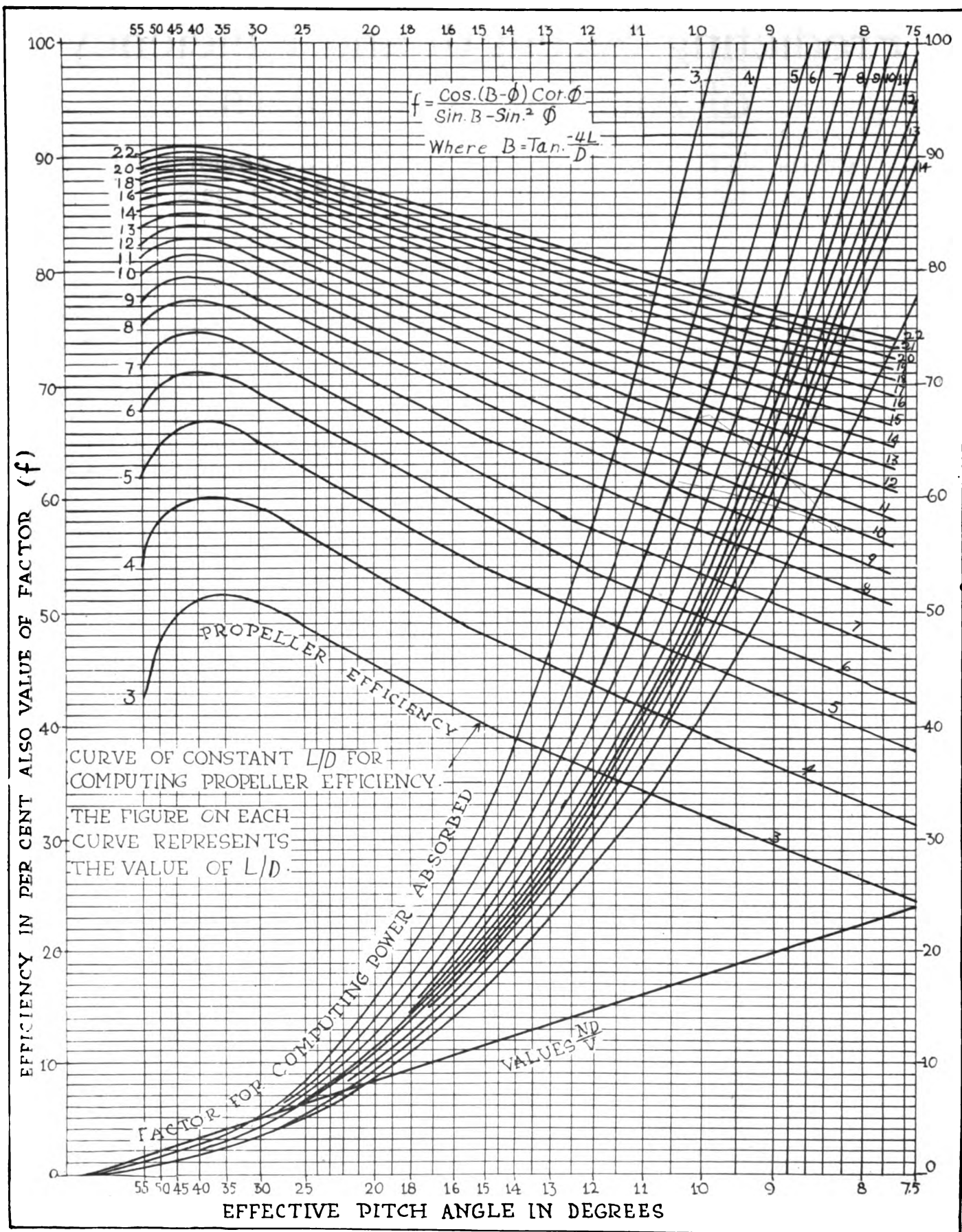


Fig. 3



$\rho$  = specific weight of air expressed in pounds per cubic foot.

$g$  = acceleration due to gravity = 32.2 f.p.s.

$K_L$  = lift coefficient, absolute units.

$K_D$  = drag (or lift) coefficient, absolute units.

$L$  = vertical component of force (lift) on aerofoil, pounds.

$D$  = horizontal component of force (drag) on aerofoil, pounds.

$f$  = factor for computing work absorbed by propeller.

$C$  = empirical constant depending on blade form.

$S$  = area of plane surface, square feet.

$V$  = velocity of airplane, feet per second.

$P_e$  = effective pitch of propeller or advance per turn.

$V_1$  = velocity (in helical path) of propeller element, feet per second.

$v$  = velocity of slip stream, feet per second.

$b$  = maximum blade width, feet.

$b_1$  = effective blade width, feet =  $0.75b$  for blade form in Fig. 2.

$N$  = engine speed at ground level, rev. per second.

$N_r$  = engine speed at 20,000 ft. altitude, rev. per second.

$D$  = diameter of propeller, feet.

$D_1$  = equivalent diameter of propeller, feet =  $0.580D$  (for computing work absorbed only).

$R$  = radius of propeller, feet.

$T$  = thrust, pounds.

$A$  = area of propeller disk, square feet.

$A_1$  = effective area of propeller disk, square feet

$$\left( = 0.95\pi \frac{D^2}{4} \right) \text{ (as corrected for the 5 per cent area considered ineffective due to the radiator).}$$

$$\phi = \tan^{-1} \frac{V}{\pi ND} \text{ (effective pitch angle).}$$

$$\beta = \tan^{-1} \frac{K_D}{K_L}$$

$\theta$  = blade angle, degrees.

$e_1$  = theoretical efficiency (Froude Method), per cent

$$\left( = \frac{100V}{V + v/2} \right)$$

$e_2$  = aerofoil efficiency, per cent.

$e$  = true efficiency, per cent ( $= e_1 \times e_2$ ).

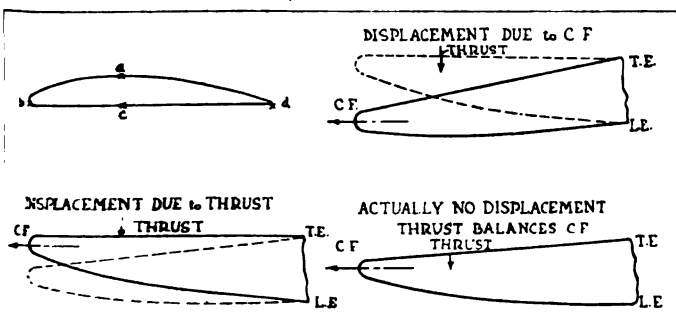
It is necessary to solve for blade width and angle of attack by means of an empirical formula. As a rough rule the angle of attack may be taken as 2 deg. for plane speeds above 100 m.p.h. and 3 deg. for plane speeds below 100 m.p.h. The method of checking this would go beyond the scope of this paper, which is intended to cover only fundamentals.

The maximum blade width should be about one-twelfth the diameter for the best practice. This gives an "aspect ratio" of six for each blade.

The usual method of computing blade widths consists in dividing the blade into zones and treating each zone as a separate aerofoil. The power absorbed by each zone is then found from the formula

$$\text{Work for zone} = \frac{\rho}{g} K_L S V_1^3. \quad (2)$$

This may be simplified by taking an average value of  $K_L$



Figs. 4, 5 and 6—Deflections caused by axial thrust and centrifugal force, as well as cross-sectional view of blade

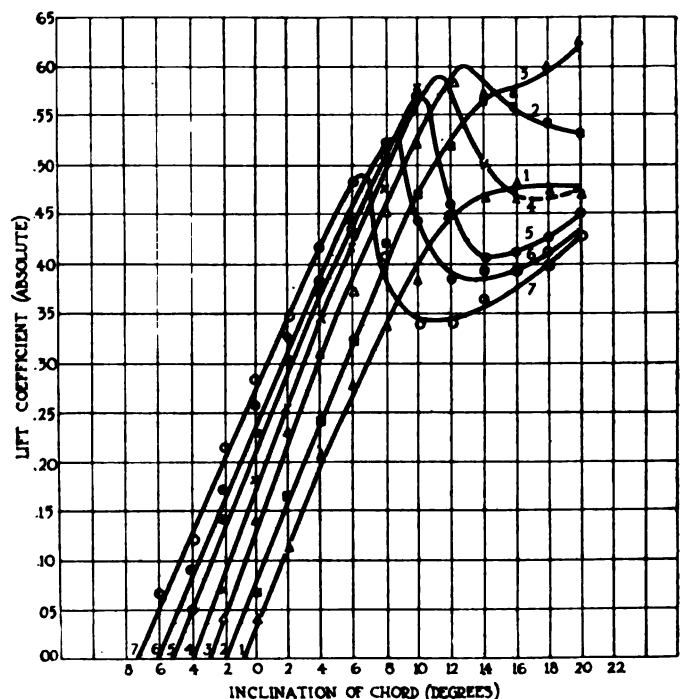


Fig. 7—Characteristics of typical aerofoils from the 1912 report of the National Physical Laboratory, England

for the blade and a weighted mean for the blade width. The power absorbed per blade is then found from the formula:

$$\text{Power} = \frac{\rho}{g} K_D b_1 R V^3 f C \text{ ft.-lb. per sec.} \quad (3)$$

The value of  $f$  may be obtained by taking 0.58 of the diameter to represent an equivalent diameter for the whole blade. (This value has been established experimentally for blade form shown in Fig. 2.) Then the value of  $V/0.58\pi ND$  is calculated, as is the corresponding angle whose tangent is  $v/0.58\pi ND$ , and the corresponding value of  $f$  is found on the chart, Fig. 3.

The ordinate corresponding to the angle is followed until it crosses the line corresponding to an  $L/D$  of the section, and the corresponding value of  $f$  is read on the scale at the right or left. An average value of  $L/D$  may be assumed with sufficient precision to be twenty, when using this method.

The empirical constant  $C$  is dependent on the blade form and must be determined experimentally. For the blade form shown in Fig. 2 it is 1.1, while it varies from 0.85 to 1.2 for different blade forms now in use. The symbol  $b_1$  represents the weighted mean of the blade width. This weighted mean of the blade width is found by determining the mean ordinate of a curve in which the cubes of the radii of the blade sections are laid off as abscissa and the corresponding blade widths are laid off as ordinates. This empirical method gives good results.

The best method of computing propeller efficiency consists in an extension of the water-propeller theories. The theoretical efficiency  $V/(V + v/2)$  is computed. First the thrust is computed and then the slip-stream velocity from the

$$\text{impact formula } T = \frac{\sigma}{g} A V v.$$

To compute the aerofoil efficiency a representative point along the blade is taken. This will usually be at 75 or 80 per cent of the radius according to the blade shape; for the blade shown in Fig. 2 it is at about 78 per cent. The product of the theoretical and aerofoil efficiencies gives the actual efficiency very closely. There is a further small correction due to the spiral component of the slip stream.

The angle whose tangent is  $V/0.78\pi ND$  is found and a corresponding ordinate  $\phi$ , Fig. 3, is followed until it crosses the efficiency line corresponding to the  $L/D$  of the aerofoil section at 0.78 of the radius. This  $L/D$  will be about twenty in good design.

Wood has been the favorite propeller material up to the

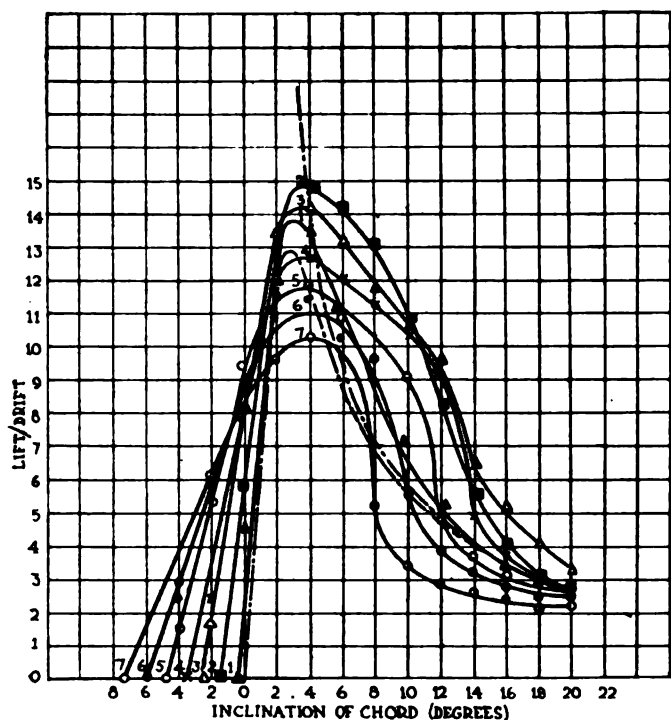


Fig. 8

present. Its success is mainly due to its high tensile strength, light weight and flexibility. Flexibility is an important factor in reducing propeller stresses, as can be seen from Figs. 4 to 6. When the thrust is applied to a wooden propeller, the blade bends and the centrifugal force creates a moment tending to restore it to its original position.

The lack of flexibility is evidently one of the weaknesses of steel propellers, since the metal cannot bend and accommodate itself to the different flying attitudes. This difficulty can be overcome for any single flying attitude and air density by offsetting centers of gravity of different sections in such a way that the bending moment due to air pressure is compensated for by the bending moment due to centrifugal force.

Among the propeller materials experimented with up to date the metals have shown the least encouraging results. While I do not consider a steel propeller out of the question, it is certain that the results to date have been discouraging. Steel propellers should be given a thorough ground test before being used in flight on an airplane, since the failures are usually extremely sudden and are disastrous to the plane structure.

#### Aerofoils

The aerofoil sections used have an important bearing on the propeller efficiency. The characteristics shown in Figs. 7-9 are taken from a report issued in 1912 by the National Physical Laboratory of England, and are about as good as any that have been published.

#### Adjustable-Pitch Propellers

Almost from the start of air-propeller work, a propeller with adjustable pitch has been considered highly desirable, because it is believed that the efficiency of the propeller could then be maintained constant for different airplane speeds. This is based on the theory that the  $L/D$  of the aerofoil section is the controlling factor in the propeller efficiency, a theory which is not borne out in practice.

Fig. 10 illustrates the effect of varying plane speed on the apparent angle of attack of a propeller section. This angle is usually chosen as 2 deg. for a flight speed of 130 m.p.h. and the aerofoil will then have a ratio of  $K_y/K_x$  of about twenty. In climbing at the rate of 70 m.p.h. the apparent angle of attack will be increased to about 10 deg., and the  $K_y/K_x$  ratio will drop to from ten to twelve.

Fig. 11 shows that the increase in true angle of attack is not so great when the slip stream velocity is taken into account; besides this, the theoretical efficiency  $(V/V + v/2)$  is

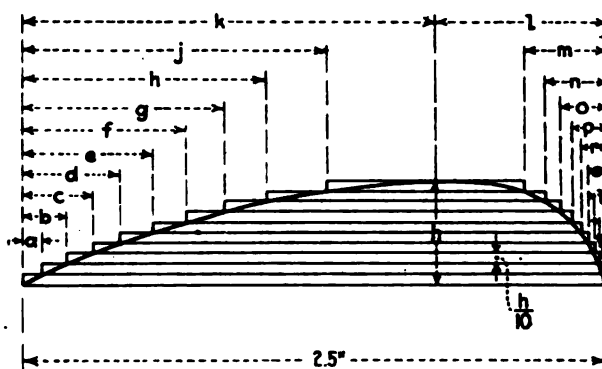


FIG. 9—DIMENSIONS OF TYPICAL AEROFOIL SECTIONS  
(FROM N. P. L. REPORT)

All dimensions in inches

			Plane No.	$\lambda$
$a = 0.085$	$h = 1.060$	$p = 0.140$	1	0.063
$b = 0.190$	$j = 1.315$	$r = 0.100$	2	0.125
$c = 0.305$	$k = 1.770$	$s = 0.070$	3	0.187
$d = 0.430$	$l = 0.730$	$t = 0.045$	4	0.250
$e = 0.570$	$m = 0.350$	$u = 0.025$	5	0.312
$f = 0.715$	$n = 0.255$	$v = 0.010$	6	0.375
$g = 0.875$	$o = 0.190$		7	0.437

greatly reduced in climbing and is not increased by an increase in the aerofoil efficiency.

An analysis of an adjustable pitch propeller (appended to this paper) shows no gain in efficiency. There is, however, a net gain in horsepower delivered to the plane, owing to the increase of engine speed in climbing. For the case in question the gain in the rate of climb is 49 per cent. Fig. 12 shows the gain in the rate of climb in a somewhat slower machine.

The keeping up of the engine speed becomes of interest in connection with the development of an engine with torque that is constant at high and low altitudes. From the performance curves shown in Fig. 14 it is apparent the climbing rate of a plane equipped with such an engine would be greatly improved if the engine speed near the ground were increased and kept the same as the plane climbs.

#### Constant Engine Power at Altitudes

It is the opinion of the author that, if it becomes desirable, an adjustable pitch propeller of fairly light weight can be built for a smooth running engine, such as the Liberty twelve, but considerable trouble may be expected with engines that have an inherent vibration.

The author has been told by many engine designers that it would be useless to build an engine to maintain its power at altitudes, because the propeller efficiency would then be so low that the net gain would be small.

All aeronautical engineers who have made a study of the subject realize that the development of an engine with constant, or nearly constant torque at altitudes up to 20,000 or 30,000 ft., is the one outstanding opportunity for improvement in airplane performance. It is just as easy to design propellers for operation at 20,000 ft. as it is to design them for performance at the ground level, so that the problem is one that must be solved by the engine designers.

The air density at 20,000 ft. is of the order of 50 per cent of that at ground level. The density of air is about 0.13 per cent of the density of water. Yet we are using the same means of propulsion in airplanes as is used in boats, and we are obtaining in practice efficiencies as high as 85 per cent, something which cannot be approached in marine practice. Not only is this true, but a propeller designed for use at 20,000 ft. will function without appreciable loss of efficiency near the ground, as may be seen from an analysis in which airplane and propeller performance are worked out in a typical case.

The words "constant torque" as used in the following analysis mean that the torque is independent of both the engine speed and the altitude. This is the simplest case to discuss, and the discussion applies exactly to this case alone. An engine that satisfies this requirement only in part would,

of course, have a performance intermediate between that of the conventional gasoline engine and that of the engine with constant torque. This analysis is applicable equally to a steam turbine and is perhaps of more interest in relation to a steam turbine, owing to the range of speed involved.

In comparing the performance of the airplane and propeller at 20,000 ft. altitude and at the ground, we will assume:

1. Speed of airplane at ground level, 130 f.p.h., or 191 f.p.s.
2. Output of engine, 356 hp. (at 1400 r.p.m., or 23.3 r.p.s.).
3. Diameter of propeller, 11.5 ft. (area 104 sq. ft.).
4. Total lifting surface of plane,  $S = 420$  sq. ft.
5. Total weight of loaded plane,  $W = 3400$  lb.

The value of  $K_v$  in absolute units is computed from the formula

$$W = \frac{\rho K_v S V^2}{g} \quad (4)$$

$$K_v = \frac{3400}{0.00238 \times 420 \times 191^2} = 0.0933. \quad (5)$$

The corresponding value of  $K_v/K_r$  may be taken as 12.3.

(To be continued)

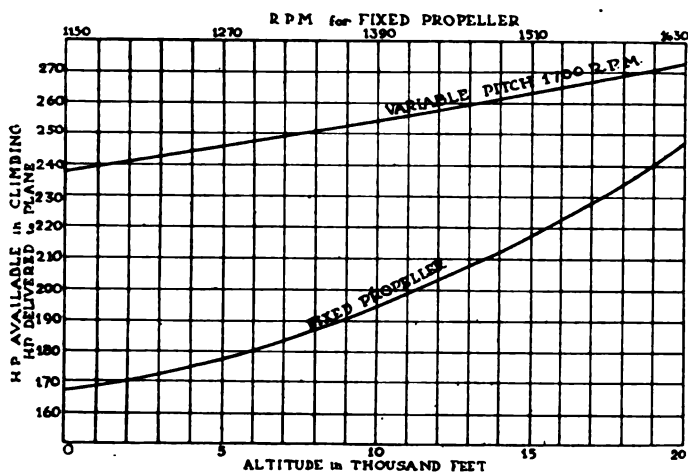


Fig. 13—Performance of propeller for constant torque engine

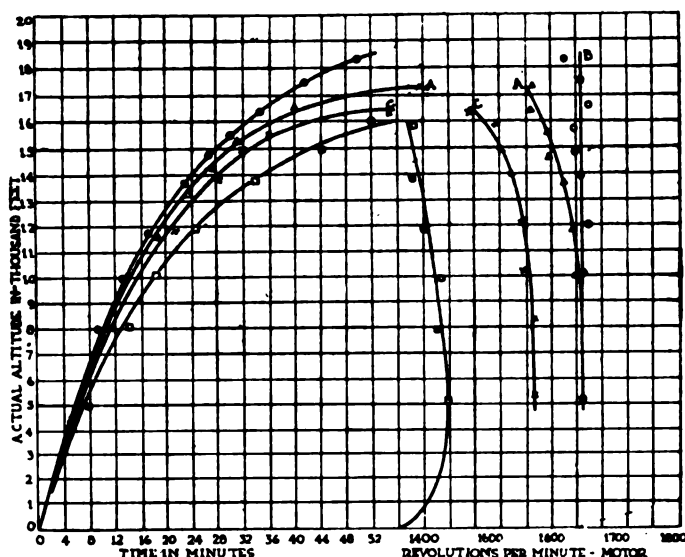


Fig. 12—Comparison of climbing tests of adjustable-pitch propeller

A—Pitch set at ground C—Pitch set to check with D  
B—Pitch changed during climb D—Solid wood blade

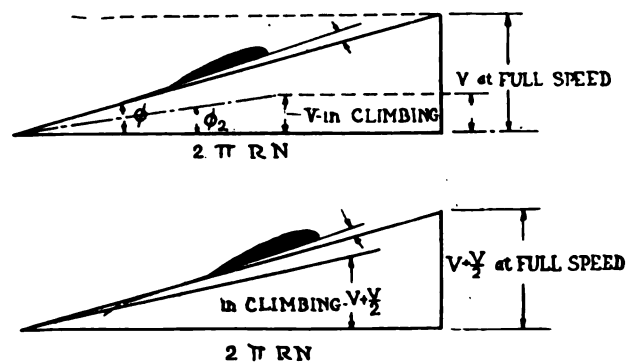


Fig. 10 (above) and 11 (below)—Effect of plane velocity on angle of attack

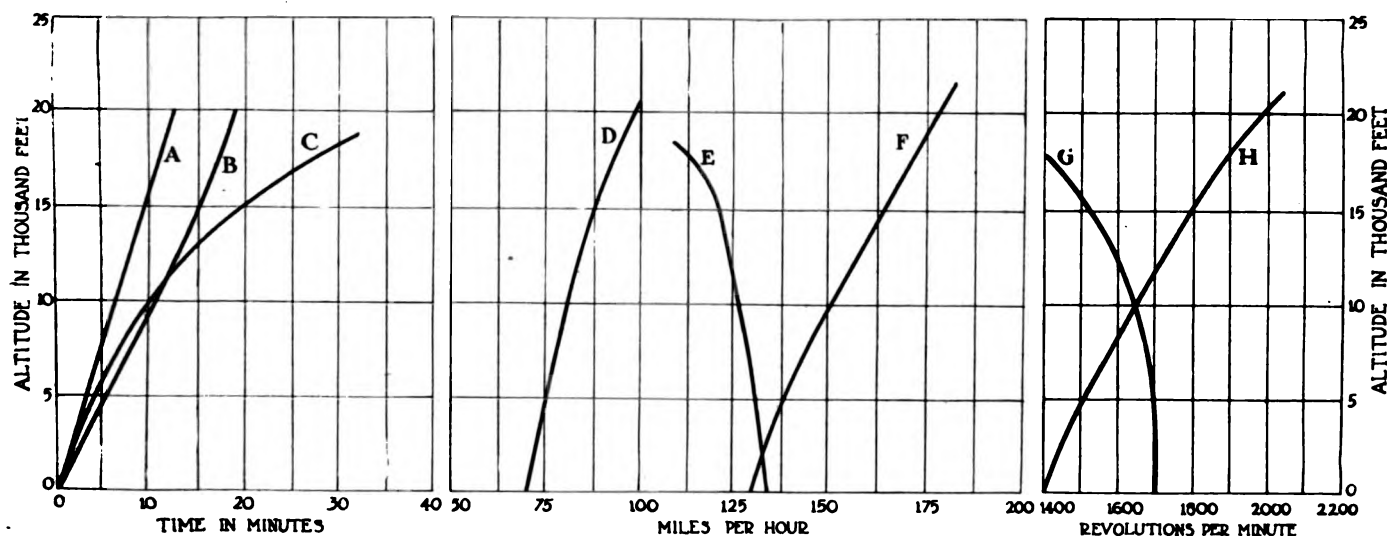
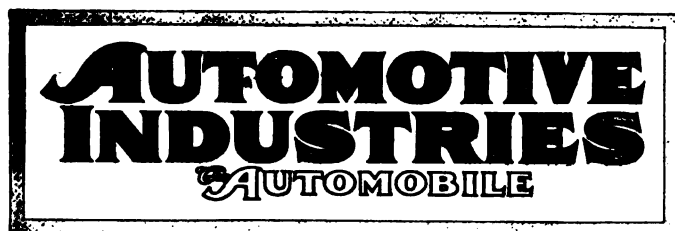


Fig. 14—Climbing and level flying performance of airplane with constant torque compared with that of a plane with a conventional gas engine

A—Time to reach altitude with a constant torque engine. B—Time to reach altitude with a constant torque engine and fixed propeller. C—Time to reach altitude with a conventional gas engine turning at 1650 r.p.m. near the ground, and with a fixed propeller. D—Best climbing speed for airplane. E—Level flight with conventional gas engine. G—R.P.M. in a level flight with a conventional gas engine and fixed propeller. H—R.P.M. in a level flight with a constant torque engine





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## War Work and Commercial Work

**M**ANUFACTURERS who have war contracts should exercise the greatest care to avoid even appearing to give too little attention to them and too much attention to their regular commercial work. Government work should and must come first.

Unfortunately there have been one or two instances in the passenger car industry where manufacturers, after having taken important war contracts, have laid themselves open to criticism by the Government because of a slowness in getting into production while at the same time their regular line was going through at its usual speed.

It is not for a moment thought that such delay is intentional or the result of a selfish indifference to the great needs of the hour, but its effect upon the industry as a whole is harmful to a degree that is not easily overcome.

When war orders and commercial orders clash,

preference must necessarily be given to the work which is helping to shorten the war. Government work is the most important work for any and all of us to-day, and those who have an opportunity to do it in any shape or form are fortunate indeed and should seize upon it as a chance to do something well worth while.

The only way that we can crush the Hun is by combined effort. Put the war work first, speed it up to the limit and then turn attention to things commercial and do the best possible with them without interfering with Government production.

## Let's Save Our Number Plate Steel

**I**T has just been announced that the 1919 number plates for the motor cars in New York State will be ready for delivery by the manufacturers to the State's automobile bureau beginning Aug. 1. It is estimated that half a million pairs of plates will be needed to meet requirements. Up to the first of this month there has been an increase in the number of cars registered of 44,130 passenger vehicles and 21,475 trucks over the corresponding period of 1917, and as the total registrations for last year in New York were 412,000 it seems that the estimate is by no means extravagant.

A pair of New York number plates weigh a little under 2 lb. This means that something like 500 tons of steel will be required to make the plates issued next year in New York alone.

The plates issued by the various states in the Union differ somewhat in size, but by taking the weight of the finished New York plate, which is about as large as any used, we can safely figure the total amount of steel needed for the number plates of all the cars in the country, and in doing so allow for waste.

Calculating on this basis we find that not far from 3500 tons of steel per year is used for the purpose of identifying motor cars—of providing the authorities, or others who would know, with a means of telling one automobile from another and who its owner is. Thirty-five hundred tons of steel is enough to build a good-sized ship.

Here is what seems to be an almost complete waste of good material which could be and should be stopped at once. Why is it necessary to change the number plates of all cars each year? The only answer that can be given is that changing the plates gives an opportunity to change their color or size or shape or the lettering on them and thus provides an easy means, an automatic means, of informing the police whether or not the annual registration fees have been paid. It sounds like a good reason, but is it?

They do not make us nail number plates on our houses and furnish us with a new one each year to show that we have paid our town, county and village taxes; they do not make us wear number plates and give us yellow, blue and green ones for different years to show that we have not overlooked sending

our checks to the Collector of Internal Revenue for that part of our incomes which we turn over to Uncle Sam.

Tax dodgers are not conspicuous because of any peculiar marks upon them, and yet they are not secure from or immune to the processes of the law. Motor car owners are no more likely to move their headquarters than are income tax-payers, and anyone will admit that the income-tax evader runs risks which most of us would not care to take. In collecting taxes or annual fees the burden is shifted from the collector to the one who does the paying in an amount proportionate to the size of the penalty for non-payment. Make the penalty large enough and the number of those who seek to evade tax payments can be reduced almost to zero.

Couldn't the whole matter of motor car registration payments be taken care of by a system which would provide for the payment of the fee or the return of the old plates on or before a certain day each year and for the issuance after that date to the local police authorities of a list of delinquents who could be haled to court and either locked up for a time or heavily fined upon failure to show good reason why they should not be so treated? We think it could, and such a system would conserve enough steel in one year to build one more ship and save the states about \$2,000,000 of the money they now spend for plates and a lot of work and incidental expense in handling them.

Let's turn our number plates into something essential.

## Dynamometers for Aircraft Testing

**A**LTHOUGH specifications for the testing of Liberty aviation engines state that these will be made with testing clubs, or testing propellers, word has come from Europe through some of the Allied missions that such a form of test is not to be relied upon too specifically and that some testing apparatus of more specific nature may have to be used.

It is claimed that differences of 50 h.p. are possible with propeller tests when the wind is blowing into the propeller as compared with when it is blowing in an opposite direction. More engine power is naturally required under these conditions. There is also a difference in the power required for driving a propeller when the cutting edge of the club becomes frayed as it frequently does. Once frayed, the edge must be sandpapered down and revarnished which reduces its size and again upsets calculations.

Fitting electric dynamometers for testing all of the engines will prove expensive, but undoubtedly some form of compromise will have to be arrived at if reports from European Allies are borne out by practice in America. It is known that some of the European makers use the water-brake test. This suggests the possibility of using the water-brake test for general work and for perhaps 90 per cent of the testing when using the electric dynamometer for the final test to be sure rated horsepower is obtained.

## Farm Implement Designs

**T**HE expected is happening in that the refinement of the farm tractor and the using of better materials and improved design resulting in increased efficiency, is bringing about a re-designing of farm machinery, which for years has existed on what might be called a horse-scale design.

It has been apparent at the farm tractor demonstrations that two men are needed for much farm work. The farm machinery used was designed to be drawn by horses and operated by a person seated in the rear. With a tractor pulling the machinery and the operator seated on the tractor it has been necessary for another operator for the machinery. This has not been efficient. Two men cannot be continued in these war days on a job that one man can handle.

Nothing short of a mere revolution, so far as farm machinery is concerned, has set in. It has been under way for some months. Farm machinery is being re-designed so that the man on the tractor can operate it. The farm machine is being converted from the horse regime to the motor regime.

This revolution in farm machinery design is not solely confined to designing for one-man control, but improved materials are being used. For the first time alloy steel is taking its place in some farm products. This is cutting the weight very materially. In some cases the reduction approaches 100 per cent. Every pound of weight removed from the farm machine adds to the efficiency of the tractor.

The time is at hand when the use of anti-friction bearings will be much more general in farm machinery. It is not consistent to use the finest steels, the highest standard of design, the best anti-friction bearings, etc., in a tractor and then load to it a piece of farm machinery that has not been designed on the efficiency standard. The farm machine in the efficiency sense must be a running mate with the tractor. What the anti-friction bearings do toward increasing the efficiency of the tractor they will similarly accomplish in the farm machinery. The day is almost at hand when threshing machines will use anti-friction bearings. Revolving parts in other machinery will also use them. The same precautions to keep out dust from the bearings will have to be taken as are taken in the tractor.

Another aspect of this revolution in farm machine design is that the machine must be designed for longer life than is much of the present machinery. Government departments have stated that the life of some pieces of farm machinery does not average more than 80 days of useful work. This may be spread over a period of 5 to 8 years, but this does not add to the sum total of days of work. A tractor cannot be built for 80 days of service. It should work 120 to 150 days in the year, and while the life of the present design of tractor is not statistically determined, 5 years should be used as the basis of a conservative estimate. On this basis of reasoning, a tractor should have a working life of 750 to 800 days, or approximately ten times that of the farm machinery to which it is attached.

# □ Latest News of the

## Will Inventory All Steel in Factories

War Industries Board Wants This to Show Quantity on Hand at Present Time—Automobile Industry is Seeking a Sixty Per Cent Steel Allotment Agreement

WASHINGTON, July 17—Hugh Chalmers, representing the passenger car makers, held a conference to-day with the War Industries Board on the question of steel for the manufacture of passenger cars, and the result of the conference is that the War Industries Board has asked for a complete inventory from the passenger car makers showing the number of partly completed cars, number of parts, as well as the quantities of steel on hand for passenger car production at the present time.

### Filing to Take 2 Weeks

Filing of these inventories will probably require 2 or 3 weeks and in the interim nothing can be done on the steel situation. It is expected that these inventories will show that the industry has not received steel on a basis of the 30 per cent reduction which was agreed upon between the War Industries Board and the industry some months ago and which agreement was to continue until Aug. 31, 1918. It is also expected that these inventories will show unbalanced stocks in many factories which will call for reasonable shipments of certain kinds of steel in order to complete the production of certain numbers of automobiles.

It is expected that the War Industries Board will announce its decision concerning further shipments of steel to the automobile industry after a thorough examination of these inventories has been made.

There seems to have been some counter-opinions concerning the steel the automobile industry has been using for some months. The makers have been operating on a 30 per cent curtailment but it is stated that since the 30 per cent agreement was entered into there have been later rulings on steel distribution and that the industry has not been receiving this allotment of steel.

### 60 Per Cent Allotment Asked

Mr. Chalmers asked the War Industries Board for a 60 per cent allotment of steel as compared with the 70 per cent allotment which the industry is operating under at present. No definite information could be given on such a request and nothing will be forthcoming until the inventories have been examined.

It has been known for some time that considerable inconvenience has been caused by the unbalanced inventories

and several factories have received good co-operation in securing quantities of steel in which they were lacking and by means of which they have been able to carry on production that would otherwise have been impossible.

During the last week the steel manufacturers have met with representatives of the War Industries Board for a general survey of steel requirements. It seems utterly impossible to get a complete budget of the requirements of the Government. New shipbuilding yards are being erected and it is impossible to estimate their requirements. The amount of ship tonnage which it is possible to build this year is being cut down and now the steel makers feel that a sane estimate of the Government's requirements will soon be available.

At present the steel capacity for this year is running on a basis of 43,000,000 tons of ingots. This will produce between 33,000,000 and 34,000,000 tons of finished steel. The shell steel requirements will approximate 5,000,000 tons for the year. These figures of ingot production represent a gain of approximately 5 per cent in steel production as compared with a year ago. In the steel industry there is a greater amount of building operations going on than formerly. New mills for ship plate production being erected and additions to others made. Many believe that the requirements for shipping will not be nearly so great as the estimates because there are not enough shipbuilding ways to possibly utilize the steel plates which have been estimated in the requirements for this year.

### Want Proper Proportioning

The steel makers are as anxious as possible to proportion steel to all of the different industries which are designated as non-essential to war work. The steel makers are also continually asking for a war budget of steel requirements and realize the almost impossible task of securing such. Their policy seems to be that of constantly cutting down estimates of Government requirements, realizing that these estimates are of necessity higher than actual needs will be.

Estimates that the Government requirements for the coming 6 months will be 20,000,000 tons are generally discounted to an extent. Steel production during the same period will, however, approximate very closely 16,500,000 tons of finished steel.



CHARLES W. NASH

### Fuel Oil Engineers Needed

WASHINGTON, July 18—The oil division of the United States Fuel Administration is looking for several engineers proficient in combustion of fuel oil and natural gas. These engineers are needed to act as inspectors in different districts where they will visit all the factories using fuel oil and natural gas, the object of their inspection being the conservation of these fuels and perhaps the pro-rating of them as necessary. The divisions in which inspectors are to be placed are: Boston, Providence, New York, Philadelphia, Pittsburgh, Buffalo, Detroit, Chicago, Minneapolis, Tulsa, New Orleans and San Francisco.

The Oil Division prefers engineers who can act as volunteers in this work at their own expense, but it is prepared to pay a certain amount for those who cannot afford to devote all of their time to this work without compensation.

### Cut Freight Rate for Road Materials

WASHINGTON, July 15—It is probable that the 20 cents per ton freight rate for stone, gravel, sand and slag promulgated by order No. 28 of the Railroad Administration will be reduced to a flat rate of 10 cents per ton. It is also probable that the 40-cent rate on brick will be cut to 20 cents. These reductions will be the result of the protest made here this week by the American Assn. of Highway Officials, Highway Industries Assn., The Portland Cement Assn. and the National Paving Brick Assn., which met with the committee under Judge Prouty and discussed the inequalities and injustices of the rates. Judge Prouty's committee hears all of the freight rate protests.



# Automotive Industries □

## Nash Made Aircraft Production Head

**Nash Assumes Charge as Assistant Under Ryan—Leaves Nash Motors**

WASHINGTON, D. C., July 18—Charles W. Nash, president of the Nash Motors Co., has been appointed to take charge of engineering and production of aircraft matters in America, and assumed these duties to-day. He has resigned his active connection with the Nash company for the period of the war. Mr. Nash, in this new field, will act as assistant under the direction of John D. Ryan, chairman of the Aircraft Production Board.

This appointment should result in greater co-operation in the matter of aircraft engineering and production, and consequently lead to greater production and greater unanimity of the entire aircraft program. This action should lead to bringing together all the loose ends of the aircraft program. Heretofore there has not been enough get-together among those engaged in aircraft manufacture. Mr. Nash is one of the best known production executives in the country.

From the time he went with the General Motors in 1910 up to the present time, production has been one of his greatest objectives. His accomplishment in the Nash Motors, in the short time he has had control of that organization, gives indication of what may be expected in the airplane program.

Since taking over the Jeffrey factory it has been entirely reorganized on a production basis. Practically every department has been reorganized and practically every piece of machinery repositioned on a production basis. As a production executive Mr. Nash is one of those who goes through the factory every day and is directly familiar with every phase of the work. He gets his production information first hand. He makes his production studies first hand. He is a master of the art, which, coupled with his first-hand study policy, is directly responsible for his success.

It is hoped that in his new field in charge of engineering and production for aircraft engines, as well as planes, that Mr. Nash will be given an office and his organization located at some city in the aircraft manufacturing zone. Some weeks ago AUTOMOTIVE INDUSTRIES, in referring to the desirability of a director for aircraft work, suggested locating such a person in Dayton, Ohio, or per-

haps some other city in the zone of this work. Just as Charles M. Schwab located the construction end of the Shipping Board in Philadelphia, so the engineering and production end of the aircraft program should be located in some city which would serve as a center of aircraft engineering, research engineering and be a large production center as well.

Mr. Nash was born near De Kalb, Ill., Jan. 18, 1864, and first became connected with the automobile industry through the Durant-Dort Carriage Co. In the fall of 1910 he was appointed general manager of the Buick Motor Co. and in 1912 became president of the General Motors Co. In July, 1916, he resigned the presidency of the General Motors Co. to form the Nash Motors Co., which took over the Thos. B. Jeffery Co., Kenosha.

## Wages Increase in Automobile Industry

WASHINGTON, July 16—Payrolls in the automobile industry for wages during April, 1918, show an average increase of 10 per cent over April, 1917. Fifty factories report 117,352 workers on the payroll for April, 1918, as against 125,407 in April, 1917. In spite of this, the payroll total increased from \$2,761,526 in April, 1917, to \$2,846,438 last April.

One automobile factory reported an increase of 25 per cent in wages as compared with an increase of 15 per cent in employees. An increase of 10 per cent to the foundry division of a passenger car factory was reported by another company. The foundry force equalled approximately 8 per cent of the organization. Eighty per cent of all employees in another plant received increases ranging from 7 per cent to 8.5 per cent, and about 90 per cent of the force of another establishment received an increase of approximately 10 per cent. The average productive hourly rate in each plant was increased 0.0067 per cent. Another factory reported an increase in the productive hourly rate but gave no data.

## Copper Concentrates Restricted

WASHINGTON, July 17—No licenses will hereafter be issued for the importation of copper concentrates containing less than 60 per cent of copper except for shipments from Cuba, Canada, and Mexico. This restriction is not to be construed as affecting importation of copper matte, blister copper or copper concentrates containing 60 per cent or more of copper, from any non-enemy country. The purpose of the new ruling is to bring about ocean transportation of copper in a concentrated form rather than as bulky ore.

## Lack of Steel Causes Production Cut

**Detroit Manufacturers Cannot Get Supplies—Parts Makers Are Short, Too**

DETROIT, July 16—The critical steel situation is causing a cut in passenger car production in this territory and there is a difference of opinion as to just how long this will last. While the curve of passenger car production is rapidly declining, the curve of motor truck production is showing a steady upward tendency. Comparing production figures of May with those of to-day the average reduction in output of passenger car manufacturers would be approximately 33 1/3 per cent. The greatest cut in production is 50 per cent while many companies are suffering only a 25 per cent decrease.

A number of manufacturers, however, have not felt the necessity of decreasing their output and have been maintaining the same production since May. Among these are Packard, Overland and Hupp. Hupp shipped 1053 cars during June.

Much optimism is expressed regarding the steel situation. Manufacturers are inclined to think that it will be clarified within the next 60 or 90 days and that everything will be running much more smoothly then. It is generally conceded that conditions at Washington are in a rather unsettled state and manufacturers cannot be expected to feel easy until the turmoil there ceases. So many rumors originating in Washington have been current here that manufacturers are now turning deaf ears to them.

It is reported that the Ford Motor Co. is now producing 750 passenger cars as compared with 1550 during May. The production of the Paige-Detroit Motor Car Co. averages thirty-five cars daily as against fifty during May. Oldsmobile represents a cut in production of 33 1/3 per cent, now making 65 to 70 cars daily. Dort Motor Car Co. production has decreased almost 50 per cent. The Paige factory has 4000 orders for cars on its books which it expects never to be filled.

## Demonstrates Wire Cutter

WASHINGTON, July 13—John E. Logan, Kansas City, Mo., construction engineer, demonstrated a barbed-wire cutting machine attached to an armored tank at the Capitol grounds yesterday. Members of Congress and Army officers were present, and were gratified by the demonstration. Mr. Logan has offered his invention to the Government.

## Device Combines Horn and Lamp

**Invention of Molyneux and  
Stowe Will Be Marketed by  
the Wire Wheel Corp.**

NEW YORK, July 10—The Wire Wheel Corporation of America has secured the patent rights to an interesting new automobile device, a combination lamp and horn. It is the joint invention of George Stowe and George E. Molyneux, both well known in the eastern automobile trade, Mr. Stowe being president of the Mitchell Automobile Co. of New York.

One advantage claimed for the combination is that it effects a marked saving in material, as the horn casing, bracket, trumpet, screws and clamp are rendered unnecessary. By combining the horn with the lamp the former is of course placed directly in front of the car, where it should be most effective. Enclosed in the lamp shell, the horn is protected from dirt, grease, oil and dust.

The construction worked out by the inventors is as follows: Near the rear of a standard lamp of the familiar bullet type, and below the horizontal diameter of the lamp, a hole is made, and the metal edges are turned up and ferruled. This aperture is slanted both downward and rearward, to prevent rain beating in, or the careless flooding of the lamp by the car washer. The ferrule becomes the supporting member of the signalling device, as well as the trumpet or mouth of the horn, as this is the opening through which the signalling sound is emitted.

The mechanism of the signalling device may be of any of the types now in common use. It is either made integral with or connected to the ferrule, and fits snugly in the rear of the lamp, back of the reflector. With the vibrator type of electric horn, the standard lamps are untouched, except for the making of the one hole, the bulb arrangement is not disturbed, and the wires of the horn are threaded through the tubular member of the lamp and its regular supporting post with the lighting leads. No outside wires are required.

It is not yet known what the intentions of the Wire Wheel Corporation of America are regarding the exploitation of the newly acquired rights. It is understood that the concern has a large plant at Springfield, Mass., at which the production of wire wheels was stopped when the war broke out, and which is now devoted to Government work. If the corporation should desire to enter into the manufacture of the combination lamp and horn this plant would evidently be selected for the purpose, as wire wheel manufacture could be concentrated at the enlarged main plant at Buffalo.

### Concession on Body Freight

WASHINGTON, July 15—Whereas a 33 1/3 per cent increase in the freight rates on bodies was proposed 6 months

ago, the increased classification has been applied mostly to enclosed car bodies, according to a decision handed down to-day by the Interstate Commerce Commission. Open car bodies are little changed. The rate applies only on Eastern roads and not on those in the West and South.

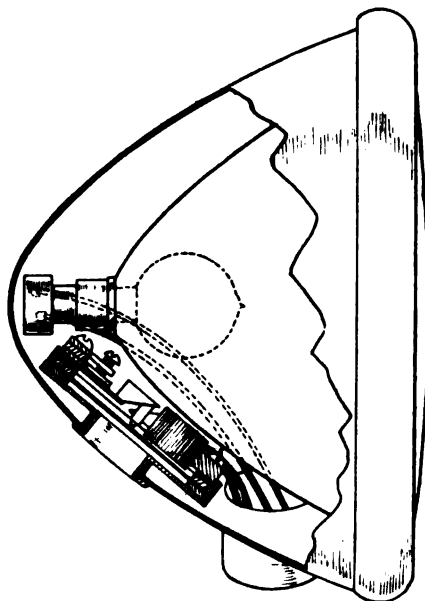
The rates in the East, South and West, which are the three railroad rate divisions of the country, were three times first class on all bodies. When the rates were raised last fall all bodies were listed as four times first class in the East. No change was made in the three-times-first-class rate in the West and South.

The National Automobile Chamber of Commerce asked for a temporary suspension of this increase and for a hearing, which were granted. The hearing was held in January. The result is that the rate is raised to four-times-first-class on all bodies over 36 in. in height and remains three-times-first-class on bodies under 36 in.

A comparatively small percentage of touring and roadster bodies exceed 36 in. in height, which causes the rate to affect enclosed car bodies mostly. The arguments of Traffic Manager J. S. Marvin, of the N. A. C. C., at the hearing were mostly technical and did not relate to the essential character of different classes of bodies.

### Hear Major Rice in Aircraft Inquiry

WASHINGTON, July 13—Members of the aircraft sub-committee of the Senate Military Affairs Committee held a secret examination to-day of Major C. A. Rice, of the American aviation service, who recently returned from France. Nothing was made public except that the testimony was technical and that the committee members were convinced that the American aerial fighting machines compare favorably with the types used by the Allies. It is quite likely that the report of the sub-committee investigations will not be completed for some time.



*Internal construction of the combined horn and lamp to be marketed by the Wire Wheel Corp.*

## Order Reduction of Plow Types

**War Industries Board Decreases  
Number as an Iron and Steel  
Conservation Measure**

WASHINGTON, July 13—For the conservation of iron and steel, the War Industries Board has ordered a reduction of more than 3000 types of plows and tillage machinery for the farm. Out of 303 types of plows only sixty-five will be continued after Dec. 31, 1918. Of 300 types of corn planters and drills only ten will be continued, and of 107 types of harrows only forty-four will be continued after this date.

This reduction in number of sizes will do a great deal to reduce the size of stocks carried by the manufacturers as well as by distributors and dealers and will consequently lower the required capital needed for carrying on business. It has been known for some time that there were too many models of different kinds of farm implements, but such a broad pruning of the list was not expected.

The plan was the result of co-operative work by the industry. The tractor plows that are involved follow:

Light tractor plows, rigid beam, power lift, 2, 3 and 4 bottom, 2 wheel, will be made in 10-, 12- and 14-in. only.

Heavy tractor plows 14-in. only will be made in 4, 5, 6 and 8 bottom only.

Medium duty tractor plows, rigid beam, power lift, 3-wheel, will be made in 3 bottom 14 in. and 4 bottom 14 in. only.

Heavy engine disk plows will be restricted in manufacture to one type to each maker with 2 to 10 disks, set and equipped to cut from 20 to 100 in.

Light tractor disk plows will be restricted to one type only by each manufacturer, equipped with 2, 3, 4 and 5 disks.

### Canadian Ford Plant Closes

FORD CITY, ONT., July 12—About 2700 workmen of the Ford Motor Co. of Canada were thrown out of employment when the plant closed its doors last week. Shortage of raw materials is said to be one reason for the shut-down. The plant has used the large stock of raw material imported before extra duties were placed on such articles by the Canadian Government, and other stocks are said to be unprocureable. Officials of the company would make no statement other than that it is their usual custom to close the plant every summer for an inventory lasting 2 weeks or more. The shut-down is considered a "lock-out" by employees, who recently made demands on the company for increased pay, amounting to 62½ cents an hour, or \$5 for an 8-hr. day. More than 3000 men will be affected, as the plants of the Fisher Body, Kelsey Wheel and Dominion Stamping companies, which are engaged in turning out parts for the Ford company, will be placed either on curtailed production or enforced layoffs. It is probable that the Government may take over the plant.

## Car and Parts Curtailment Need Not Be in Proportion to Fuel Reduction

### Coal Allowance to Manufacturers Will Not Be Estimated in Terms of Quantitative Output of Factories

WASHINGTON, July 15—The coal curtailment for 1918-1919—probably a 75 per cent cut—will not necessarily reduce the manufacture of passenger cars or parts 75 per cent.

The United States Fuel Administration will not estimate its coal reduction by a quantity car or parts reduction.

If a manufacturer of passenger cars or parts reduces his coal consumption for these commodities 75 per cent, but discovers an honest method for maintaining his production at 50 per cent of the 1917-1918 period, for example, the Fuel Administration will approve such activities.

In fact, the Fuel Administration is in favor of the greatest production possible and compatible with the 75 per cent coal reduction. This was made clear to-day by the Administration in reply to inquiries by AUTOMOTIVE INDUSTRIES.

The coal allowance to passenger car and parts manufacturers will not be estimated by enforcing a curtailment in the number of passenger cars or parts.

#### Methods of Estimating

It will be estimated by taking the requirements of 1917-1918 non-war work and cutting it 75 per cent, allowing 25 per cent of the coal consumption last year for non-war work for the 1918-1919 period.

It will apply only to passenger cars, as trucks and tractors, and the parts for these are considered as war work by the Fuel Administration.

In order to ascertain the proper amount of coal to be used for non-war work manufacturers will be expected to estimate accurately the coal consumption for the 1917-1918 period. They will be expected to deduct 75 per cent from this and use the remainder as a guide for their 1918-1919 requirements. They will be allowed 100 per cent coal for war work. They will not be allowed to use more than 25 per cent of the coal they have for non-war work regardless of the amount of coal they may have on hand.

#### Can Prevent Over-Consumption

While it is doubtful if the United States Fuel Administration has the power to take the surplus coal away from an owner, it has the power through the Lever Act to prevent the owner of that coal from consuming more than the amount prescribed by the Administration regulations.

Manufacturers engaged solely in non-war work can easily learn their position for the 1918-1919 period by checking up the coal requirements for the 1917-1918 period and allowing 25 per cent of that amount for the 1918-1919 period. Manufacturers engaged in non-war work and war work will be expected to observe the following plans:

- 1—Estimate accurately the average amount of coal per piece produced required for heat and power, basing these figures on the 1917-1918 period.
- 2—Estimate accurately the total amount of coal required for the period Aug. 1, 1917, to Aug. 1, 1918. Take 25 per cent of this as the coal allowance for non-war work for 1918-1919.
- 3—Estimate accurately the total amount of war work engaged in. Find the amount of coal required by using the coal per piece rate. Allow 100 per cent coal requirement for the war work.
- 4—Order 25 per cent of coal for the non-war work. Order 100 per cent of coal necessary for the war work. This will be the total coal allowance from the United States Fuel Administration.

In using the figures "25 per cent," it is necessary to add that these are approximate.

The United States Fuel Administration has not yet definitely decided upon the actual allowance of coal to the automobile industry.

Dr. Harry Garfield has indicated that it will probably be 25 per cent of the 1917-1918 requirement for the 1918-1919 period.

#### Entire Matter Vague

The entire matter is as yet somewhat vague in the minds of the Fuel Administration.

It is not certain of the exact percentage curtailment nor of the methods of procedure in special cases.

It does not know, for instance, what would be done in the instance of a manufacturer of parts who in 1917-1918 not only supplied passenger cars made during that period but millions of passenger cars made in previous years.

Following is an example of how the manufacturer can approximately ascertain his coal allowance for the 1918-1919 period:

A. B. & Co. manufactured 3000 passenger cars Aug. 1, 1917-Aug. 1, 1918.

A. B. & Co. consumed 3000 tons of coal Aug. 1, 1917-Aug. 1, 1918.

A. B. & Co. have war contracts for 1300 passenger cars or for other materials using 50 per cent of plant.

The United States Fuel Administration allows:

One hundred per cent coal requirements for the war work for 1918-1919.

Twenty-five per cent of the 1917-1918 coal used in 1918-1919.

Using 3000 tons of coal for 3000 passenger cars, A. B. & Co. average 1 ton of coal per car.

Being allowed 100 per cent coal for war work, it orders for war work 1500 tons (war car order or 60 per cent of

last year's consumption to meet the 50 per cent war work in their plant).

Being allowed 25 per cent of the coal consumed in 1917-1918 for non-war work, it orders for non-war work 750 tons of coal, which is 25 per cent of the 1917-1918 consumption. Thus the complete order is: 1500 tons for war work, 750 tons for non-war work, 2250 total allowed for war and non-war work, which is 75 per cent of the 1917-1918 coal.

#### Holiday Lessens Coal Production

WASHINGTON, July 16—Bituminous coal production for the week ending July 6 was 10,250,000 tons as against 12,340,000 tons in the preceding week. The decrease of 17 per cent was caused by the observance of July 4. The daily average production for the operating days was practically the same as that of the previous week of 1917. The production for the 5-day week amounted to 1,000,000 tons more than for the corresponding week of 1917.

Anthracite shipments during the week of July 6 amounted to 31,493 cars as against 41,641 cars, a loss of 25 per cent, also due largely, according to the Fuel Administration, to observance of July 4.

During the week of June 29 the mines operated 84.3 per cent of their full time capacity. Losses against production were: Car shortage, 7.8 per cent; labor shortage, 0.8 per cent; mine disability, 2.8 per cent; no market, 1.2 per cent; all other causes, 3.1 per cent. Car shortage losses in West Virginia were 28.4 per cent, and in parts of Kentucky, 36.5 per cent. Material losses on account of car shortage were also shown in Pennsylvania, Illinois and Indiana.

#### Labor Shortage Continues

WASHINGTON, July 12—Continuing shortages of common labor are reported by the weekly labor service of the United States Employment Service. Of the 100 offices which reported for the week ended June 29, 72 show a serious shortage. Three cities in California and 3 in Texas show a surplus of common labor, while 3 cities report normal conditions.

Common labor is especially scarce from Long Island Sound to the mouth of the Chesapeake River. The United States Employment Service is arranging to send men from Maine and Massachusetts, where the lack is not so serious, to meet this shortage. Common labor is greatly in demand from South Carolina to Texas, and in the North Central states, excepting Indiana, where there has been some surplus. In the mechanical and skilled-craftsmen divisions, there is a small but noticeable improvement due to the recruiting of skilled workmen and machinists by the United States Employment Service.

#### Tractor Plant for Texas

ORANGE, TEX., July 15—The Blumberg Mfg. Co., San Antonio, will build a plant here for the manufacture of farm tractors. The new tractor will be adapted specially for use on rice plantations.



## Labor Recruiting Plans Complete

### U. S. Employment Service Will Cooperate with Factories to Get Unskilled Men

WASHINGTON, July 16—Federal transfer of labor from non-war to war work will begin Aug. 1. At the same time employers engaged in war contracts and with organizations numbering more than 100 workers will recruit all workers solely through the United States Employment Service of the Department of Labor. It is anticipated that through these plans 4,000,000 workers will be shifted from non-war to war activities within the next few months.

The classifications of preferred industries as made by the War Industries Board in its steel schedule, and previously published in AUTOMOTIVE INDUSTRIES, will be followed by the Department of Labor.

Instructions were sent out to the war industries late last week following a 3 day conference of employment managers, state employment agents and officials of the United States Employment Service, authorizing war industries with field service forces to recruit labor under certain conditions after Aug. 1, in co-operation with the United States Employment Service. The full instructions are as follows:

Order blanks for workers are sent to each employer to be filled out and returned, within 24 hours, to the man in charge of labor recruiting for the United States Employment Service in the State where the factory is located. The information sought by the blank is used to ascertain the total requirements of industries for unskilled labor, and the requirements by states for each particular industry and factory. Filling out and returning the blank does not mean that a manufacturer will obtain immediate relief of labor shortage. This is the goal aimed at for the future.

As soon as an employer fills in his order he will be notified by the United States Employment Service of the office and agent assigned to co-operate with him in getting the unskilled labor. The employer should immediately get in touch with this agent.

The total of the present needs of the war industries for unskilled labor will be divided into quotas among the states and sub-divided among communities. Vigorous efforts will be made in each community to secure the allotted quota in such a manner as to prevent taking labor from war industries or firms or needlessly crippling non-war industries. So far as possible recruiting for each plant will be centered in certain definite states and localities.

Employers with a field force for recruiting labor may continue these organizations under the direction of and subject to regulations of the United States Employment Service. Authorization for continuing such organizations is to be secured from the men in charge of the

work of the United States Employment Service in the state in which the company is located. Such authorization is subject to withdrawal at any time, but will be continued so long as it works satisfactorily.

In order to stabilize labor recruiting and distribution a Community Labor Board will be organized in each community, made up of a representative of the United States Employment Service, a representative of the workers and a representative of the employers. It will assist in recruiting local labor, but its principal function will be to decide on the relative needs of local establishments and prorate labor supply when it is inadequate.

#### Labor Administration Organization Completed

WASHINGTON, July 13—The new bureaus of the War Labor Administration of the Department of Labor as finally organized are:

Women in Industry Bureau—to deal with problems involving women.

Conditions of Labor Bureau—to set up and administer conditions of labor, including safety, sanitation, etc.

Training and Dilution Bureau—to train workers for war occupations. This organization will have jurisdiction where industries lack skilled workers and it becomes necessary to dilute the skilled supply with those who are less skilled.

Bureau of Labor Adjustments—to have jurisdiction over strikes, lockouts, etc.

Insignia Service—to reward war workers by means of badges, etc.

Investigation and Inspection Service—to handle investigations other than statistical.

#### Condemns Competition For Labor

WASHINGTON, July 12—The using of competitive peace-time methods in the procurement of labor is strongly disapproved by a resolution of the War Industries Board. Henceforth the Board, through its Priorities Division will in proper cases withhold priority assistance from employers who persist in using competitive peace-time methods which result in the withdrawal of labor from war industries.

#### Repairmen Not to Be Reclassified

WASHINGTON, July 12—Repairmen in garages and repairshops will not be affected by the "Work or Fight" order recently promulgated by Provost-Marshal General Crowder. This ruling was made to-day by the office of the Provost-Marshal here and is definite. It does not matter whether the repairmen are working on trucks or passenger cars, according to the office of the Provost-Marshal, and those local draft boards which are reclassifying repairmen under the order are acting without proper authority.

#### Calls Men to Cut Spruce

WASHINGTON, July 13—Provost-Marshal General Crowder yesterday issued a call for an additional 3000 men from 38 states to cut spruce wood in the forests of the Northwest for airplane construction.

## How Women Should Be Employed

### Statement of the Government's Attitude Toward the Use of Female Labor in War Work

WASHINGTON, July 13—The shortage of labor in essential war industries should be met so far as possible by the increased use of women in clerical and office positions. Women should not be employed in occupations physically or morally unsuited to female labor. These and other principles setting forth the Government's attitude for the employment of women in the war emergency are included in a resolution issued by the War Labor Policies Board here to-day. The resolution will govern the work of the new division of Women in Industry of the Department of Labor which was created this week. The resolution is in part as follows:

The existing shortage of labor aggravated daily by the military and naval demands of the Government and the withdrawal from civilian occupations of a quarter of a million additional recruits each month necessitates widespread recourse to the labor of women.

Standards as to hours, night work, wages and other labor conditions, as recommended by the Chief of Ordnance and the Quartermaster-General should be observed by all employers.

The shortage of labor in essential war industries should be met in part by further introducing women into occupations easily filled by them, such as clerical, cashier and accounting service in manufacturing, mercantile and financial establishments and in the offices of transportation companies and other public utilities; such as sales clerks and floor walkers in mercantile establishments.

Women should not be employed to replace men in occupations or places of employment clearly unfit for them owing to physical or moral conditions, as for instance, in bar rooms, saloons, pool rooms, mines, smelters, quarries, furnace work, glass works, etc. Girls under 21 years of age should not be employed where it is clearly unfit for them owing to their youth, as for instance in public messenger service, street car, elevated and subway transportation, as elevator operators or bell boys.

The introduction of women into war industries or other employments involving special hazards such as the use of industrial poisons should be guided by the standards of health, comfort and safety as defined by the various Governmental departments.

Introduction of women into new occupations should be guided by regulations concerning hours of labor, night work, etc., as adopted for instance by the Industrial Commission of Wisconsin.

Recruiting of mothers of young children for war industries should be discouraged.

Introduction of women into positions hitherto filled by men should not be made a pretext for unnecessarily displacing men.

The services of the division of women in industry should be sought by employers with regard to introduction of women in industry and the working conditions which should be established.

Older men should be more generally employed. They constitute a largely unused labor reserve. It is estimated that since the

war began the maximum age for employing men has advanced 10 to 12 years, that is from 38 to 50. It has been found that tasks can be graded for these workers according to their strength, and that work unsuitable for women, especially at night, can be performed by them.

#### Deliver 2514 Liberty Engines

WASHINGTON, July 16—The delivery of Liberty engines for all purposes on July 5 was 2514. At the same time 450 DH-4 or DeHaviland battleplanes, each designed for two men and fitted with four machine guns, had been shipped.

Rumors are beginning to be spread in Washington as to the report of the Senate Military Affairs Committee which is investigating the aircraft situation and whose report will be filed soon. This committee has visited many of the aircraft factories. Undoubtedly this report will deal largely with Liberty engine production as well as the manufacture of battleplanes.

Members of the Aircraft Committee state that quantity production has just been arrived at in the matter of engines, and that the Handley-Page and Caproni types are now starting in production. They say that for these types "the Liberty engine cannot be beat."

#### Marmon Delivers First Liberty Engine

INDIANAPOLIS, July 15—The first Liberty engine to be completed by the Nordyke & Marmon Co. ended its 50-hr. trial run, 55 min. after midnight Saturday and has been accepted by government officials, who came from Detroit to inspect it.

Following the long period test, the engine was taken apart and each unit examined separately to determine what wear or strain, if any, was visible after the endurance run. For most of the time the engine was on the block, a normal speed of 1650 r.p.m. was maintained, and for shorter spaces higher speeds were attained.

The Nordyke & Marmon plant will immediately enter upon quantity production. The company has already built and delivered 1000 Hall-Scott engines and completion of this order has delayed production of Liberty engines.

#### A.E.F. Motor Transport Corps Organized

WASHINGTON, July 16—Motor truck transportation in France has been made an entirely separate division of the Army and will hereafter be called the "Motor Transport Corps."

#### Packard Not to Change Its Car

DETROIT, July 15—The Packard Motor Car Co. will continue its present 12-cylinder passenger car model substantially without change for an indefinite period.

#### G.M.C. to Erect Body Plant

ST. LOUIS, July 12—The General Motors Corp. has purchased a plot of 105 acres here, and, it is stated, will erect a plant for the manufacture of bodies.

## South Africa Using New Motor Fuel

### Natalite, a By-Product of Sugar Is Found to Be Cheaper But Less Efficient Than Gas

JOHANNESBURG, SOUTH AFRICA, May 25—Natalite, a bi-product of sugar is being used as an automobile fuel in this part of South Africa. Although this fuel is not nearly so satisfactorily as gasoline or kerosene due to carbonization of the engine, there is nevertheless a good deal of interest in it because it is much cheaper than imported gasoline and kerosene. It is being sold at 75 cents an Imperial gal. in wholesale quantities, and at points on the coast at a lower price. Gasoline is selling at \$1 a gal.

In addition to carbonizing the engine, natalite does not give as much power as gasoline and kerosene. The feeling is that its quality as a fuel can be improved and distributors are looking forward to it with interest.

A shortage of gasoline is one of the automobile problems of South Africa. It has resulted in a large number of automobiles already being placed in storage. Gasoline has been as high as \$1.25 per gal., and the price generally ranges between \$1 and this figure. Some of the distributors have recently imported large quantities of American gasoline, but the economy has been slight in so far as price is concerned.

Considering the population of South Africa, the number of automobiles imported and sold is great. The entire white population is little more than 1,000,000, which is one-fifth that of Australia and about one-ninth that of the Dominion of Canada.

The demand for motor trucks is not large and is confined principally to larger cities. A possible exception is that territory known as the South Western African Protectorate, which is a sparsely populated section and one in which motor trucks are badly needed.

On some of the larger farms of the Cape Province, farm tractors have been introduced but it will be some time before the tractor will be an attractive proposition to the South African distributor. The cheap price of oxen which cost the farmer nothing, is largely responsible for this. Another fact is that the native farmer is ignorant of machinery, and the tractor would be badly abused in his hands. The sale of automobiles to the farmer is a useful missionary work since it educates him for the tractor.

#### British Aircraft Production Increasing

LONDON, June 28—During the 3-month period from March to May, production of airplanes in England increased 116 per cent over deliveries from June to August, 1917, according to a statement by the Aircraft Production Department of the British Air Ministry. In the same 3-month period, production of engines increased 105 per cent. The statement

adds: "The increase in the fighting value of the airplanes is very much higher than these figures would indicate, as the engines delivered during the 3 months just completed are of a much higher and more powerful type than those delivered during the 3 months of 1917." At the present time there is a considerable quantity of planes in storage ready for engines, but it is anticipated that these will be fitted in the near future.

#### Housing Corporation Formed

WASHINGTON, July 14—The United States Housing Corp. has been created to take over the functions of the Bureau of Industrial Housing and Transportation of the Department of Labor. This new organization is expected to afford more facility in operation. The charter was taken out under the laws of New York State. The articles of incorporation provide for issuance of 1000 shares of stock without par value, of which the Government holds 998 shares and O. M. Eidlitz and G. G. Box one share apiece.

The executive officers of the corporation are: President, Otto M. Eidlitz; vice-president, Joseph D. Leland; treasurer, George G. Box; and secretary, B. L. Fenner. These, together with Albert B. Kerr, J. W. Alvord and William E. Shannon, will serve as directors.

#### Engines for Ordnance

NEW YORK CITY, July 17—The Trego Motor Corp., New Haven, Conn., which was given a contract to manufacture Liberty aircraft engines for aircraft purposes, has transferred its manufacturing activities from aircraft to the Ordnance department. It will continue the manufacture of the Liberty engine, but for Ordnance purposes. This company has gotten into production in a small way, but has facilities for approximately twenty-five engines per week. The factory is well fitted up for dynamometer testing of these engines, having two Sprague testing units capable of handling 800 hp. engines and four other units capable of handling 400 hp. Although the Trego corporation has not been in production to any extent it has for many months been producing parts for the Liberty engine in quantity.

#### Badges for War Workers

WASHINGTON, July 16—War badges for industrial workers employed at least four consecutive months in Government war industries, will be issued through the U. S. Employment Service according to a new plan just announced. The badges will comprise some design not yet completed of service bars. They will be given to workers in those industries where work is in sufficient volume and importance to require the supervision of a Government official or a plant certified by the chief of a Government department as sufficiently important in war work to merit badges.



General Lee of the British Mission ready for a flight in his Avro plane



General Lee landing with a passenger after a flight with loops and spiral falls

## Planes Hover Continually Over the American Capital

WASHINGTON, July 12—Flying has become a daily event here with the construction of a large hangar at Potomac Park housing several Curtiss J-N 4 airplanes. A DeHaviland airplane equipped with two Liberty engines has just been added and two Spads are expected shortly. In addition there is an Avro airplane here, shipped from England, built by A. V. Roe & Co. and equipped with a 100-hp. Nome engine. The Avro plane is the property of the British Mission and is used exclusively by General C. F. Lee who heads the British Aeronautical Mission in this country. General Lee was practically the first flier to exhibit the maple leaf drop, the "Immelman" loop, the spiral fall and the other "stunts" used at the front, in Washington. His exhibits have been watched with great interest by President Wilson and the various War Department officials.

Many fliers are stationed in the aviation section in Washington at desk work. In order to maintain their records and to secure the 25 per cent extra monthly pay allotment awarded to fliers provided they are in the air a certain number of hours each month, these men make frequent use of the Curtiss J-N 4 planes. Several may be seen flying each day at all hours, over the State, War and Navy buildings, the White House and the city proper.

### New Export License Regulations

WASHINGTON, July 15—Partial shipments from interior points or ports of exit where licenses can not be readily presented, will no longer be allowed by means of the special partial shipment certificate sworn before a notary public, or a certificate of transfer drawn by a collector of customs. The use of these forms, EAB-23 and WTB-176, were discontinued on July 10.

Partial shipments against export licenses may be made in the following manner except in instances when the license itself can be presented at the port of exit:

The shipper will prepare a Shipper's Export Declaration in quadruplicate and will endorse upon the back of the license in the space provided for the purpose the full details of the partial shipment he desires to make. He will then present the Declaration (4 copies) and the license (with the partial

shipment endorsement on the back) to any postmaster of the first or second class or to a collector of customs. The postmaster or collector to whom the papers are presented will compare them and if they agree in fact, that official will countersign and date the partial shipment endorsement on the back of the license and will stamp all 4 copies of the Shipper's Export Declaration with an official partial shipment stamp and sign and place his seal on such stamp. He will then return the license and all 4 copies of the Declaration to the shipper. The collector of customs at port of exit will allow the partial shipment to proceed upon presentation of the Declaration, so stamped, signed and sealed.

Shippers located in cities where there are no collectors of customs but where the post offices are of the first or second class, may communicate with their postmaster and ascertain at which post office station, if more than one, and at which window this service will be rendered. The attention of shippers is called to the fact that postmasters in cities wherein are located collectors of customs will not exercise this authority. Shippers in such cities may apply to a collector of customs.

### Navy Workers Needed

WASHINGTON, July 12—Workers are needed to assist in building seaplanes in the Naval Aircraft factory at the Philadelphia Navy Yard. The plant, which builds seaplanes for hunting submarines and serving as convoys to merchant ships, is being expanded, and several thousand workers are required. It is not considered desirable to take the workers from other aircraft factories or from any concerns engaged in Government work. There is a scarcity of men to work on the bracing wires which support the wings and hull of the seaplane. Men experienced in splicing small woven wire cables are preferred. Tube benders who have worked on bending small steel tubing in bicycle factories or furniture factories are needed. Coppersmiths, acetylene welders and braisers for work on metal parts, and a limited number of tool designers and tool makers are required. Boat builders who have designed or built small racing boats or schooners can be used to advantage in building the hulls.

In the final assembly of the seaplanes, men who have worked on assembly of automobiles are needed. Active, intelligent young men with but slight experience in handling of tools and who are taking engineering courses in colleges or universities are also sought. In fact any man with 6 months' experience at shop work can obtain a job.

## Detroit's War Contracts Will Reach \$2,000,000,000

DETROIT, July 16—In all probability, \$2,000,000,000 worth of war work will be in the city of Detroit within the next twelve months, according to J. Hubbert Cullen, secretary of the Resources and Conversion section of the War Industries Board for Michigan. This means that Detroit manufacturers will be working on an amount about double the present contracts.

At the present time 90 per cent of all Detroit's industries are working on war contracts or sub-contracts, but in comparatively few cases are the plants engaged to capacity. In many cases the proportion of war manufacture is as low as 5 per cent. In such plants the production of war needs will be greatly increased. These estimates are based on Mr. Cullen's recent survey of Detroit's industries.

At present this city leads the country in the percentage of industries working on munitions, but the large contracts are concentrated in the larger factories and it is expected that the future will see all factories, large and small, use their facilities for war work. In many cases factories are not equipped to take war contracts but the majority can be converted to this character of work with little difficulty. As an instance, there is one wood-working factory which occupies only 5 per cent of its facilities for airplane body work. This factory alone could turn out hundreds of completed bodies a week.

### Government Trains 12,000 Men

WASHINGTON, July 15—More than 12,000 men have been trained for the United States Army through the war trading division of the Federal Board for Vocational Education. Six thousand of these were trained in mechanical lines, 5000 in radio work and 1000 in clerical occupations. It is estimated that an additional 3000 men have been trained by private agencies through impetus given to the work by the Federal Board, using Federal Board courses of instruction.

### Grossman Gets Post Office Contract

NEW YORK, July 12—The post office department in Washington has awarded a contract for Red Head Vitristone spark plugs to the Emil Grossman Mfg. Corp.



## Truck Sales Are Good on Seaboards

### Detroit Territory Coming Back After a Month's Lull—Many Trucks Idle

DETROIT, July 16—All truck manufacturers in Detroit territory report very brisk business on the east and west seaboards, but throughout the middle of the country in sections a lull in sales is manifest. Although there are scores of prospects in these sections and the desire to own trucks is present, the sales are backward. A depressed condition seems to prevail.

This condition, the manufacturers state, is only temporary and are optimistic about it; many producers already see an easing up of the situation and note a slight increase of sales in some parts.

The city of Detroit is just coming out of such a lull. During June the truck business, it is reported by most retail agencies, has been at a standstill and none was able to determine the cause. Most persons lay it to the fact that solicitations for various war activities swerved money to other channels; others are of the opinion that this territory is oversupplied with trucks, while still others are satisfied with the thought that the depression is a natural one at this time of the year.

It is a fact that Detroit has an oversupply of dump trucks at this time. When the city was enjoying its building boom some time ago a large number of individuals entered the building and contracting business and bought great numbers of this type of trucks. Now these vehicles are standing idle in many garages, only a few being converted into types suitable for regular truck service. It seems enough work cannot be found to keep all these idle trucks in use. One local contracting firm that owns over one hundred trucks has an average of thirty to forty trucks idle every day and has found it necessary to advertise that it has vehicles for outside service.

The sales of many manufacturers show a decrease of 20 per cent in this territory. It is believed that the South will be the first section to come out of its state of depression, due to the coming cotton crop. The east and west coast have been active because of the great quantities of material handled there; there is more moving in these sections.

The decreased use of trucks has caused a corresponding lessening of tire sales. The Detroit branch of the B. F. Goodrich Co. reports a marked dropping off of business in the truck tires sales. This condition is noted with other tire agencies.

#### U. S. Rubber Sales \$100,000,000

NEW YORK, July 15—The United States Rubber Co. in the 6 months ended July 1 did a gross business of approximately \$100,000,000, which is only \$16,-

000,000 less than the sales of all of 1916. In 1917 sales amounted to \$176,000,000. More than 15 per cent of the company's business at present is government work. In the order of importance, from the standpoint of Government contracts, the various departments rank: First, boots and shoes; second, tires; third, mechanical goods.

The tire business of the company, on sales to dealers in the first half of 1918, showed a large gain over 1917. Tire business is divided into two departments: Sales to dealers and sales to manufacturers of automobiles. Sales to manufacturers are less than those of last year. The company is finding it difficult to manufacture enough tires to satisfy the demands for cars built before Jan. 1, 1918.

#### First Eagle Launched

DETROIT, July 12—Without a semblance of ceremony and with less than a hundred spectators outside of the Ford employees and the naval men, Ford's Eagle-1 was launched yesterday. With hardly a hitch, the 200-ft. boat was brought out of its housing and lowered into the water.

Unlike other launchings where boats are built at the water edge, the Eagle had to be conveyed a distance of about 500 ft. before it could be placed in the water. This new type of sea-fighter or submarine chaser is assembled on a long conveyor resembling an elongated freight car. When completed the boat is pulled on its conveyance to a transfer table and brought to the launching well.

The transfer table is a large square area sunk about 3 ft. below the floor of the construction building, and on this are 16 parallel railroad tracks placed about 15 ft. apart. A trestle-like construction with a small engine house abutting one side, in the middle, spans these tracks. This contrivance also has four tracks, and receives from the construction building the conveyance on which the boat is resting and carries it to its launching place.

Here the boat is pulled off the carrier with a cable onto tracks on another platform which is then lowered by means of hydraulic power and the boat is floated.

The boat resembles a speed boat with its tapering bow and blunt stern. It will draw 8 ft. when fully equipped and ready for sea. The motive power is a steam turbine geared to the propeller shaft on which is mounted a single three-bladed screw. Crude oil fuel will be used to generate steam. The tank capacity of the boat is sufficient for a steaming radius of at least the distance across the Atlantic Ocean.

There is not a forging or a rolled beam in the ship. Everything is pressed from sheet metal, cold, by means of automatic machinery that cuts every piece to an exact pattern, then punches the rivet holes and bends every part to its final shape.

It will not be long before the next Eagle will go through a like program. It is expected that ultimately the plant will reach a production of one a day.

## Goodyear Employs 3000 Women

### Female Labor Successfully Used on Large Variety of Tire Operations

AKRON, OHIO, July 16—According to figures given out by the labor department of the Goodyear Tire & Rubber Co. nearly 3000 women and girls are now employed in that plant, many of whom are doing work which requires a high degree of skill. It is estimated that women are now turning out 20 per cent of the company's products.

Among the things which the women are doing are finishing tires, cutting and splicing fabrics for balloons, weighing rubber, molding and trimming rubber heels, operating industrial trucks, making gas masks, operating refining and straining machines in reclaiming rubber, running rubber-washing machines, splicing and trimming tire tread bands, separating rubber sheets that become stuck together in the long voyage from the crude rubber plantations, and making tubes.

It is interesting to note that since the close of the school year there has been quite a decided influx of school teachers. Many of these teachers have been prompted to seek work in the factory by a desire to perform a patriotic duty at this particular time. Others are influenced undoubtedly by the fact that a high wage rate may be earned.

It has been found that the work of the women is done as efficiently as it was by men. There are, however, certain operations which they are unable to perform. For example, they work on tire finishing with the men, but they have been found physically unable to carry the heavy metal cores on which the tires are built. This part of the work is therefore still done by men, and the women's rate of pay in this department is determined by the portion of the work which they actually perform. In cases where they work independently of other help they are paid the same as men for the same work.

More than 4600 men have left the company since the beginning of the war to enter Federal service.

#### New York Closing Saturday Afternoons

NEW YORK, July 13—Following the affiliation of the Automobile Dealers' Assn. of New York City with the National Automobile Dealers' Assn., the dealers here have voted to close their establishments at 1 o'clock Saturdays, beginning to-day. The service stations generally have been closed Saturday afternoons, the shops working 48 hours a week on a plan which made a half holiday possible.

Following the meeting July 1, at which the New York dealers joined the N. A. D. A., eight new members have been received, the local membership now including practically the entire row.

## Tractor Show Lists Filling

### Twenty-six Makers of Tractors, 9 of Implements and 16 Accessories Signed Up

SALINA, KAN., July 12—The list of accessory and implement manufacturers who will exhibit at the National Tractor Demonstration July 29 to Aug. 3, is growing steadily larger. So far, 26 tractor, 9 implement and 16 accessory manufacturers have signed up. The list follows:

#### Tractors

Avery Co.	Peoria
Square Turn Tractor Co.	Chicago
Hart Parr Co.	Charles City
Holt Mfg. Co.	Peoria
Nilson Tractor Co.	Minneapolis
Moline Plow Co.	Moline
Dauch Mfg. Co.	Sandusky
Parrett Tractor Co.	Chicago
Russell Co.	Massillon
Gile Tractor & Engine Co.	Ludington
Advance Rumely Thresher Co.	La Porte
Aultman & Taylor Machine Co.	Mansfield
Rock Island Plow Co.	Rock Island
Gray Tractor Co.	Minneapolis
La Crosse Tractor Co.	La Crosse
Cleveland Tractor Co.	Cedar Rapids
Hession Tiller & Tractor Co.	Buffalo
Four Drive Tractor Co.	Big Rapids
Velle Motor Corp.	Moline
American Tractor Co.	Peoria
Lyons-Atlas Co.	Indianapolis
J. I. Case T. M. Co.	Racine
Emerson-Brantingham Co.	Rockford
Wallis Tractor Co.	Peoria
Frick Tractor Co.	Wainsboro
Waterloo Tractor Co.	Waterloo

#### Implements

P. & O. Plow Co.	Ancon
Oliver Chilled Plow Works.	South Bend
John Deere Plow Co.	Moline
Grand DeTour Plow Co.	Dixon
Vulcan Plow Co.	Evansville
South Bend Chilled Plow Co.	South Bend
Turner Mfg. Co.	Port Washington
La Crosse Plow.	La Crosse
I. H. C. Co.	Chicago

#### Accessories

McQuay-Norris Mfg. Co.	St. Louis
Hyatt Roller Bearing Co.	Chicago
Timken Roller Bearing Co.	Canton
Diamond Chain Co.	Indianapolis
Am. Manganes Steel Co.	Chicago
Buda Motor Co.	Harvey
Sumpter Electric Co.	Chicago
Bosch Magneto Co.	New York
K-W Ignition Co.	Cleveland
Modine Radiator Co.	Racine
Hooen Radiator Co.	Chicago
Vacuum Oil Co.	New York
Gurney Ball Bearing Co.	Jamestown
Automotive Parts Co.	Indianapolis
S. K. F. Ball Bearing Co.	Hartford
R. D. Nuttall Co.	Chicago

#### Walnut Needed For Propellers

WASHINGTON, July 16—American walnut is needed for airplane propellers. The Bureau of Aircraft Production has said that years of test in the present war has proved that walnut is the best material for propeller manufacture and is soliciting mills and individuals to increase the Government walnut supply.

The Government does not buy walnut directly. Mills holding Government contracts for propellers purchase the walnut trees and logs and the Government is urging the owners of these trees and logs to sell them to the saw mills. Owing to

their inability to purchase sufficient walnut logs, the saw mill proprietors have not been able to supply the present requirements of the Allies.

"Fight with your walnut trees" is the slogan used in the publicity campaign of the Hardwood Section of the Bureau of Aircraft Production. It is pointed out that 6 walnut trees will provide lumber for a propeller and supply gun stocks for a platoon of infantry.

Any one with walnut trees 12 in. or more in diameter can learn where to sell them by addressing the Hardwood Section, Bureau of Aircraft Production, or the Production Division, Small Arms Section, Ordnance Department.

#### Purchasing Control System Planned

WASHINGTON, July 17—A system of control designed to protect the Government in the procurement of all war materials will soon be operated by the Department of Justice in conjunction with the War Department. A board of control will be appointed which will review every contract. Centralization of purchases of each commodity under a single bureau will be arranged in a manner similar to the present plan whereby all motor trucks are purchased by the Motor Transport Service. Contract clauses will be standardized. A daily fiscal survey of Government requirements will be made both for the information of the War Department and the public.

#### To Prevent Resale of Steel

WASHINGTON, July 17—Certain manufacturers on the preference list for steel supply, are reselling steel that has been delivered to them as a result of Government priority assistance, according to the War Industries Board. To prevent such abuses of the priority privilege the Board passed a resolution yesterday that if any such resales made hereafter without the approval of the director of steel supply of the War Industries Board, the manufacturer who is responsible for these resales will be dropped from the preference list and receive no further priority assistance.

#### Air Mail Expansion Planned

WASHINGTON, July 17—Rapid expansion of the air mail service with eventual country-wide scope will begin August 1, when the air mail service will pass from the War Department to exclusive post office control. College Park Aviation Field, 8 miles from Washington, has been selected as the new Washington terminal. Motorcycle delivery will be made from that point to the city. Army aviators returning from the war will have the preference in this service.

The first flight under the new system will begin August 1 when it is possible that another reduction in service charges from 6 cents per ounce to 3 cents per ounce with the usual 10-cent special delivery charge will be announced.

It is also planned to shortly inaugurate and 8 hour aerial mail route from Chicago to the East.

## South Africa Cars Sent from U. S.

### More than Half of All Imported Vehicles and Parts Come from America

JOHANNESBURG, SOUTH AFRICA, June 21—In the annual customs returns of South African imports for 1917, the value of cars, trucks, parts, motor cycles, tires and gasoline totals \$10,237,970 as compared with \$8,830,040 in 1916, or an increase of 25 per cent. Of the 1917 amount, \$4,500,000 was sent by the United States.

Under the head Motor Imports, South Africa includes not only cars, trucks, motor cycles and parts, but also tires and motor fuel. Of the total amount of passenger cars imported, 2596 valued at \$2,063,125 came from the United States in 1917 as compared with \$2,790,970 in 1916. The value of trucks likewise decreased from \$125,180 in 1916 to \$33,640 in 1917. The only item imported from the United States which increased in value in 1917 was motor fuel, including benzine and naphtha. In 1917, 4,589,896 gallons at a cost of \$1,383,770 were imported as compared with 3,204,474 gallons valued at \$893,360 in 1916.

#### U. S. Leads Exports

Despite the reduced amount of imports from the United States last year, in each case that amount was larger than shipments from all other countries combined, or more than 50 per cent of the total.

Passenger car shipments from Canada came second to those of the United States, having a value of \$960,000. Imports from all other countries besides Canada amounted to only \$21,000, making the total value of passenger cars sent from all countries other than the United States \$981,000, or less than half those from the United States. The difference in trucks was even greater, proportionally. United States imports were \$682,320 as compared with all other imports of \$3,480. In the matter of chassis, the United States and Canada sent approximately the same amount.

#### Imports Into South Africa of Cars, Trucks and Parts.

	1917	1916
<b>Passenger Cars.</b>		
United States.....	\$2,063,125	\$3,847,705
All other countries..	981,885	1,156,735
	<b>\$3,045,010</b>	<b>\$6,004,430</b>
<b>Motor Trucks.</b>		
United States.....	\$33,640	\$125,180
All other countries..	3,480	29,235
	<b>\$37,120</b>	<b>\$154,415</b>
<b>Parts</b>		
United States.....	\$56,862	.....
All other countries*.	55,065	.....
	<b>\$111,927</b>	

Grand total.....\$3,194,057 \$4,002,130  
\*1916 amount included with car and truck import figures.

## Michigan to Have Rural Express

Lines to Run from Lansing to Grand Rapids—Another Line to Center in Flint

LANSING, July 15—In co-operation with the Federal Government to relieve railroad freight congestion and the State efforts to bring about the organization of rural motor express lines and return load bureaus, preparations have been made for the operation of such a line between Lansing and Grand Rapids. One Lansing company which owns several large motor trucks has informed Secretary Wickham of the Michigan Highways Transport Committee that its trucks will be available.

The plan of the Rural Express, which has been adopted in several States, is to organize routes for trucks between the principal cities and towns of the State. While the State will not be financially interested in the proposition, the committee appointed by the governor will assist in picking out the route, interest owners of trucks in the proposition and help the various Chambers of Commerce in organizing the Return Load Bureaus. The owner of a truck in the Rural Express system picks up the farm produce along his route, and in some instances he buys outright from the farm and sells the produce in the city. In other cases he receives a certain rate for transporting it to its destination. At the same time he takes orders for such goods as the farmer needs in town and delivers them to the farmer on his return trip.

Where the rural motor express companies do the transportation work for the big manufacturers between cities, the Return Load Bureaus have an opportunity to co-operate. For instance, if a truck should leave Lansing with a consignment for Grand Rapids, the Return Load Bureau in that city would be expected to get in communication with the manufacturers of that city and provide a load for the truck on its return trip.

### Truck Freight Line Centers in Flint

Plans have already been perfected by the traffic department of the Flint Board of Commerce whereby this city will become the center of a large transportation organization providing truck freight service for all of this section of the State. The first trucks to start out loaded in this new system left Detroit yesterday and will return with freight for Detroit to-morrow. Early next week freight service will start between Flint, Saginaw, Bay City and Alma, and at the same time truck service will start between Flint and Owosso, and Flint and Lansing.

Four trucking companies have been brought together in this new system which will practically work as one unit, with an interchange of freight service, so that through shipments may be made from any point to another. The towns

to be served include Ann Arbor and intermediate points between that city and Pontiac, where transfers will be made on the Detroit-Flint line, Holley, Fenton, Linden, Mt. Morris, Clio, Birch Run, Saginaw, Bridgeport, Frankenmuth, Bay City, Alma, Owosso, Corunna, Lansing, Fowlerville, Durand and smaller towns.

### More Rural Express Lines Started

NEW YORK, July 17—The National Automobile Chamber of Commerce is continuing to carry out its plan of urging and assisting in the establishment of rural express lines, and in harmony with this work, companies are steadily being established for this purpose. In Omaha, the Ford Livery Co. has purchased 3 trucks to act as forerunners to a fleet of between forty and sixty. These will be put in operation shortly, and haul freight both in and out of Omaha.

A corporation has been formed in Mason City, Iowa, which will purchase trucks and operate them on routes leading out of the city. The towns to be covered have a population of 89,900, and there are 1876 farms on the routes as well as 5628 within a mile of them.

In Chattanooga, Tenn., the Glaser Hauling Engineering Co. has opened a terminal and will run trucks to Knoxville, Atlanta, Birmingham, Memphis, Nashville and other cities.

A transportation club was formed in Elizabeth, N. J., last week, and already 32 tons of merchandise have been hauled between there and Philadelphia. A Return Loads Bureau has been established in connection with the rural express line.

## More Cars Are Sent Via New York

Nearly Half of All Automotive Exports of United States Go Through Metropolis

NEW YORK, July 17—The proportion of automobiles, trucks and parts shipped from the port of New York to the total automotive exports from the United States is again increasing. It was 43 per cent in May as compared with only 24 per cent in April, an increase of almost 100 per cent. The percentage, however, is still below normal, comparing unfavorably with a proportion of 46 per cent in March, 61 per cent in February and 71 per cent in January.

Automobiles, trucks and parts shipped from New York in May totalled \$3,339,558 as against \$2,396,448 in April. May exports as a whole were 22 per cent less than those for April.

The total value of passenger cars shipped from New York was \$1,289,109; that of trucks \$1,280,606, and parts \$769,843. The proportion of parts continues to increase steadily, being 9 per cent greater in May than April, which was the record until that time.

The largest individual shipment was one of 100 trucks valued at \$382,899, to Scotland. A shipment of 110 trucks valued at \$355,301 to France followed.

France also received the greatest number of passenger cars.

### Automobile, Truck and Parts Exports from New York for May

	No.	Cars Value	No.	Trucks Value	Parts Value
Argentina .....	161	\$140,361	2	\$1,675	\$51,661
Australia .....	...	...	1	2,800	43,301
Barbados .....	4	2,400	...	...	218
Bolivia .....	70	64,490	1	1,539	540
Brazil .....	...	...	...	...	29,806
British East Africa .....	3	4,086	...	...	625
British Guiana .....	...	...	...	...	736
British India .....	...	...	...	...	15,854
British Oceania .....	70	68,250	...	...	49
British South Africa .....	19	11,028	2	2,048	9,019
British West Africa .....	...	...	...	...	2,474
British West Indies .....	93	159,729	9	15,045	2,357
Chile .....	5	13,089	...	...	60,137
China .....	12	12,284	...	...	1,489
Colombia .....	...	...	...	...	851
Costa Rica .....	80	58,803	48	116,963	100
Cuba .....	...	...	...	...	40,792
Danish West Indies .....	...	...	...	...	125
Dutch East Indies .....	3	2,208	...	...	218
Dutch West Indies .....	17	13,893	...	...	281
Ecuador .....	6	10,754	97	286,318	1,649
England .....	108	365,375	110	365,301	109,807
France .....	39	20,057	...	...	303,337
French Africa .....	10	10,215	1	3,616	1,821
French West Indies .....	2	20,000	14	32,000	906
Greece .....	1	1,008	...	...	194
Guatemala .....	30	16,691	2	1,200	4,062
Hayti .....	...	...	...	...	1,647
Honduras .....	...	...	...	...	3,409
Italy .....	6	5,508	...	...	5,564
Jamaica .....	63	75,783	14	14,480	21,622
Japan .....	77	61,394	8	12,272	11,178
Mexico .....	10	15,667	...	...	668
Newfoundland .....	2	1,341	...	...	385
New Zealand .....	2	2,800	...	...	...
Nicaragua .....	5	4,319	6	3,600	6,195
Norway .....	33	36,667	19	29,774	6,873
Panama .....	5	16,250	...	...	603
Peru .....	7	5,954	...	...	237
Portugal .....	9	19,530	...	...	3,928
Salvador .....	...	...	100	382,899	...
San Domingo .....	30	48,596	2	5,506	6,425
Scotland .....	...	...	...	...	54
Spain .....	4	3,171	...	...	3,439
Switzerland .....	...	...	...	...	7,033
Trinidad .....	27	17,558	2	12,200	7,857
Uruguay .....	...	...	...	...	...
Venezuela .....	...	...	...	...	...



## Ford Buys Factory Site for Tractor Assembling Plant

DEARBORN, MICH., July 15—Henry Ford & Son has bought a large water power site in Hamilton, Ohio, where the company will erect a plant for the assembling of Fordson tractors. Construction will start in 30 days. It is expected the company will be in production within 90 days. A similar site has been purchased in New England, the exact location of which has not been announced.

With the acceptance of an additional order from Illinois for 3000 Fordson tractors, the production of the Dearborn plant is entirely sold out for the next year. Orders on the books of the company aggregate 50,000 tractors and no further orders are being accepted. Production is steadily increasing and before the end of the month a daily output of 150 tractors will have been reached.

Instead of having branches, the company intends to establish tractor plants all over the country. The Ohio and New England plants will assist in supplying some of the 50,000 tractors now on order.

Foreign shipments are being made to Peru, Japan, Africa, Fiji Islands, Sumatra, Java, Ceylon and the Philippines. The company is experimenting with packing for foreign shipments, and striving to reduce the cubical contents of its cases with the least amount of disassembling of its tractor.

### Ford Chaser Plant at Kearny, N. J.

WASHINGTON, July 15—Henry Ford will build a large plant at Kearny, N. J., for the manufacture of submarine chasers for the Navy. It is said that this will be the largest plant of its kind in the world. The first of the Ford chasers being completed at Detroit will be delivered next month.

### New Plant for Master Trucks

CHICAGO, July 15—Work will start shortly on the new plant of Master Trucks, Inc. A large tract of land has been purchased and details of construction are being worked out now. The company is making two trucks and a tractor, the bulk of the business, however, being on the 2-ton chassis.

### Overland Plant in Walkerville

DETROIT, July 16—Willys-Overland, Inc., will establish a branch manufacturing plant in Walkerville, Ont. It has signed a 3-year lease for the buildings recently occupied by the Gramm Motor Co. and will begin operations some time in August.

### American Motor Truck Sold

DETROIT, July 16—The American Motor Truck Co. was sold at auction June 27 by the Detroit Trust Co., receivers for the company, for approximately \$32,000. The personal property was sold in divided lots for \$22,000. The real estate, represented by an equity in a contract, was bought by Frank Bros. for \$10,000.

## Current News of Factories

*Notes of New Plants—Old Ones Enlarged*

The purchaser will assume payments on the unpaid balance. The entire contract is worth \$35,000 on which \$17,000 has been paid. The book liabilities of the company total \$50,000. This does not include the unliquidated claims. After these are filed it is believed the total will reach much in excess of \$75,000. The defunct company had been in operation only a short period—about a year or so—and it is said that only ten trucks were built during that time.

### Employees Insured by Page Steel

ADRIAN, MICH., July 17—The Page Steel & Wire Co. has perfected arrangements whereby every employee who has been in the service of the company for 3 months is insured to the amount of \$500, payable at his death to whomsoever he may direct the policy to be issued. The entire expense of the policy is paid by the company. The insurance will apply to the employees in the Adrian plant and also in the Detroit, Chicago and Monessen factories.

### Clubhouse for Falls Employees

MILWAUKEE, July 15—The Falls Motors Corp., Sheboygan Falls, Wis., has turned over to its 500 or more employees a clubhouse for their exclusive use and benefit. The club is provided at the expense of the company for entertainment and to promote educational, literary, musical and athletic activities. The club contains a library and reading room, pool and billiard hall, an auditorium for dancing and theatricals, and several smaller rooms for conferences and group meetings. The basement is provided with bowling alleys and gymnastic apparatus. Tuesday evening has been set aside for the exclusive use of the facilities by the female employees and their guests.

### Free Movies for Rubber Workers

AKRON, OHIO, July 16—As an extension of its welfare work, The Goodyear Tire & Rubber Co. is giving free outdoor moving picture shows for the benefit of its employees. The company's athletic field is used for the purpose, and pictures are shown there twice each week. The subjects shown are the popular comics, war films, good dramas, and a weekly pictorial review of Goodyear activities.

### A. Nelson Mfg. Co. Moves

CHICAGO, July 12—The A. Nelson Mfg. Co. has moved to its new building at 2662 Southport Avenue.

## Chandler Awards Contracts for Two Tractor Buildings

CLEVELAND, July 13—The Chandler Motor Car Co. has awarded contracts for the erection of two more tractor buildings and the enlargement of its two office buildings here. The work will be completed as soon as possible.

### Bearing Plant Output to be Doubled

TOLEDO, July 13—The Bock Bearing Co. soon will complete plans for extensions to its plant. It is expected that the capacity will be doubled by early winter, and that by 1921 it will be increased at least five times. The company now employs 800, and by winter this number will be increased to 1,000. The enlargement is due to the government's recent specifications of Bock bearings for all army trucks and automobiles. The company is a subsidiary of the Standard Parts Co., Cleveland.

### Gary Motor Truck Expands

GARY, IND., July 17—The Gary Motor Truck Co. has increased its capital from \$175,000 to \$1,000,000, and has perfected plans for the erection of an addition to its plant which will increase production from the present rate of 500 vehicles a year to 1500. The financial reorganization does not entail any change in management or policy.

### Republic Establishes Baltimore Branch

BALTIMORE, July 15—The Republic Motor Truck Co., Alma, Mich., has opened a factory branch here and taken over the business of Habersham-Miller, Inc. L. Van Bunkirk, formerly of the Studebaker Corp., is president of the reorganized company, which will retain its former style. Herbert L. Charlack is vice-president and A. J. Kenny secretary-treasurer. They have all been associated with the Republic organization for some time.

### Metal Auto Parts Organized

DES MOINES, July 17—The Metal Auto Parts Co. has been organized here to manufacture accessories for cars. Jack Messenger has been elected president; T. A. Tooey, vice-president; E. M. Messenger, secretary, and C. A. Messenger, treasurer.

### Sandusky Tire Breaks Ground for Plant

SANDUSKY, OHIO, July 12—Ground was broken to-day for the plant of the recently organized Sandusky Tire & Rubber Co. This will be completed within 6 months, and approximately 200 men will be employed.

### Comet in New Plant

DECATUR, ILL., July 15—The Comet Automobile Co. has moved into its newly constructed plant at William Street and Broadway. The construction of cars and trucks is being rushed.

## Dent Parrett a Captain in the Ordnance Department

CHICAGO, July 16—Dent Parrett, president of the Parrett Tractor Co. has been commissioned a captain in the Ordnance Department. He will work in Peoria on the co-ordination of engineering, production and inspection in the factories of the middle west that are building tractors for the Ordnance Department. The directors of the Parrett company were unanimous in permitting Captain Parrett to retain the presidency of the company, and accept his commission in the service.

Capt. Lawrence H. Earle, on duty for the past year as government inspector at the Holt Works, East Peoria, Ill., has been transferred to Washington as supervisor of tractors and tanks in the Ordnance Department. He has been succeeded in East Peoria by Capt. T. A. Collins.

H. S. Johnson, western district representative for the automobile equipment department of the Westinghouse Electric & Mfg. Co., has resigned and has become associated with the Ansted interests, manufacturing the Lexington car and the Teeter engine. He will be located at the plant of the Teeter-Hartley Motor Co., Hagerstown, Md.

E. W. Beach, president of the Manufacturers' Foundry Co., Waterbury, Conn., and a member of the board of directors and executive committee of the Motor and Accessory Manufacturers' Assn., has been appointed to a position in the inspection department of the Bureau of Aircraft Production. The work will take his entire time.

J. E. Allen, for several years manager of the Chicago branch of the Braender Tire & Rubber Co., has been made sales manager. He will make his headquarters at the factory in Rutherford, N. J.

J. B. Wyckoff, who was advertising manager for the Colt-Stratton Co., New York, Dodge Brothers distributor, has resigned. He has been appointed assistant business manager of The Nation's Business, Washington, and will take up his new duties Aug. 1.

F. A. Mansfield, for the last 12 years associated with the export and industrial departments of the Westinghouse Electric & Mfg. Co., has resigned to become manager of the Pittsburgh office of the Mechanical Appliances Co., manufacturer of motors and generators.

J. H. Amory has succeeded A. G. Thomson in the automobile lubrication sales division of the Joseph Dixon Crucible Co., Jersey City.

Edgar H. Dowson, vice president of the White Motors Co., White and Buick distributor in New Haven, Conn., has been appointed first lieutenant in the

## Men of the Industry

### *Changes in Personnel and Position*

Quartermaster Corps. He is stationed at Camp Holabird, Baltimore, in command of the Watertank division of a motor train.

J. M. Griffin has been appointed sales manager of the Kerosene Equipment Co., Detroit. He was formerly with the General Electric Co., Schenectady, N. Y., and later with Holley Bros., Detroit.

J. F. Cast, of the Firestone Tire & Rubber Co., Akron, has been promoted to assistant manufacturers' sales manager, a new position made necessary by the growth of this department. He has been with the company as salesman, branch manager and special representative since 1910.

C. P. Henderson, for the last 8 years general sales manager of the Cole Motor Car Co., Indianapolis, has resigned to assume the management of the company's western sales. J. E. Roberts, formerly western district manager has been promoted to general sales manager.

H. R. Hyman, for several years advertising manager of the Cole Motor Car Co., Indianapolis, has been appointed promotion department manager to succeed J. D. Riker who has resigned. Mr. Hyman will continue his duties as advertising manager in addition to the new work.

L. T. Miller, formerly assistant purchasing agent of the Detroit Steel Products Co., has been appointed purchasing agent for the Elgin Motor Car Corp., succeeding F. X. Devlin, resigned.

H. S. Ketcham, sales manager of the manufacturer's division of the Bradfield Co., has resigned. He has been appointed New England zone manager of the Cleveland Tractor Co., with headquarters in Boston.

E. D. Rogers has been appointed district sales manager of the Beck-Hawkeye Motor Truck Co., Cedar Rapids, Iowa, for the states of Texas, Oklahoma, Arkansas and Louisiana.

Harry J. Warner, former vice-president of the Continental Motor Co., has associated himself with the organization of the Federal Truck Co. He will act as vice-president in charge of production.

Fenn H. Fossick, assistant advertising manager of the Nash Motor Co., has resigned. He will take up special work in connection with the motor equipment section of the Ordnance Department.

## H. W. Davis Made President of Emil Grossman Mfg. Co.

NEW YORK, July 15—Changes have been made in the management of the Emil Grossman Mfg. Co., Brooklyn. H. W. Davis, who is vice-president of the Finance & Trading Corp., 43 Exchange Place, has succeeded Emil Grossman as president; K. P. Collins, who is also connected with the Finance & Trading Corp., has been made vice-president succeeding L. M. Schwarz.

Fred Berger, formerly chief engineer of the Oakland Motor Car Co., Pontiac, and sales manager of the Muir Carburetor Co., and later chief engineer of the Abbott Motor Corp., Cleveland, has been appointed chief engineer of the Gray Motors Co., Detroit.

E. W. Hurd has been advanced from assistant sales manager of the Premier Motor Corp., Indianapolis, to director of sales. The promotion was made following the death of P. D. Stubbs, the former director of sales.

H. E. Mahaffey, who has been acting as assistant manager of the branch of the Oakland Motor Car Co., in Cleveland, has been transferred to the Omaha branch, where he will serve in a similar capacity. Before joining the Oakland company, he was general sales manager of the Gray Tractor Co., Minneapolis.

Blaine McGrath has succeeded Hi Sibley an advertising manager of the Republic Motor Truck Co., Alma, Mich.

H. G. MacEachen, formerly western division manager of the Firestone Tire & Rubber Co., Akron, has joined the Veterinary Department of the United States Army.

J. Walter Drake, president of the Hupp Motor Car Corp., Detroit, has been appointed chairman of the Wayne County War Board, succeeding A. A. Templeton.

### Columbus Tractor Adds to Personnel

COLUMBUS, OHIO, July 14—The Columbus Tractor Co. has made several additions to its personnel. E. B. Moon has been appointed director of sales and advertising; Gebhard Jaeger, manufacturer of concrete mixers, will be production manager and general superintendent. Frank H. Nagle, formerly general manager of the Toledo Stove & Range Co., has been appointed assistant secretary and treasurer, in charge of purchasing and accounting, and Walter A. Jones, president of the United States Window Glass Co. and vice-president of the Columbus Chamber of Commerce, will be chairman of the board of directors.

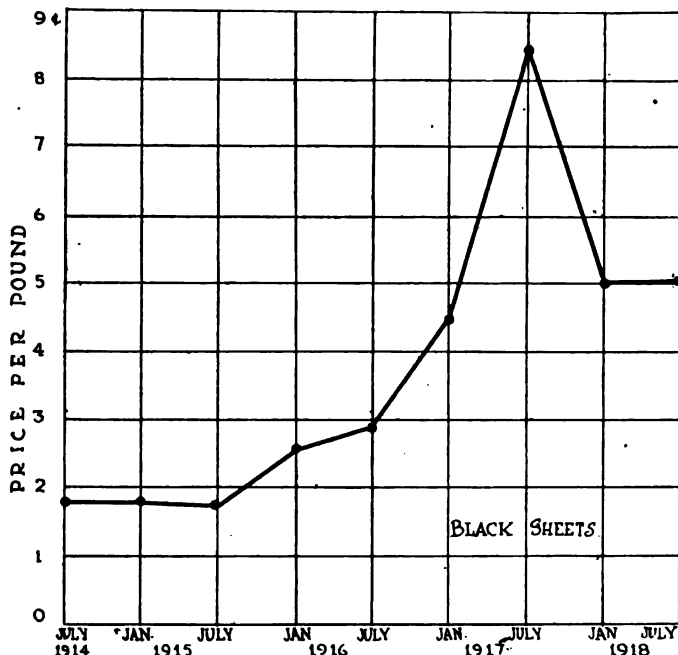
### Dr. Edgar Marburg Dies

PHILADELPHIA, July 15—Dr. Edgar Marburg, secretary-treasurer of the American Society for Testing Materials since its incorporation in 1902, died recently.

## AUTOMOTIVE MATERIALS MARKETS

## Material Market Prices

<b>Acids:</b>		<b>Burlap:</b>	
Muriatic, lb. ....	.02-.03	8 oz. yd. ....	.18½-.19
Phosphoric, ct. ....	.35-.39	10 oz. yd. ....	.23½-.24
Sulphuric (60), lb. ....	.11	<b>Copper:</b>	
<b>Aluminum:</b>		Elec., lb. ....	.26
Ingot, lb. ....	.33	Lake, lb. ....	.26
Sheets (18 gage or		<b>Fabric, Tire (17½ oz):</b>	
more), lb. ....	.40	Sea Is., combed, lb. ....	1.65-1.70
Antimony, lb. ....	.13-.13½	Egypt, combed, lb. ....	1.25-1.35



The variations in the price of black sheets during the last 4 years may be taken as an indication of the manner in which prices of the higher grades increased before Government regulations went into effect

Egypt, carded, lb. ....	1.20-1.30
Peelers, combed, lb. ....	1.05-1.20
Peelers, carded, lb. ....	.95-1.05
Fibre (¼ in. sheet base), lb. ....	.50
<b>Graphite:</b>	
Ceylon, lb. ....	.07½-.25
Madagascar, lb. ....	.10-.15
Mexican, lb. ....	.02½
Lead, lb. ....	.07½-.08½
<b>Leather:</b>	
Hides, lb. ....	.19-.33
Nickel, lb. ....	.40
<b>Oil:</b>	
Gasoline:	
Auto., gal. ....	.24
68 to 70 gal. ....	.30
<b>Lard:</b>	
Prime City, gal. ....	2.20
Ex. No. 1, gal. ....	1.50-1.52
Linseed, gal. ....	1.65
Menhaden, gal. ....	1.05
<b>Petroleum (crude):</b>	
Kansas, bbl. ....	2.25
Pennsylvania, bbl. ....	4.00

<b>Rubber:</b>	
Ceylon:	
First latex pale crepe, lb. ....	.63
Brown, crepe, thin, clear, lb. ....	.60
Smoked, ribbed sheets, lb. ....	.62
<b>Para:</b>	
Up River, fine, lb. ....	.68
Up River, coarse, lb. ....	.40
Island, fine, lb. ....	.59
Island, coarse, lb. ....	.27
Shellac (orange), gal. ....	.70-.76
Spelter ....	.09½-.10½
<b>Steel:</b>	
Angle beams and channels, lb. ....	.03
Automobile sheet (see sp. table).	
Cold rolled, lb. ....	.06½
Hot rolled, lb. ....	.03½
Tin ....	.95
Tungsten, lb. ....	2.00-2.40
Waste (cotton), lb. ....	.12½-.17

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only. Per 100 lb.	Primes when seconds up to 15 per cent are taken. Per 100 lb.	Seconds arising. *See Note
Automobile body stock.....	\$5.95	\$5.85	
Automobile body stock, deep stamping .....	6.20	6.10	
Automobile body stock, extra deep stamping .....	6.45	6.35	
Hood, flat fender, door and apron, or splash guard stock.....	6.05	5.95	
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20	
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45	
Automobile Sheet Extras for Extreme Widths:			
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.			
Nos. 19 to 21 over 36 in. to 44 in., 30c. per 100 lb.			
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.			
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.			
Black sheet extras to apply to narrow widths.			
Oiling, 10c. per 100 lb.			
Patent leveling, 25c. per 100 lb.			
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.			

\*Ten per cent less than the invoice Pittsburgh price for corresponding primes.

## Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co. ....	63	65	+1
*J. I. Case T. M. Co., pfd. ....	80	85	-1
Chalmers Motor Co., com. ....	3	6	+1
Chalmers Motor Co., pfd. ....	20	30	-5
*Chandler Motor Co. ....	80	81	-2
Chevrolet Motor Co. ....	132	135	-3
*Fisher Body Corp., com. ....	38	39	-6
*Fisher Body Corp., pfd. ....	89	90	-3
Fisk Rubber Co., com. ....	55	58	..
Fisk Rubber Co., 1st pfd. ....	98	103	+1
Fisk Rubber Co., 2nd pfd. ....	79	83	..
Firestone Tire & Rubber Co., com. ....	98	101	+10
Firestone Tire & Rubber Co., pfd. ....	93	95	..
*General Motors Co., com. ....	152	155	-5
*General Motors Co., pfd. ....	81	82	..
*B. F. Goodrich Co., com. ....	45	45½	+½
*B. F. Goodrich Co., pfd. ....	97½	98½	-1½
Goodyear Tire & Rubber Co., com. ....	160	165	-4
Goodyear Tire & Rubber Co., pfd. ....	96½	97½	..
Grant Motor Car Corp. ....	2½	3	..
Hupp Motor Car Corp., com. ....	2½	3½	-½
Hupp Motor Car Corp., pfd. ....	78	81	+½
International Motor Co., com. ....	25	35	..
International Motor Co., 1st pfd. ....	55	60	-5
International Motor Co., 2nd pfd. ....	35	43	..
*Kelly-Springfield Tire Co., com. ....	50½	51	+1
*Kelly-Springfield Tire Co., 1st pfd. ....	82	87	..
*Lee Rubber & Tire Corp. ....	18½	19	-1
*Maxwell Motor Co., Inc., com. ....	28	28½	-2½
*Maxwell Motor Co., Inc., 1st pfd. ....	54½	55	-3
*Maxwell Motor Co., Inc., 2nd pfd. ....	20½	22	..
Miller Rubber Co., com. ....	103	105	..
Miller Rubber Co., pfd. ....	92	95	..
Packard Motor Car Co., com. ....	118	125	+5
Packard Motor Car Co., pfd. ....	93	96	..
Paige-Detroit Motor Car Co. ....	18	20	..
Peerless Truck & Motor Corp. ....	13	17	+1
Portage Rubber Co., com. ....	102	105	..
Reo Motor Car Co. ....	13½	15	..
*Saxon Motor Car Corp. ....	7	8½	-¾

	Bid	Asked	Net Ch'ge
Standard Motor Construction Co. ....	12	14	+1½
*Stewart-Warner Speed. Corp. ....	59½	60½	+2½
*Studebaker Corp., com. ....	45	45½	-1½
*Studebaker Corp., pfd. ....	84	90	..
Swinehart Tire & Rubber Co. ....	55	62	..
United Motors Corp. ....	32½	33½	-½
*U. S. Rubber Co., com. ....	60½	60½	+½
*U. S. Rubber Co., pfd. ....	105	106½	..
*White Motor Co. ....	41	42	..
*Willys-Overland Co., com. ....	19½	19½	-¾
*Willys-Overland Co., pfd. ....	81½	83	..

\*At close July 13. Listed N. Y. Stock Exchange.

## OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	Bid	Asked	Net Ch'ge
<b>ACTIVE STOCKS</b>			
Auto Body Co. ....	..	7½	..
Bower Roller Bearing Co. ....	..	18½	..
Chevrolet Motor Co. ....	132	135	-3
Commerce Motor Co. ....	..	10½	..
Continental Motor Car Co., com. ....	5½	5½	..
Continental Motor Car Co., pfd. ....	94	..	..
Edmunds & Jones, com. ....	14	17	..
Edmunds & Jones, pfd. ....	80	90	..
Ford Motor Co. of Canada. ....	170	180	..
Hall Lamp Co. ....	12½	..	..
Michigan Stamping Co., com. ....	12½	..	..
Motor Products .....	..	..	..
Packard Motor Car Co., com. ....	120	123	..
Packard Motor Car Co., pfd. ....	93½	..	+½
Paige-Detroit Motor Car Co. ....	..	19	..
Prudden Wheel Co. ....	..	12½	..
Reo Motor Car Co. ....	14	14½	+½
<b>INACTIVE STOCKS</b>			
Atlas Drop Forge. ....	..	26	..
Kelsey Wheel Co. ....	25	..	-65



# Industrial Review of the Week

## A Summary of Major Developments in Other Fields

### Margin of Steel Output and Requirements Narrowed

Washington has given no sign that ordinary consumers of steel will get larger allowances under the War Board's recent statement. Later checking of figures furnished by the Government and its Allies really narrows the margin between probable output in the second half of the year and the requirements for war. Leading steel manufacturers up to this week have taken the view that the situation would be easier in a few months. They are less confident of that now.

Actual procedure under the new classification of orders is not far from what has been followed. Some producers are even more exacting than before, now that they are asked by the Government to decide as to precedence in shipment.

It now appears certain that open-hearth steel output of the country will be practically taken up by war and essential needs for the remainder of the year and that whatever permits are given for general or class D purposes must be filled almost entirely with Bessemer steel.

The plate mills keep on producing at a yearly rate of 6,000,000 tons, a recent week showing 114,000 tons, while new capacity may bring the rate up to 7,000,000 tons a year by January.

Data are being gathered on which a question may be raised with the British Mission as to the nature and extent of British exports of steel. The Canadian steel trade is involved in a measure also. Some Canadian steel has been sold in New England at high prices, to a non-essential industry, yet large shipments of American steel are being made to Canada at control prices. An amicable exchange on the whole question is possible, in view of the considerable amounts of American steel for which Great Britain has asked. Interesting in the same connection are recent reports of easier conditions as to steel supply in the Birmingham and Sheffield districts of England.

Jobbers are finding that they cannot replace their stocks except in so far as these went to fill war needs, and few warehouses are likely to get back to more than 50 per cent of normal tonnage.—*Iron Age*.

### Detroit Plane to Make Flight

DETROIT, July 17—The first battle plane built entirely in Michigan will be flown to-morrow. According to arrangements the plane will fly from Detroit to Flint, leaving Detroit at 10.30 a. m. and landing at its destination at 11.30. Flint is 68 miles from Detroit. The plane will be piloted by Lieut. Lewis and a member of the Aviation Corps will be in the bomber's seat. The ma-

chine is the De Havilland fighting and bombing type, equipped with a Liberty engine. The body was constructed entirely at the plant of the Fisher Body Corp. Arriving at Flint, it is planned to have Lieut. Lewis give an aerial demonstration of fighting tactics before 12,000 employees of the Buick Motor Co.

### Ford & Son Shares to Be \$100

DEARBORN, MICH., July 16—At a meeting of the holders of the capital stock of Henry Ford & Son, according to an application made for an increase in the capital stock from \$1,000,000 to \$5,000,000, it was decided to divide the stock into 50,000 shares of \$100 each. The document states that \$4,000,000 has already been subscribed and \$1,000,000 paid in cash.

### Saxon Moves Service Department

DETROIT, July 16—So that work can be handled more efficiently, the service department of the Saxon Motor Car Corp. has moved its quarters to the main plant.

### United Motors Service Expands

NEW YORK, July 12—The United Motors Service, Inc., which operates 6 branches and 15 service stations in various cities, has taken over all of the field service work of the manufacturers of Delco, Remy and Klaxon electrical equipment. The general offices of the company have been moved to larger quarters at 782 Woodward Avenue, Detroit.

### Cassidy to Market Fuel Economizer

NEW YORK, July 15—The Edward A. Cassidy Co., which has built up a distributing business in several automotive products, has added a gasoline economizer. The product is Eccolene, which is made by the Eccolene Co., Detroit. This is made of seven oils and is added to gasoline in the ratio of one or two oz. of the product to 5 gals. of gasoline, depending on the size of the engine.

### Lipsner to Superintend Aerial Mail

WASHINGTON, July 16—Captain B. B. Lipsner of Chicago, has resigned his commission in the Army to become superintendent of the United States Aerial Mail Service. The position given Captain Lipsner is in anticipation of the ultimate taking over of the service by the Post Office Department with its own equipment and personnel. The equipment and personnel used at present has been loaned to the Post Office Department by the War Department.

The new 16-cent rate, announced earlier, went into effect yesterday. The rate is 16 cents for the first ounce including special delivery service, and 6 cents for each additional ounce.

### Wilson Satisfied with Copper Price Agreement

WASHINGTON, July 15—The President has approved the agreement that the maximum price on copper shall be 26 cents a pound, taking effect immediately and subject to revision after Aug. 15. This is an advance of 2½ cents over the former price of 23½ cents. The new price is f.o.b. cars or lighters at the refinery if shipped from eastern refineries, and f.o.b. New York if shipped from western refineries, subject to the additional charges on copper shapes announced early in June.

June production of refined copper, including electrolytic, lake and casting, is estimated at 210,000,000 lbs., as compared with 220,000,000 lbs. in May. Total output for the 6 months ended June 30, 1918, is estimated at 1,220,000,000 lbs., as compared with 1,270,000,000 lbs. for the corresponding period of 1917.

The estimates of the number of pounds of copper production compare as follows:

	1918	1917
January .....	175,000,000	183,000,000
February .....	185,000,000	198,000,000
March .....	215,000,000	225,000,000
April .....	215,000,000	211,000,000
May .....	220,000,000	223,000,000
June .....	210,000,000	230,000,000

### Holmes Forming Truck Company

MT. PLEASANT, MICH., July 15—Milton A. Holmes, for 4 years sales manager and for 2 years vice-president of the Republic Motor Truck Co., Alma, Mich., is at the head of the Transport Truck Co., a \$1,000,000 organization which is being formed here. A committee was appointed to investigate Mr. Holmes' proposition. On the strength of this report a stock subscription drive is going on in Isabella County so that the company's operations can start about Oct. 1. Plans call for two buildings, each 700 x 80 ft. The size of the truck to be manufactured has not been officially announced.

### Four Makers Change Prices

NEW YORK, July 17—Following are changes in price which have been made during the past week:

Car	Old Price	New Price
Glide, light six-forty.....	\$1,495	\$1,595
Templar, five-passenger..	2,085	2,185
*Haynes, model 39.....		1,900
Olympia .....	1,085	1,240

\*New model.

### Aviation Expert Here

WASHINGTON, July 14—Lieutenant-Colonel Sir Henry Fowler, in charge of the Sectional Components of Aircraft, and Assistant Director General of Aircraft Production of the British Ministry of Munitions, has arrived in this country on a special mission concerning airplanes.

## Army Truck Contracts Awarded

WASHINGTON, July 14—Awards for parts for the new series model B 3-ton standard Army motor trucks have been made as follows:

June 21, 1918.

The Vichek Tool Co., Cleveland; sets tool bag equipment.

Fairmount Tool & Forging Co., Cleveland; sets tool-bag equipment.

The Hinkley Motors Corp., Detroit; motors.

June 27, 1918.

American Brass & Iron Works, Detroit; gasoline feed pipe shut-off cocks.

Duff Mfg. Co., Pittsburgh; jacks.

Templeton Kenly Co., Chicago; jacks.

June 28, 1918.

Kales Stamping Co., Detroit; gasoline feed pipe clips.

The Hayes Mfg. Co., Detroit; air cleaner assemblies, air cleaner clamp assemblies.

General Motors Co., Flint; transmission front hangers.

Sterling Motor Truck Co., Milwaukee; pedal pads.

Peters Machine Co., Cleveland; universal joints.

June 29, 1918.

Perry-Fay Co., Elyria, Ohio, rear axle worm shaft thrust bearing cover stud, rear axle worm shaft thrust bearing retaining nut, rear axle worm shaft radial bearing lock nut, differential carrier to rear axle housing stud, rear axle worm shaft thrust bearing cover and stud nut, rear axle worm shaft radial bearing cover screw, differential carrier to rear axle housing stud nut, rear axle worm shaft nut, rear axle worm shaft radial bearing spacer (narrow), rear axle worm shaft radial bearing spacer (wide), rear axle worm shaft thrust bearing retaining nut washer, rear axle worm shaft thrust bearing sleeve, rear axle worm shaft thrust bearing spacer.

Globe Machine & Stamping Co., Cleveland; rear axle worm shaft oil thrower (front), rear axle worm shaft oil thrower (rear), rear axle worm shaft thrust bearing retainer nut lock, rear axle worm shaft radial bearing lock nut lock.

National Malleable Castings Co., Toledo; malleable iron castings, No. 1909-Y, rear axle differential carrier; malleable iron castings, No. 1906-W, rear axle worm shaft radial bearing cover; malleable iron castings, No. 1911-V, rear axle worm shaft thrust bearing cover; metal pattern equipment for No. 1909-Y, rear axle differential carrier; aluminum vibrator plate pattern for No. 1911-V, rear axle worm shaft thrust bearing cover; aluminum vibrator plate pattern for No. 1906-W, rear axle worm shaft radial bearing cover.

Cleveland Worm Gear Co., Cleveland; No. 1910-Y, axle worm shaft.

Lincoln Brass Works, Detroit; gasoline shut-off cocks.

United States Ball Bearing Mfg. Co., Chi-

cago; radial bearings complete with bronze retainer; special thrust bearings, complete with bronze retainer.

The Prudden Wheel Co., Lansing; sets wheels.

Breeze Mfg. Co., Newark, N. J.; pieces air cleaner to carburetor tube, with paper packing.

July 3, 1918.

Garlock Packing Co., Cleveland; rear axle worm shaft radial bearing cover gaskets.

Hayes Mfg. Co., Detroit; body seat assemblies.

C. R. Wilson Body Corp., Detroit; body seat assemblies.

Orem Motor Protector Co., Baltimore; air cleaner assemblies.

## Quartermaster Awards

WASHINGTON, July 12—The Motor Transport Service of the Quartermaster Department has awarded contracts to the following companies:

Nash Motors Co., Kenosha, Wis.

Grant Motor Car Corp., Cleveland.

Moon Motor Car Co., St. Louis.

Cleveland Tractor Co., Cleveland.

## Ordnance Contracts Placed

WASHINGTON, July 12—Following are the firms with whom purchase orders and contracts were recently placed by the Ordnance Department:

Pyrene Mfg. Co., New York.

Empire Tire & Rubber Co., Trenton.

United States Tire Co., Washington.

Nash Motors Co., Kenosha, Wis.

The Stanley Works, New Britain, Conn.

The Four Wheel Drive Auto Co., Clintonville, Wis.

North & Judd Mfg. Co., New Britain, Conn.

Champion Spark Plug Co., Toledo.

Wilson Body Co., Detroit.

Militor Corp., Jersey City.

## Marine Contracts Placed

WASHINGTON, July 12—The following are contracts placed by the Marine Corps:

Studebaker Corp. of America, New York, trucks.

Ford Motor Co., Detroit, chassis.

Firestone Tire & Rubber Co., Philadelphia, tires.

The Goodyear Tire & Rubber Co., Akron, tires and tubes.

## Ask Bids for 5000 AA Trucks

WASHINGTON, July 15—Bids have been requested by the Motor Transport Service from automobile manufacturers on the AA  $\frac{3}{4}$ -ton army truck. Five thousand of these trucks will be purchased. Blueprints and specifications are on view in Washington at the office of the National Automobile Chamber of Commerce, and at the Motor Transport Service offices and in the Book Building in Detroit, Cleveland and Chicago. The AA truck is an adaptation of the General Motors Co. No. 16  $\frac{3}{4}$ -ton truck which has been adopted as previously announced in these columns.

Chicago Quartermaster Branch  
Discontinued

CHICAGO, ILL., July 17—The Quartermaster's Truck Purchasing Department of this city will shortly be given up and the entire work concentrated in Washington.

## Toledo Screw Gets Shell Order

TOLEDO, July 15—The Toledo Screw Products Co. has received another order for 1,000,000 1-lb. shells, complete, for the navy. The contract, with other government work on hand, will necessitate the erection of a \$50,000 machine shop, 150 x 32 ft., adjoining the present plant. Work on the addition is to begin immediately.

## Milwaukee Speeds War Work

MILWAUKEE, July 15—Wisconsin is one of the first states in the Union to perfect its industrial organization to speed up war work under the plan of regional districting recently adopted by the War Industries Board, Washington. August H. Vogel, regional director for District No. 17, embracing nearly all of Wisconsin, has divided the state into twenty districts, each of which has formed a sectional organization with a chairman and secretary. The most important of these is Section 16, comprising Milwaukee and Waukesha counties, of which Richard P. Tell, president and general manager, National Brake & Electric Co., Milwaukee, and head of the Milwaukee Metal Trades and Founders' Association, has been designated as chairman. The industrial bureau recently established at Washington by Milwaukee business men has been turned over to the regional director to serve the entire state.

## Calendar

## RACING

July 27 — Chicago. Chicago Speedway.  
Aug. 3 — Uniontown. Uniontown Speedway Assn.  
Aug. 10 — Providence, R. I.  
Aug. 17 — Sheephead Bay.  
Sept. 2 — Uniontown. Uniontown Speedway Assn.  
Sept. 7 — Chicago. Chicago Speedway.  
Sept. 21 — Sheephead Bay.  
Oct. 5 — Cincinnati. Cincinnati Speedway.

## SHOWS

July 27 — Syracuse, N. Y. Tractor Demonstration. New York State Food Commission.  
July 29-Aug. 4 — Salina, Kan. National Tractor Demonstration. Auspices of National Implement and Vehicle Assn.  
Aug. 6 — Fulton, N. Y. Tractor Demonstration. New York State Food Commission.

Sept. 2-7 — Indianapolis, Indiana. State Fair. Indianapolis Automobile Trade Assn.  
Sept. 14-21 — Chicago. Automotive and Accessories War Exposition. Municipal Pier.  
Oct. 14-27 — Dallas, Tex. Seventh Annual Texas Automobile Show. Texas State Fair.  
Oct. 16-18 — Ottawa, Ont., International Plowing Match, Tractor and Farm Machin-

ery Demonstration. Experimental Farm.

## ENGINEERING

Sept. 2 — Cripple Creek, Colo. American Institute of Mining Engineers.  
Nov. 14-15 — New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

# AUTOMOTIVE INDUSTRIES

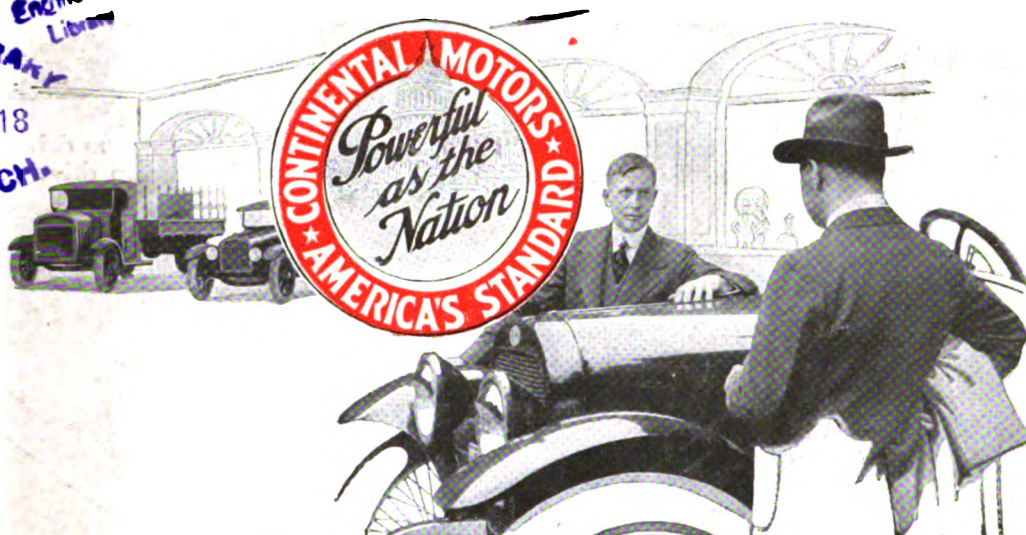
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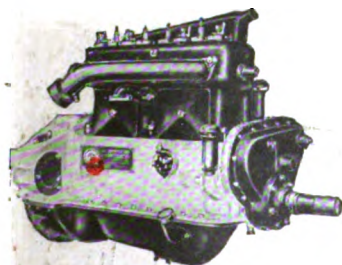
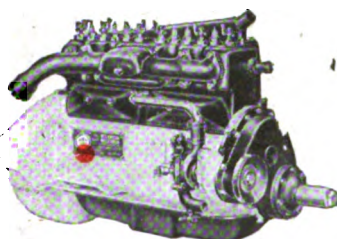
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2-ton "O," long wheel base,  
internal gear drive

2-ton "W," worm drive

2-ton "WL," long wheel base,  
worm drive

3½-ton "A," worm drive

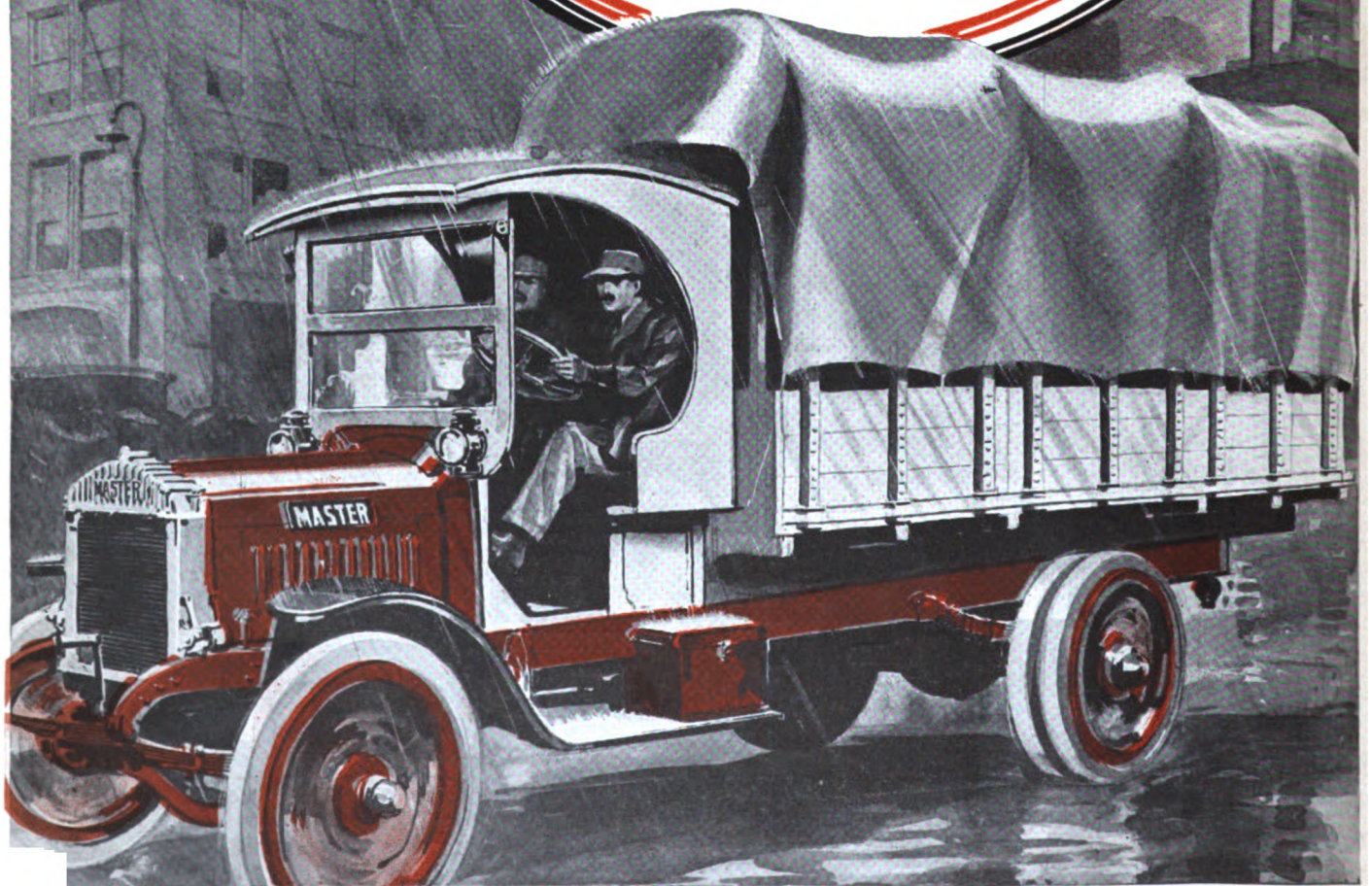
5-ton "B," worm drive

6-ton Tractor "T"

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# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

VOL. XXXIX

NEW YORK—THURSDAY, JULY 25, 1918—CHICAGO

No. 4

## Motor Truck's Essential Nature Presented to War Industries Board

Reasonable Steel Supply Assured—Trucks Sold Should Go Into  
Essential Uses—Makers Should Encourage Proper Use of  
Vehicles—Priorities Board Outlines Liberal Program

**W**ASHINGTON, D. C., July 20—The essential character of the motor truck in transportation, and the necessity for a continuation of the industry during the war, were placed before the Priority Committee of the War Industries Board yesterday, and as a result motor truck manufacturers are assured a supply of steel for the manufacture of trucks and parts both for war and industry.

It was shown that approximately 90 to 95 per cent of existing motor truck users are essential to transportation and industry. Eighty per cent of the truck users at present are using their vehicles directly or indirectly for war work, and most of the remaining 20 per cent are used in domestic uses.

The truck industry was represented by the National Motor Truck Committee, and the National Automobile Chamber of Commerce, George N. Graham, chairman of the Truck Committee, presenting the arguments for the truck, in which a written statement was submitted.

The Priority Committee, headed by Judge Edwin B. Parker, took a very favorable view of the truck situation, and while there is a serious need for steel for war, and while the government could use more steel than will be produced this year, the War Industries Board realizes that certain industries must be properly supplied, and Judge Parker agreed that

the motor truck industry is performing exceedingly valuable work and should be given the necessary steel even if such has to be taken from steel supplies needed for other war work, in order to allow it to increase its value as a transportation medium.

Summed up briefly, Judge Parker stated that steel would be assured to all truck manufacturers both for manufacture of repair and spare parts and for the manufacture of the trucks demanded by the yearly program on the condition that the truck makers will encourage proper use of trucks and will guarantee that all trucks sold will go to essential use. In consideration of the urgent Government demand for steel, and the fact that the steel for the truck industry will virtually come from the stocks designed for war purposes, the truck committee feels that the War Industries Board has displayed a comprehensive view of motor truck utility and has agreed to a broad and ample program for it.

Judge Parker stated that the necessary steel for motor trucks will be found providing the industry follows the three requests, which are:

1—Motor truck makers and agents use every facility for encouraging the widest possible proper use of trucks during the war.

2—Motor truck makers will comply with a list of essential truck users in making future sales.

The list of essential users is to be compiled by Mr. Graham and C. C. Hanch, Chief Automotive Section, War Industries Board, within the next 10 days and will later be checked and completed by the Priority Committee. It will contain at the outset every kind of truck user. Those not considered essential will be eliminated.

#### Written Presentation Sent

Motor truck makers and agents will work for the strictest conservation of those trucks now in the hands of consumers by urging their repair and maintenance so long as possible before replacement by new trucks. Owners and operators will be requested to repair and use the old trucks, operate them fully loaded and maintain shifts of drivers to secure the greatest use possible per day from each.

The written presentation sent to the Priority Committee recently follows in complete text. It tells of the shortage of steel now existing in all motor truck factories, of the utility of the truck as a method of transportation for both general and war work, of the Government recognition of the truck as a mode of transportation for war materials, food produce and general express work.

These are tabulated with the percentages. On Jan. 1, 1918, 400,000 trucks were used in this country, it is shown, with production indications for 1918 placed at 275,000 trucks of which 50,000 go to Europe for war work, 40,000 replace others worn out in this country, making a total of 185,000 to go into domestic use. This insures approximately 585,000 trucks in use in this country for 1919, and the committee estimated that these will individually average 10 tons haul per day or a total of 5,850,000 tons hauled daily by trucks. These figures impressed the Priority Committee.

#### Information Requested

Mr. Graham further explained at the hearing yesterday, which was attended by the Priority Committee, C. C. Hanch, and the truck committee, including George Graham, Pierce Arrow Motor Car Co., and chairman, Windsor T. White, White Co.; M. L. Pulcher, Federal Motor Truck Co.; David Ludlum, Autocar Co.; D. C. Fenner, International Motors Co., and S. A. Miles, National Automobile Chamber of Commerce, a number of other points important to the request for steel.

In reply to requests from the Priority Committee, made earlier this week, the truck committee telegraphed all truck makers for information as to:

a—How many completed and unsold trucks for domestic use each has on hand at the factory or in branches or agencies.

b—How many trucks each can build from material at present on hand.

c—For how many trucks each will require material to fill the domestic program for the remaining months of 1918.

d—How many trucks were produced by years for 1916, 1917 and the first 6 months of 1918 for the United States and the Allies.

e—How many trucks were produced for domestic purposes in the same period.

f—How much steel the aggregate number of trucks produced in that period required.

g—How much rubber the total number of trucks produced in that period used.

h—How much coal was needed per plant per year.

i—What war work other than truck manufacturing each plant was engaged in.

j—The passenger car business of each truck maker.

Inquiries for this information was sent to 144 firms and replies were classified into two series, those who made more than 100 trucks in the 2½-year period and those who made fewer than that number. It was found that 101 concerns made more than 100 trucks in the 2½ years. These manufactured 276,477 trucks between Jan. 1, 1916, and June 30, 1918, for all purposes, war and otherwise. Figures revealed show that 276,477 trucks required 492,129 tons of steel and 48,537 tons of rubber.

These figures give the average of 1.7 tons of steel and 200 lb. of rubber per truck.

#### 13,000 Trucks on Hand

Thirteen thousand trucks, 1 month's supply, are all that the manufacturers have on hand, either completed or which can be completed from the parts and material in stock. This small amount displayed to the Priority Board the need for prompt relief to the truck industry provided it found the industry worthy.

One of the most impressive statements by the truck committee was to the effect that elimination of trucks at this time would be seriously injurious to the railroads, war and every war requirement, which was backed up with a detailed account of the functions of the motor truck. The chairman not only told how important these functions are but went into detail telling that trucks are being used for road work, cantonment provisioning government, warehouses, government and war housing building, by steel firms, express companies, oil companies, army shoe makers, army clothing and wool makers, food product concerns like the meat packers, dairy companies, electrical equipment makers and for shells, government furniture, feeding cantonments, farm products producers, tobacco growers and packers, coal mines and so forth and created a climax by telling that 28 5-ton Mack trucks were purchased this week by the Bureau of Mines which will deliver every ton of coal this next season to be used by the many government buildings here. The chairman enumerated more than 200 companies dealing in the above commodities for war purposes that used thousands of the trucks, and it was through this complete accurate tabulation that the Priority Committee realized how important the motor truck was.

#### 900,000 Tons Hauled

The committee further told that 900,000 tons of war and other important merchandise is being hauled yearly between Philadelphia and New York by motor trucks, considerably augmenting the railroads and actually preventing serious railroad congestion. He described the Akron to Boston route used by the Goodyear company.

As far as can now be gathered the essential list of truck users will include a vast majority of existing consumers. Such concerns as department stores were mentioned and the Priority Committee taking a reasonable view, admitted that while some of the commodities purchased should be carried home, many others, such as furniture which is to a great extent an essential commodity, could not be carried and could best be handled by motor trucks. A truck consumer who is in some such business as jewelry and to some degree doing war work, can, if not on the essential list, arrange to purchase a truck demanded by his war work, by making application possibly to C. C. Hanch or to the Priority Committee as will be later arranged.

Following is the text of the written presentation sent to the Priority Committee by the truck committee:



# Need of Motor Truck Makers for Materials and Fuel

## Text of Presentation Before War Industries Board

"THIS presentation directs to the attention of the War Industries Board the imperative necessity of giving to motor truck manufacturers an advanced priority that will assure materials and fuel at once.

"Such action is urgently needed. Unless it comes immediately there will be an interval of months with virtually no production. This will have the direct result of delaying the war program.

"We believe that trucks used in this country are necessary to a swift winning of the war. On this basis alone we ask consideration.

"Careful analysis shows 101 motor truck manufacturers must between June 20, 1918, and Dec. 31, 1918, meet a demand for 103,961 trucks exclusive of those classed as war orders. They have completed, or have on hand materials for 13,044 trucks. This is a shade more than 12 per cent of the demand. The sales of one month will exhaust these 13,044 trucks.

"Some makers have no steel whatever.

"Steel and other metals must be found for the making of more trucks unless the nation's commerce and the war program are to be denied the transportation help the motor truck can give.

### Utility Is Sole Criterion

"The motor truck is solely a utility. In this presentation we ask to have it considered separately from the automobile passenger car, which also is a highly important transportation medium, but not used exclusively for business.

"The motor truck discharges no function of entertainment.

"It furnishes transportation at a time when transportation is a vital material need.

"It is conceded that during the war we must have production. The motor truck is inseparably related to distribution of this production.

"Congested traffic constitutes a war problem.

"Production cannot be brought up to its ultimate unless sources of communication are regular and rapid.

"Insufficient transportation did more to retard the rapid and efficient entrance of the United States into the war than could a legion of Huns.

"This was proved last winter when to get transportation for coal to send ships to Europe with urgently needed supplies, the Fuel Administration found it necessary to stop all production for 5 days.

"Present shortages of coal and steel result largely from transportation deficiencies.

"There are three main sources of transportation, as follows:

"a—Railway.

"b—Steamboat.

"c—Motor Truck.

"The enormous growth of business and the extraordinary volume of war haulage have virtually overwhelmed both railroad and steamboat facilities. Both have more freight than they can handle. Only transportation over the highways offers any considerable possibility of immediate relief.

### Trucks in War

"Almost all trucks serve their war purpose at this time. This applies equally to trucks that are going to the European battlefronts, and to those that will be used in this country.

"Many purveyors in war supplies have based their schedules of rapid delivery on the help of the motor truck.

"We can furnish your committee instances in which the truck has rendered a four-way service in this work. Such trucks haul away the dirt excavated for the foundations of a new building. Then they bring in material for constructing the building. Next they deliver raw material for making the product. Finally the truck completes its record of performance by carrying the finished articles to the point of delivery. Such trucks are just as valuable in handling war supplies as those used in France.

### Government Recognition

"The United States Government has recognized the importance of the truck both for military and so-called domestic uses.

"War Department Order No. 38 established the Motor Transport Service for war trucks. The Highways Transport Committee, serving as part of the National Council of Defense, was organized to divert all possible traffic to the highways.

"Government trucks running from cities in the middle west to the seacoast are constantly establishing the practicability of overland delivery by power vehicles.

"The Department of Agriculture has encouraged the application of trucks to the moving of food.

"The Fourth Assistant Post-Master General is hauling farm products into the big cities, distances of more than 100 miles by motor trucks. His program, presented in a bill now before Congress, calls for the eventual establishment of 5000 miles of new roads, which will be built from the profits of motor truck haulage of food to market.

"Every truck put into service brings the manufacturer nearer his market, brings the farmer nearer the consumer, brings the finished war order nearer the labor.

shipping point, facilitates rapid filling of orders, supplies the equivalent of manpower lost by withdrawal of soldiers, makes less serious the shortage of horses, and restores gaps in organizations occasioned by deficiencies of labor, material and transportation.

"The farmer, dependent as much on rapid access to his market as on the productivity of his farm, finds the motor truck coming to his aid at a time when he cannot hire farm hands. A truck on a farm will replace from two to four men. It will carry twice the load in half the time. It will make available for other production 5 acres of land whose yearly crop is now required to feed a horse.

"It has been estimated that in view of the greatly increased production of food stuffs, wheat, rye, barley, oats, corn, beef, pork, mutton, eggs, milk, poultry and fruit, that 2,000,000 trucks could profitably be used between farms and markets. Only 450,000 motor trucks are now available for all lines of business. This is only 25 per cent of what could be applied to farms alone.

"The use of the truck in so-called rural motor express lines offers the best possible medium through which farmers, truck growers and dairymen may get to their markets. The truck is also being used for the delivery of live stock to stock yards.

"Some makers sell 60 per cent of their trucks to farmers.

"Many trucks are carrying raw materials to factories. The absence of the service rendered by these trucks would often mean that thousands of men would go idle for lack of the raw material on which they work.

"Some railroads have had to decree that goods consigned in less than carload lots cannot be delivered in any specified time. This ruling results from a shortage of rolling stock and equipment, and a general congestion in freight yards, terminal points and warehouses.

"The facilities of express companies for general work have been very much limited through the necessity of using baggage and express cars in troop movement. Therefore the purveyor in food supplies has found himself hard pressed to get transportation. He is placing increasing dependence on the motor truck.

"The development of heavy haulage companies operating between big cities and sometimes covering as much as 150 miles in their regular routes, is a significant development. The use of trucks in this kind of work is increasing by leaps and bounds, for the truck is superior for short-haul work and in making stops en route. It can deliver supplies to the door of the consignee. It saves time and

"In many points it has been found necessary to place embargoes on movement by rail of certain kinds of freight within certain zones. The result has been to divert this haulage to local transportation and transfer companies, the medium in almost every case being a truck.

"All that has been gained by the application of these trucks will be lost if there is a shortage of trucks or of parts to keep present trucks in repair. There will be this shortage unless some immediate guarantee of material is given to the whole industry.

#### 80 Per Cent in War Work

"Our inquiries, based on a questionnaire sent to various manufacturers, show that about 80 per cent of the output of motor trucks is being used in war work or related war activities.

"By war work is meant motor trucks sold to the United States or its Allies, to the Red Cross, to the Y. M. C. A., or for use in cantonments, hospitals, government war buildings. In related war activities we include trucks used in the construction of ship building plants, used in industrial plants where war materials are being made, used by manufacturers or merchants in hauling army supplies, used for motor express lines, including parcel post service, by farmers as motor omnibus or stage lines, together with their application to a variety of other uses relating to the war.

"This leaves a comparatively small percentage of trucks applied to unrelated war activities. Even this small percentage involves a service of practical utility and convenience.

"In order to make this usefulness clear, we have analyzed the sales of a foremost motor truck manufacturer for the period of 12 months' business in the year 1917. The appended arrangement by percentages will show that virtually every activity therein represented has some relation to the war:

Transfer and transportation.....	13.27
Grocers .....	8.8
Contractors .....	7.6
Oil and gas producers.....	14.3
Coal dealers .....	4.7
Building supplies .....	5.0
Tool and machinery mfgs.....	2.0
Lumber .....	3.5
Meat packers .....	2.7
Chemical manufacturers .....	1.3
Textile manufacturers .....	1.7
Public utility .....	2.3
Road building .....	5.4
Iron and steel .....	2.0
Foundry and forging.....	1.6
Storage and warehouse.....	1.5
Milk .....	1.2
Farmers .....	7.8
Ice .....	9.2
Ammunitions .....	3.9
Mining .....	2.4
Stone .....	1
Brick .....	3.9
Gas producers.....	8.3
Rubber .....	7.3
Hardware .....	9.8
Paper .....	9.8
Paints .....	8.8
Bakery .....	8.8
Flour .....	1.2
Sugar .....	8.3

"On Jan. 1, 1918, there were 400,000 trucks in the United States. It would be better for this country were the number five times as great.

"On the basis of the first 3 months production, there are indications that 275,000 trucks will be produced in 1918. Approxi-

mately 50,000 of these will go into war use in Europe; 40,000 will be used to replace trucks withdrawn by the law of wear and tear. This will mean not less than 185,000 trucks for domestic use.

"The smallest of these trucks has a capacity of 5 ton, the range progressing up to 10 tons with the aid of a trailer.

"The potential haulage capacity of the 450,000 trucks now in use can readily be understood. Allowing an average of 10 tons a day per truck, an estimate which is small since many trucks in short haul work will move as much as 100 tons per day, we have a total of 4,500,000 tons of freight moved per day. Surely there can be no arguments in favor of restricting such a valuable service.

"Any delay in obtaining motor truck materials will eliminate the manufacture of parts necessary to keep in repair trucks now in use.

"This constitutes a serious problem, for there is constant need of replacement

#### War Steel for Trucks

"We genuinely believe that the need for trucks and for repair parts is so great that steel and other materials should be found for them, even though it has to be taken from some other items classed as war necessities.

"It means little to get rapid motor truck movement of war supplies in Europe if similar rapid movement lack at home.

"A way should be found to make to the motor truck industry a definite allotment of a certain percentage of the steel in sight, even though it be necessary to curtail some other war programs. We believe there are others less immediately vital.

"This recommendation is made with the full knowledge of its seriousness. It is based solely on our belief that trucks are important to the winning of the war, that the whole system of transportation in this country will be further handicapped unless they are supplied.

"It is essential to make a prompt decision for the guidance of manufacturers.

"It is necessary in the construction of motor trucks to plan ahead. Even material delivered at once cannot be converted into trucks in less than 3 or 4 months.

"Under the present system nothing is definite. A manufacturer cannot lay out his program. He works out his requirement and places an order with the producer of steel. The latter declines to enter it on his books because he is prevented from so doing by regulations of the War Industries Board. Often 90 per cent of material may be available, but lack of the other 10 per cent delays production.

"Therefore, valuable time is lost. Transportation needs are constantly growing. Action should be taken so that the motor truck manufacturer may supply his share of that transportation.

"We cannot think it is the purpose of the War Industries Board to allow this condition to continue.

"It might be possible to work out an arrangement by which each motor truck manufacturer would be permitted during the next 12 months to produce a certain

number of trucks per month and to furnish replacement parts for trucks now in service. The allotment per month should be based on the sales of the last year.

"Each concern would report the amount of material necessary for its production allotment.

"Should the demand for any particular truck increase, this manufacturer could make application to be allowed to purchase an additional volume of material.

"In order to present necessary data we have requested motor truck manufacturers, not only those included in the membership of the N. A. C. C., but the unaffiliated as well, to answer these three questions:

"1—How many completed and unsold trucks for domestic use have you at your factory or in the hands of your branches and agencies?

"2—How many trucks can you build from the material at present on hand?

"3—For how many trucks will you need material to fill your domestic program for the remaining months of 1918?

Please note attached a record of the answers. These show that the stock of trucks on hand, or the material with which to build trucks, is virtually depleted.

#### Production Waits on Material

"By a study of the data you will find that nearly every manufacturer of motor trucks needs material. His stock in hand has been depleted by large purchases for war uses and related war uses.

"It has been our endeavor to make the presentation as brief as possible. If there is any further data you desire, we shall be glad to furnish it.

"The N. A. C. C. maintains in Washington a resident Motor Truck Committee composed as follows:

"George M. Graham (Chairman), Pierce-Arrow Motor Car Co.

"Windsor T. White, The White Co.

"N. L. Pulcher, Federal Motor Truck Co.

"David Ludlum, The Autocar Co.

"D. C. Fenner, International Motors Co.

"S. A. Miles, Natl. Automobile Chamber of Commerce.

"It is possible that the Priorities Section of the War Industries Board might deem it advisable to grant a hearing to this Committee or to the industry as a whole, in order that the facts above presented might be furnished in more detail and that there might be an interchange of views.

"The National Motor Truck Committee is representative, since it speaks for the 55 principal manufacturers of motor trucks included in the membership of the N. A. C. C., as well as for many other companies not affiliated, but with whom it works in harmony and whose viewpoint it presents at this time.

"In making our case we have dealt only with the utility of the motor truck. We might also with entire propriety have called to your attention the very large investment in the industry, the number of men it employs, and the hardship that will result from failure to get material to keep its plants active.

(Continued on page 172)

## American, British and Hun Planes at the Front



*Upper—An American aero squadron in France*



*Left—British bombing machines ready for a flight over the Hun lines*

*Lower—Two German planes brought down by the British on the British front. The one at the right is a scout*





# Eagle Boats by New Ford Methods

Naval Architecture on Progressive System Utilized to Attain Quantity Production of Submarine Chasers—Same Underlying Principle Used in Automobile Plant Put to Work in the Production of These Boats

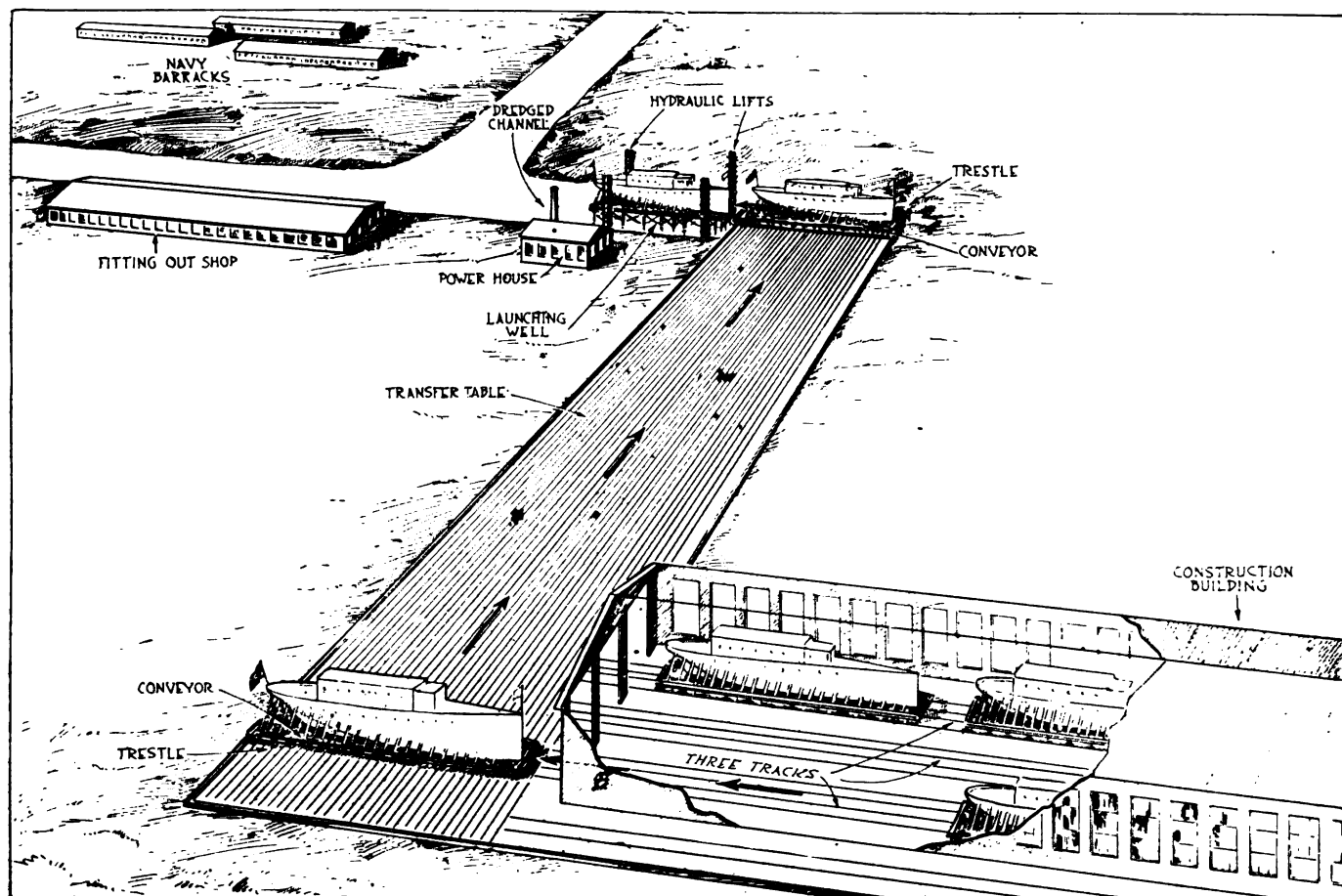
**W**HEN Henry Ford took the contract to build the submarine chasers known as the Eagle boats, and stated that he would meet a production schedule of one per day, it was immediately concluded that new methods would play an important part in arranging for this production.

The methods employed have come to light with the launching of the first of the Eagles. Ford has put the same underlying principles used in his automobile plant to work in the production of these boats with the result that he has revolutionized the industry. Ford does not *build* boats; he is *manufacturing* them. The illustrations on this page show how the work is handled. The exact details are not given, neither are the drawings to scale, as it would not be advisable to print them; nevertheless, sufficient is given to show the fundamentals.

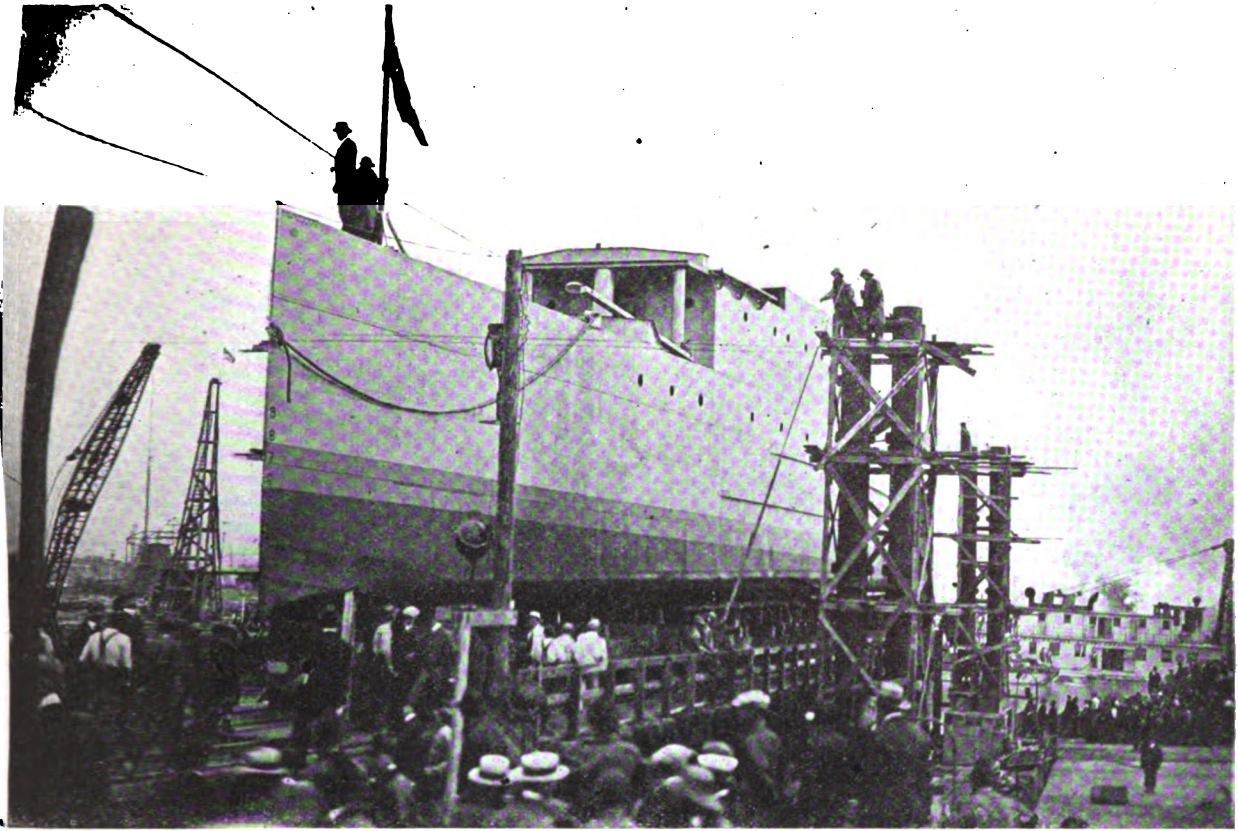
Under the Ford system, production is a straight line proposition from the time the keel is laid until the boat

is launched from the hydraulic elevator. The boats are manufactured in a long building capable of carrying three abreast. The manufacturing operations are carried on while the boats are on cars and these cars pass along as various operations are completed until, when the boat is ready for launching, the end of the building is reached. The car, together with the boat upon it, is then carried out to the end of the launching pier.

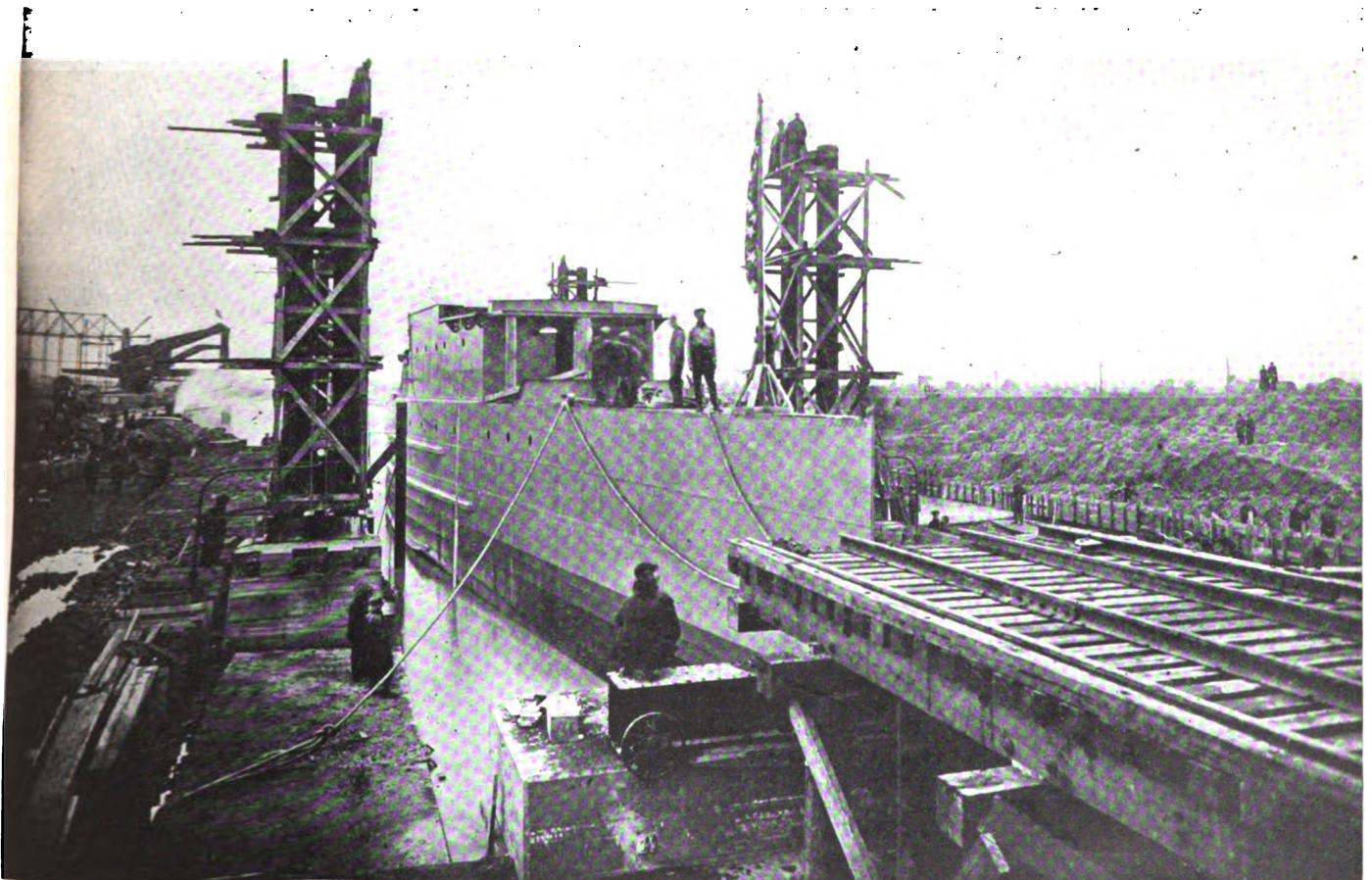
The launching is not done in the conventional manner. There are no launching calculations to make and the engineers of the yard do not stand with their hearts in their mouths waiting to see that the boat slides off the ways properly and that there have been no mistakes in the launching calculations. Instead, the end of the launching pier is a hydraulic elevator which gently lowers the boat into the water, lets it float off the car and then rises to allow the car to be returned to the end of the building for the starting of another boat.



Sketch showing the course the Eagles must take before reaching the water. From the large construction building an Eagle is brought out onto a trestle-like device operated by electricity and carried along sideways until it reaches other tracks on the launching table. After being pulled on this table the boat is lowered by means of hydraulic power. The area called the transfer table measures about 240 x 500 ft. and has on the floor sixteen single railroad tracks on which rides the trestle-like construction that carries the Eagle to the launching well



*The first Eagle before it took its dip into the waters of River Rouge, July 11, at Ford's shipbuilding plant. With hardly a hitch, the 200-ft. boat was brought out of its housing and lowered into the water*

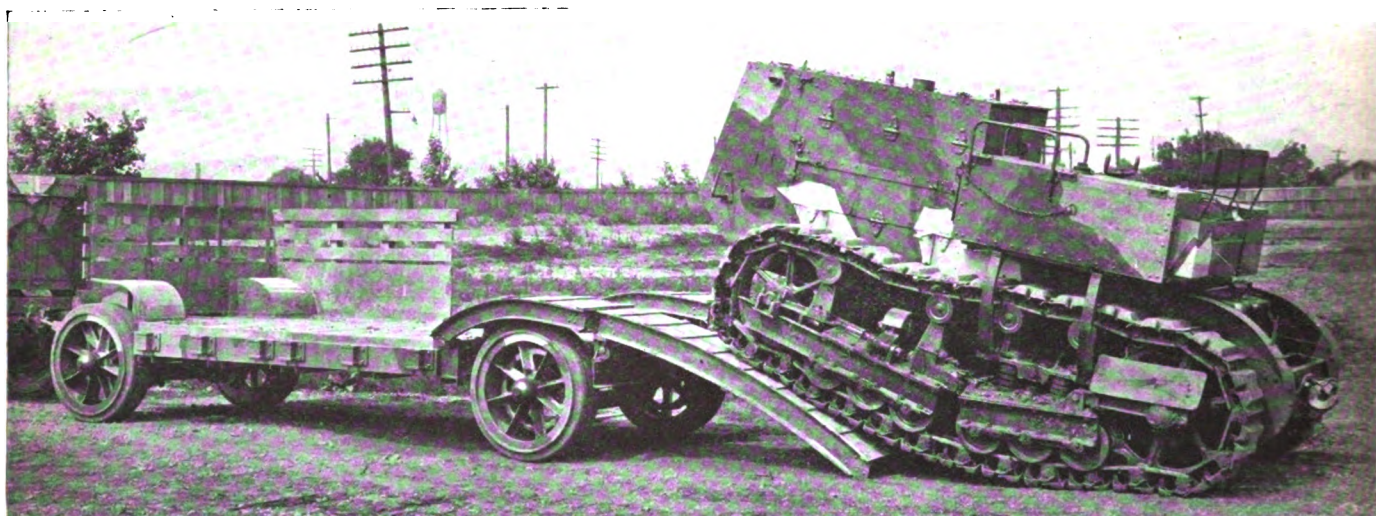


*The Eagle-1 was floated at 6.55 p. m. The end of the launching pier is a hydraulic elevator which gently lowers the boat into the water, lets it float off the car and then rises to allow the car to be returned to the end of the building*



# Heavy Trailers for War Department

Hauling Tractors to Double Their Speed and Save the Roads—Moving Guns and Heavy Equipment

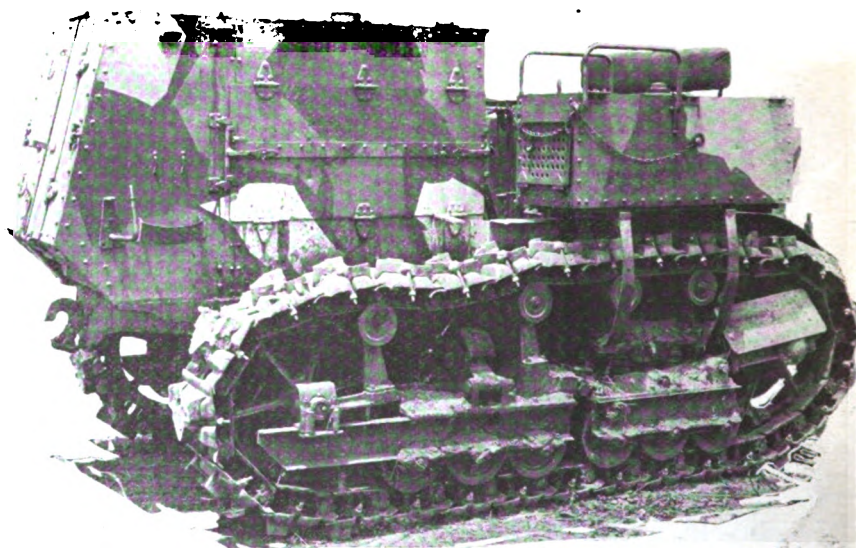


*Five-ton crawler type of tractor mounting a 10-ton trailer on the special ramps provided for the purpose*

**T**HE peculiar demands of war work, particularly in the Ordnance and Signal Corps, and the rapid development of motorized equipment, are combining to produce some rapid developments in the trailer manufacturing industry. An unweildy piece of mechanism which, although mounted upon wheels, is incapable of traveling more than 6 or 8 m.p.h., can be mounted upon a trailer and transported at two or three times that speed with a resulting gain in efficiency and in time which may prove invaluable under war conditions.

There is no doubt but that the trailer industry is now only in its infancy and has much bigger prospects before it than would appear possible from superficial thought. The Signal Corps and the Ordnance Department have placed orders for tens of thousands of trailers of varied designs, and a number are already on their way to France and are proving to be highly successful. These trailers not only transport guns and form a firing platform for them, but also transport tractors of the track-laying or crawler type, which would be able to make only slow progress over the roads, and in fact, would be road destroyers, inasmuch as the track shoes are designed to obtain a hold on very rough ground and are equipped with grousers or other traction securing devices.

With a trailer it is possible to pick up the slow moving crawler or track-laying type of tractor and transport it to within a short distance of its field of operation, and make this transportation far more rapid than would be possible with the tractor itself and at the same time save wear and tear on the roads.



*Five-ton armored tractor which is typical of the type of vehicle which can be more rapidly and efficiently transported over good roads on a trailer, but which is capable under its own power of negotiating very difficult conditions of traction*

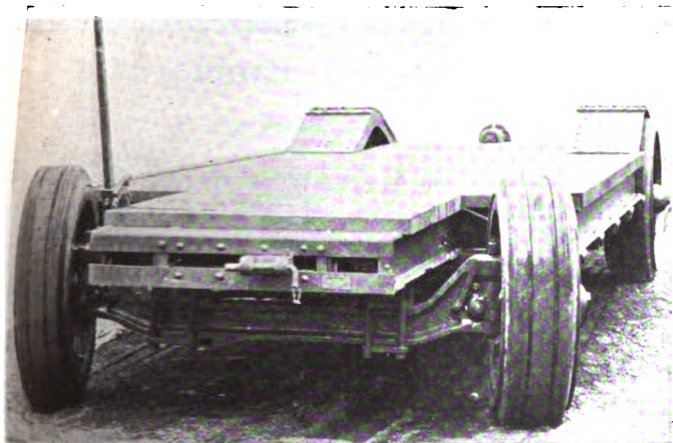
The track-laying type of tractor used by the Ordnance Department for pulling the 3-inch field guns and the larger 5-ton type is a good example of the sort of equipment which can be efficiently transported from place to place on a trailer. The four-wheel drive truck and other wheel types of vehicles used by the Ordnance Department form handy pieces of apparatus for transporting not only the trailer and its load, but also themselves carrying a fully loaded body.

The track-laying type of tractors now in use are capable of making speeds up to 12 miles per hr., which is exceptionally high for vehicles of this type, but running them continually at this speed places excessive



duties on the machine and is not productive of the highest efficiency. A speed of 6 or 8 miles per hr. for the 2½ and 5-ton types of creeper tractors is more in line with the limitations of the design.

Another big use to which the Ordnance Department and Signal Corps are putting trailers is for transporting shop equipment. These trailers have a capacity of about 4 tons and carry a complete repair shop capable of handling practically all emergency work behind the lines.

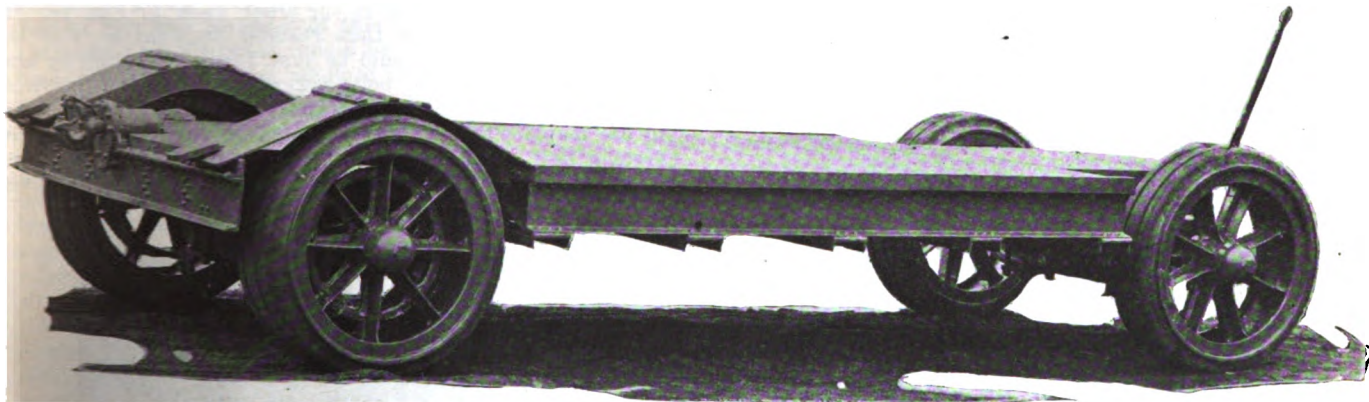


*Ten-ton capacity trailer, showing the standard drawbar mounting at the front end with the wheel guard at the rear, and also showing the location of the brake lever at the forward end of the trailer platform*

There are trailers upon which anti-craft guns are mounted in which the trailer itself is so designed that the gun need not be removed from it when it is fired. In fact, the trailer makes an ideal gun platform and the gun crew is placed upon the trailer in such a way that it can readily operate the gun and at the same time need not unload any of its equipment, so that it is possible to transport the entire apparatus rapidly from place to place. These trailers run all the way up to 10 tons in capacity for handling special loads.

For carrying the crawler or track-laying type of tractors the trailers are provided with loading means which permit the tractor to mount the trailers. These are in the form of ramps which are hooked to the rear of the trailer, allowing the tractor to mount itself upon the trailer under its own power. One of the illustrations shows a 5-ton creeper type of tractor climbing upon a 10-ton trailer, readily capable of transporting this tractor at a speed of 18 miles per hr. when towed by one of the standard Ordnance four-wheel drive type of vehicle.

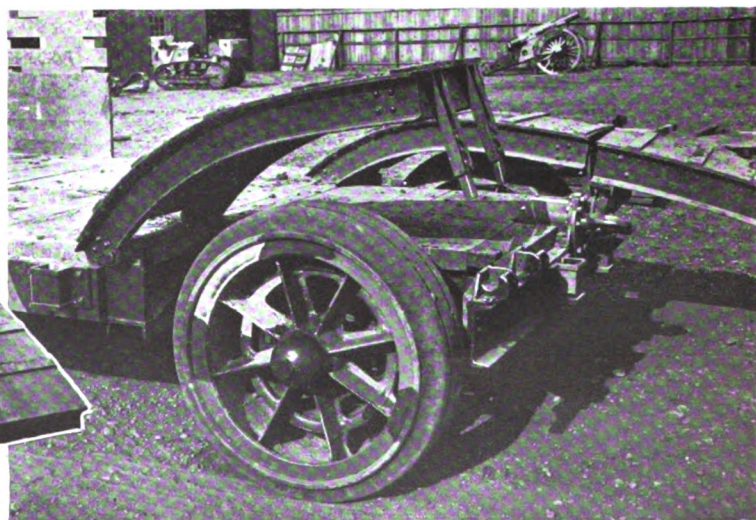
The design of the trailers is naturally simple and is fairly well standardized except that some have four-wheel steer for easy maneuvering, while others have but two-wheel steer. The trailers are designed to operate in trains if so required, and are all fitted with the standard drawbar and steering lever arrangements by means of which the steering cross-arms are actuated by the movements of the drawbar. This allows the trailers to track accurately one behind the other in cases of long trailer trains. The rear wheel steer is generally locked in its position and is not in use unless actually required.



*Typical type of trailer used in Ordnance Department work, showing standard pintle mounted on the rear end for towing other trailers*



*Loading ramps which are carried as part of the equipment of the 10-ton trailer*



*Method of providing wheel guards over trailer to protect wheels from damage in loading and unloading*

# A New Method for the Testing of Airplane Wing Ribs

How Load Application and Distribution Are Controlled by a Series of Rubber Bands—A Comprehensive Description of the Apparatus Employed

By Irving H. Cowdrey

THE construction of the airplane wing rib is such that the question of stress distribution through the various parts does not readily lend itself to solution by direct calculation. Hence the determination of the relative excellence of various designs becomes very largely a problem for laboratory solution. Laboratory tests have a value directly proportionate to the accuracy with which the actual conditions of service are reproduced.

The actual load borne by each individual rib is distributed non-uniformly over the length, and the rib itself is a member of astonishing lightness and frailty.

The problem to be solved in the tests here described seemed after some consideration to divide itself into the following heads which will appear in the same order in the subsequent discussion:

1. Methods of support or suspension.
2. The distribution of load.
3. Application of load with the proper distribution.
4. Accurate measure of the load.
5. Determination of the distortion of the member under test.

\*Abstract of a paper read before the American Society for Testing Materials.

In the completed wing the ribs are connected by one or more continuous spars, passing from tip to tip of the wing. This affords secure lateral fastening at these points. To duplicate such a condition, the ribs were cut from a group or so fabricated as to leave in place a piece of spar about one inch thick.

This spar section may be seen at A, Fig. 4. In the cases furnishing data for this paper the two-spar suspension was used. To each of these spar sections was fastened a pair of steel plates  $\frac{1}{8}$  in. thick, each plate having in its center a  $\frac{1}{8}$ -in. hole. The fastening was accomplished by means of four  $\frac{1}{8}$ -in. steel studs having a nut on each end. These studs appear at A, Fig. 1, and the hole for one of them may be seen at I, Fig. 4. With these plates in place a 5/16-in. hole was bored through the wood to line as nearly as possible with the  $\frac{1}{8}$ -in. hole in the steel (see J, Fig. 4). The holes in the wood were then reamed so that a  $\frac{1}{8}$ -in. bolt with a finished shank could be just forced through by hand pressure. These  $\frac{1}{8}$ -in. bolts served then as the points of suspension and from them straps (B, Fig. 1) were carried to the maple plank C, Fig. 1, which in turn was suspended from a pair of chain falls. The suspension bolts were set up as tightly as possible without producing clamping action

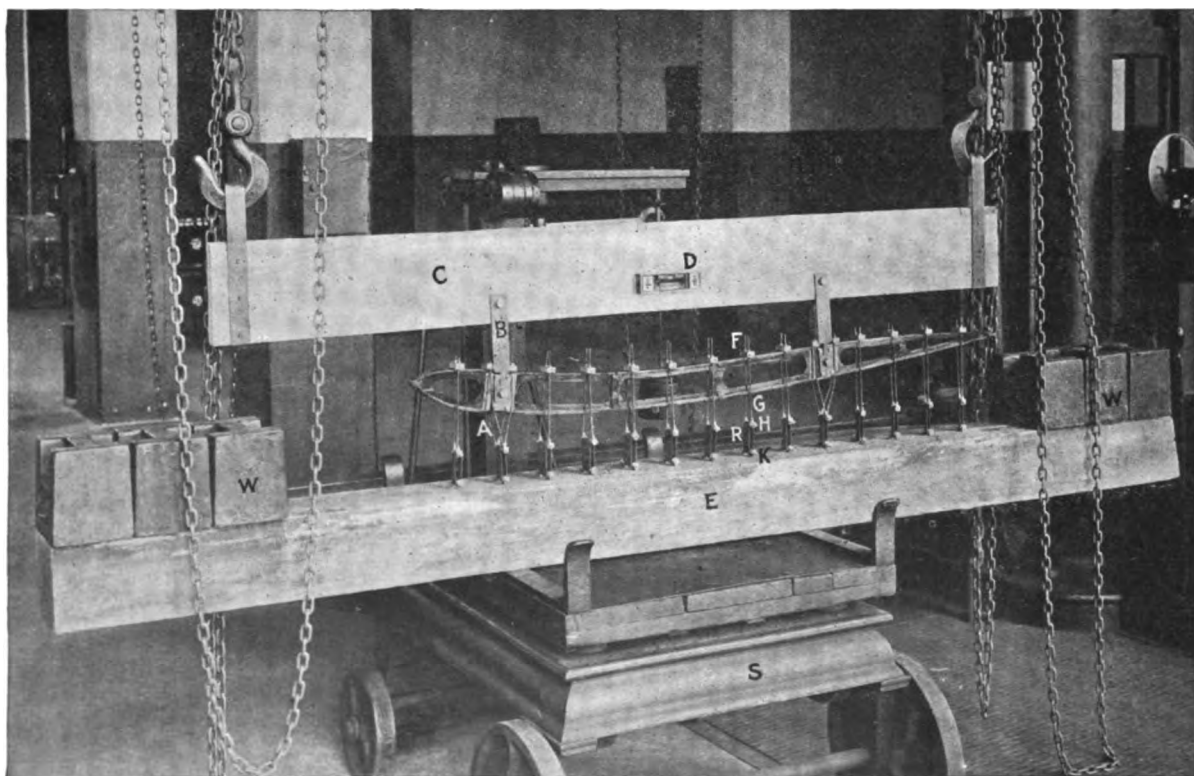


Fig. 1—Apparatus for testing wing rib, non-uniform load distribution



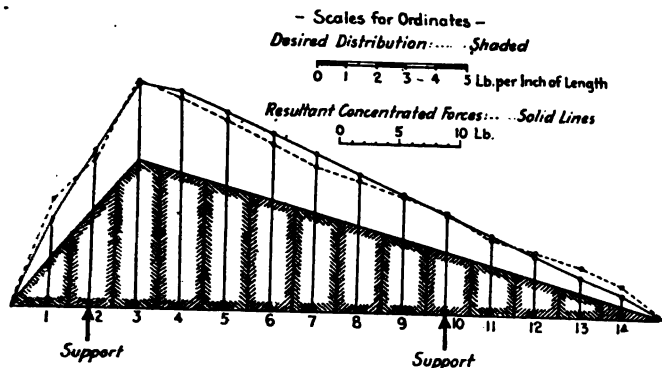


Fig. 2—Force distribution for 150 lb. total load

between the suspension straps and the side plates on the rib. This was to afford as much lateral support as possible without interference with freedom of vertical deflection under load.

[This method of suspension does not perfectly duplicate the supporting of the ribs in the frame of the wing. The attachment of the fuselage to the spars is such that twisting of the spar at these points is prevented to a large degree. Actual conditions would then, possibly, be more accurately reproduced if the straps *B*, Fig. 1, were clamped to the spar section in place of the intermediate side plates at *A*.]

The very nature of the purpose of the airplane wings indicates a distributed load. Accepted diagrams for the distribution of load on a rib show that the distribution varies under the varying conditions of flight, both in general outline and in the position of maximum intensity. Under such circumstances a representative load diagram must be arbitrarily chosen. For the purpose of these tests it was assumed that a straight-line diagram would be a satisfactory approximation. Moreover, it was assumed that the point of maximum intensity could reasonably be assumed at a distance of one-fifth the chord length from the leading edge of the wing. (Shaded area, Fig. 2.)

[Some tests have been made by various experimenters since those here described in which the point of maximum load intensity is further from the leading edge. In some of the design calculations this point is taken at mid-chord instead of as indicated above.]

Such a distribution, as well as the general dimensions of the members, precluded the possibility of anything in the line of sand or hydraulic cushioning. Hence, a truly distributed load seemed impossible. With the member under test the total length was 60 in. A load, more or less concentrated, applied at each 4-in. interval giving 14 points of loading, could be presumed to give a fair approximation to the distributed load desired, provided these individual loads be properly proportioned.

The common methods of construction provide for the entire removal of the web of the rib at frequent intervals. A reference to Fig. 1 will show the extent of such removal in the type of rib under test. The portions of the rib over one of these spaces act like secondary beams under load. A number of loading points less than was used in the tests under consideration produces, in the writer's opinion, very serious effects on the stress distribution throughout the rib. It would seem that the number of loading points should be greater than those used in this case rather than less.

Using the number of loads noted above the problem of proper proportionment was attacked as follows: The load diagram for a total load of 150 lb. is divided into 14 parts (see Fig. 2). The ends are triangles with bases each 6 in. long. The remaining divisions then take the form of trapezoids, with the ex-

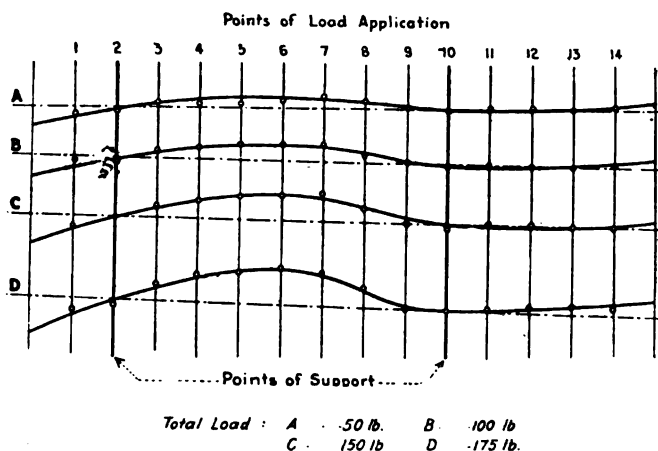


Fig. 3—Distortion of rib. Ordinates equal distortion with respect to a datum line through points of support. Ordinates are drawn full size in the above diagram

ception of division 3. Each division has a 4-in. base. Each of these areas then represents the load distribution desired over a length bounded by its extreme ordinates. The computed resultant for each of these areas appears below:

Load No.	Load, Lb.	Load No.	Load, Lb.	Load No.	Load, Lb.
1	7.5	6	15.0	11	6.7
2	13.3	7	13.3	12	5.0
3	19.0	8	11.7	13	3.3
4	18.3	9	10.0	14	1.9
5	16.7	10	8.3		

The application of concentrated forces according to the above schedule then should give a loading quite comparable with that indicated by the straight-line diagram. Theoretically these fourteen concentrated forces should be applied at the centers of gravity of the respective areas. This has been done for numbers 1 and 14. In the other instances it has been assumed that the middle ordinate is sufficiently near to the center of gravity. This introduces an error of from 0.03 to 0.17 in. in the location of these resultants. In the case of the larger central forces this error in location is least. These resultant forces are shown as solid lines in Fig. 2. To aid in a comparison to be made later their ends have been joined by a solid line.

The problem now resolves itself into one of the simultaneous application of fourteen different loads. Not only must the application be simultaneous, but the rate of increase in the application of each load must be such that under any total load whatever the relation between the various forces must be the same as the relation shown in the above tabulation.

Careful consideration of all well-known systems of multiple point loading lead to the final adaptation of what the writer believes to be a new departure in load application. It was felt that the most satisfactory solution of the problem could be reached by the application of load through a series of rubber bands of uniform properties whose widths should be made directly proportional to the load each band was expected to apply. These bands were obtained by cutting sections from a motorcycle inner tube. The particular tube used was of red rubber for a 28 by 3-in. tire.

With such an ideal series of bands, let one end of each be fastened to a rigid support, such as *E*, Figs. 1 and 4, and the other properly attached to the rib under test. The suspension of the rib as already described will permit it to be raised while a level (*D*, Fig. 1) enables a

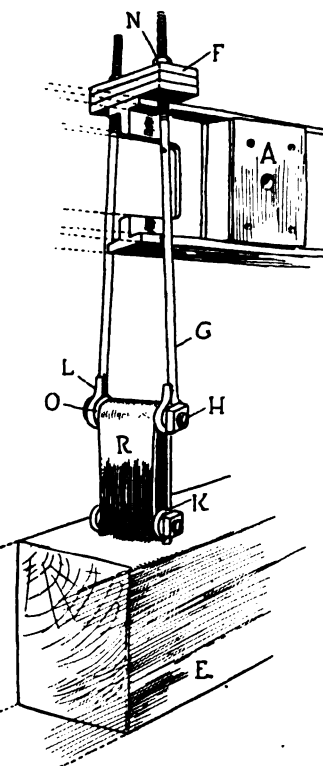


Fig. 4—Detail of loading device



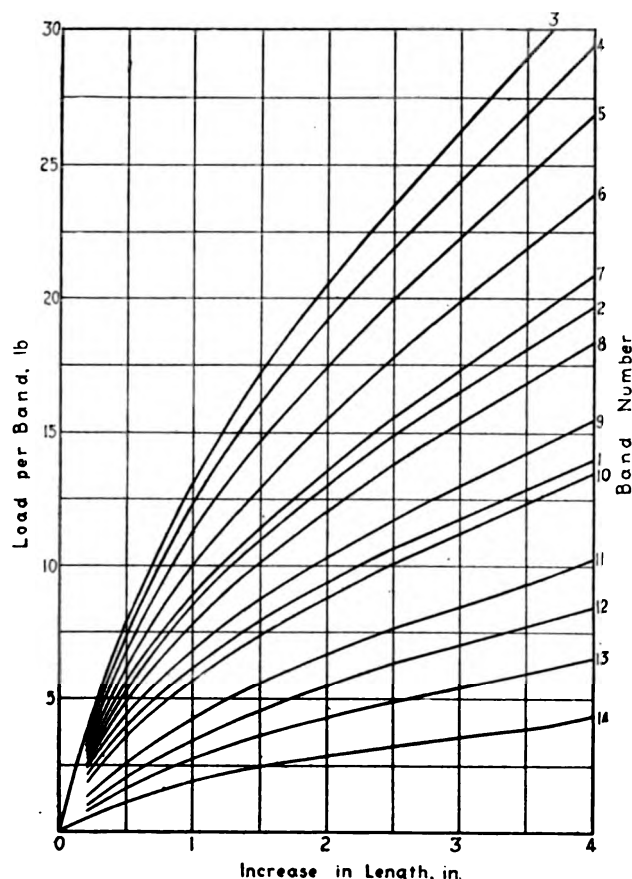


Fig. 5—Calibration curves for rubber bands

proper horizontal alignment of the supports. Under such conditions, neglecting the deflection of the rib itself, the fourteen loads will be applied at the predetermined points and with exactly the predetermined distribution.

In the device as illustrated by Figs. 1 and 4 the attachment of the bands is as follows:

Into the timber *E* are screwed at *K* heavy screw eyes of a size proper to take a  $\frac{1}{4}$ -in. stove bolt. Each pair of eyes are so spaced transversely on the timber that they permit on the bolt, between their inside faces, a pair of washers between which is a thin brass tube of a length equal to the width of the rubber band, *R*, which is to be used at that particular loading point. This gives the rigid fastening for one end of the band. Two  $\frac{1}{8}$ -in. hard brass wires, *G*, with a soldered eye (*L*, Fig. 4) in the lower end of each, *H*, and threaded at the upper end, pass through a small wooden block at *F*. On the upper side of *F* washers and nuts (*N*, Fig. 1) afford a ready means of adjustment of the length of this stirrup-shaped device. A stove bolt with tube and washers (*O*, Fig. 4) passes through the eyes of the wire rods. Such device affords a proper means of attachment between the upper end of the rubber band and the member under test. The proper adjustment of these stirrups will be discussed later.

As will be readily seen from Fig. 1 the heavy timber *E* (in this particular test a 6 by 6-in. hard pine stick weighing about one hundred pounds) rests on platform scales, *S*. On each end of this timber are three 50-lb. weights *W*. With no tension in the bands *R*, the tare weight of the timber and weights is read on the scales. The plank *C* is raised and maintained level, thus stretching the bands and hence applying to the rib, loads according to the predetermined schedule. The summation of these fourteen loads may be obtained at any instant by balancing the beam of the scales and noting the difference between the reading obtained and the original tare weight. The accuracy of this determination depends solely upon the accuracy of the scales. This should usually be within a half pound.

Scales of the ordinary platform type were used in this method of test for two reasons: First, in the opinion of the writer a greater precision can be thus obtained than with any

of the forms of testing machines commonly employed in laboratory work; second, it was desired to produce a method of testing that could be carried out easily by the manufacturer and permit and encourage experimental work on rib design by those who are not privileged to have at their disposal a properly equipped laboratory.

It is believed that the actual strength of a wing rib is but a partial solution of the problem at hand. The writer would not pose as an expert in aerodynamics nor in airplane design, yet to any engineer of analytical turn of mind the question of the effect of wing distortion must present itself. If the wing surface changes appreciably under conditions of flight does it not seem possible that some of the expectations of the designer may fall far short of fulfillment? If the designer expects so much lift, so much drift, and such a center of pressure, what unexpected factor enters into the problem through the possibly unforeseen distortion of his aerofoil?

The possible importance of rib distortion would seem to make such determination a requisite adjunct to any satisfactory method of test. However, in view of the fact that many variables in the line of material and workmanship enter into the fabrication of each rib, it would seem that undue precision in the distortion determination is neither necessary nor advisable. A precision of 0.01 in. is doubtless satisfactory and such precision is possible with the device under consideration.

Throughout this discussion it is assumed that any distortion of the timber *E* which may occur is of such magnitude as to be absolutely negligible. As the plank *C* is raised the rubber bands become elongated. This elongation is measured by means of dividers set in center punch marks in the ends of the stove bolts *H*, *K*, etc. If there were no distortion of the rib, the increment of length of all bands would be the same under any given total load. Such is found not to be the case. For the particular test under discussion, these increments of length for loads of 50, 100, 150 and 175 lb., respectively, will be found in Table I. In Fig. 3 these increments of length have been plotted from arbitrary reference lines not shown. Now points 2 and 10 are the points of suspension as well as loading points. Hence so far as the rib is concerned these are points of zero deflection.

In each curve of Fig. 3, straight lines have been passed through the intersections of the curve with these two ordinates. Such lines serve then as lines of reference from which the actual distortion of any part of the rib may be determined for the particular load in question. The distortion curves are drawn showing the rib in its true position in flight. It will be noted that with the load distribution assumed, the particular rib under investigation showed a noticeable droop of the leading edge with a corresponding up-tilting of the trailing edge. Whether this distortion is of a magnitude and nature to affect the aerodynamics of the craft in flight is not within the province of this discussion. In the interpretation of these curves it must be borne in mind that while the ordinates are plotted full size, the chord length of the rib is vastly contracted.

TABLE I—DETAILED LOAD INVESTIGATION

Band No.	Initial Reading, In.	LOAD BY SCALES, 50 LB.			LOAD BY SCALES, 100 LB.			LOAD BY SCALES, 150 LB.			LOAD BY SCALES, 175 LB.			Band No.
		Length, In.	Increase in Length, In.	Force from Curves, Lb.	Length, In.	Increase in Length, In.	Force from Curves, Lb.	Length, In.	Increase in Length In.	Force from Curves, In.	Length, In.	Increase in Length, In.	Force from Curves, Lb.	
1	2.47	2.87	0.40	3.4	3.45	0.98	6.2	4.36	1.89	9.1	4.96	2.49	10.7	1
2	2.50	2.88	0.38	4.4	3.50	1.00	8.7	4.34	1.84	12.5	4.96	2.46	14.7	2
3	2.47	2.80	0.33	5.7	3.39	0.92	12.5	4.23	1.76	19.1	4.81	2.34	22.7	3
4	2.47	2.80	0.33	5.2	3.37	0.90	11.5	4.20	1.73	17.7	4.75	2.28	20.7	4
5	2.47	2.80	0.33	4.8	3.35	0.88	10.4	4.17	1.70	15.9	4.73	2.26	18.8	5
6	2.53	2.84	0.31	4.1	3.41	0.88	9.3	4.22	1.69	13.9	4.76	2.23	17.5	6
7	2.54	2.82	0.28	3.7	3.41	0.87	8.1	4.21	1.67	12.2	4.79	2.25	14.6	7
8	2.53	2.84	0.31	3.5	3.46	0.93	7.6	4.29	1.76	11.1	4.87	2.34	13.3	8
9	2.52	2.86	0.34	3.3	3.50	0.98	6.8	4.37	1.85	9.8	4.98	2.46	11.7	9
10	2.52	2.88	0.36	2.9	3.52	1.00	5.7	4.40	1.88	8.5	4.99	2.47	10.0	10
11	2.53	2.87	0.34	1.9	3.51	0.98	4.3	4.37	1.84	6.4	4.99	2.46	7.6	11
12	2.55	2.89	0.34	1.5	3.55	1.00	3.5	4.40	1.85	5.3	5.00	2.45	6.3	12
13	2.58	2.93	0.35	1.3	3.58	1.00	2.7	4.44	1.86	4.1	5.03	2.45	4.8	13
14	2.52	2.85	0.33	0.7	3.51	0.99	1.9	4.38	1.86	2.7	4.96	2.44	3.2	14
		Sum	46.4			99.2			148.3			176.5		
		Discrepancy	-7.2%			-0.8%			-1.1%			+0.9%		

While there was every reason to believe that the method of loading described in the previous pages would yield a load distribution quite closely in accord with that indicated by the diagrams of Fig. 2, still it seemed desirable to check the loads as carefully as might be. Such a check investigation is described in the following text.

Each band, after being cut to the proper width, was calibrated to determine the load-elongation relation through and somewhat beyond the range expected to be used in the rib test. These calibration curves appear in Fig. 5. For convenience in use, the increment in length has been plotted as abscissa rather than the actual length of the band. It should be noted, however, that the original length of the bands varied not over 0.02 in. The "band number" refers to the position of the band in question in the loading scheme (see Figs. 2 and 3). During the test, as has been previously noted, readings were made so that the increment in length is known for each band at each of the four specific loads investigated.

This increment, by reference to the calibration curves of Fig. 5, makes it possible to determine the force applied at each of the fourteen loading points. For any given set of readings, the sums of the individual forces thus determined should, of course, check with the summation as indicated by the reading of the scale beam. The closeness of this check between the apparent and actual summation is indicated in Table I. With the exception of the 50-lb. load investigation the discrepancies average about 1 per cent. It is only to be expected that the discrepancy for very small loads will be largely due to the difficulty in making accurate interpolations on the calibration curves.

#### Detailed Comparison Made

A detailed comparison has also been made between the computed and applied forces for a total load of 150 lb. Such comparison is shown graphically in Fig. 2. The forces as determined by the calibration curves have been plotted in the figure and the ends of ordinates thus obtained are joined by the dotted line. The closeness with which this follows the solid line joining the ends of the ordinates representing the desired forces would indicate that the method which has been herein discussed should prove satisfactory for this type of investigation.

It is necessary to make a very careful adjustment of each stirrup before attaching the rubber bands, in order that when the plank and rib are raised for the application of load, each band shall start elongating at the same instant. The most satisfactory of the methods tried is as follows: Lower the rib until the lowest point of the bottom edge will clear the timber *E*, Fig. 4, by some convenient amount. A single bolt should now be passed through the eyes in the timber *E* and through the eyes of the corresponding stirrup. By means of the adjusting nuts *F*, the stirrup may be brought to the proper length. When each stirrup has been thus adjusted, the level *D* should be set by means of the slotted end fastenings, so that the bubble will be in the center of the glass.

With all the above precautions observed, the stirrups may be released from their companion eyes, the rib and attachments raised and the rubber bands put in place.

#### The Rubber Bands

The tube from which these bands were cut was of uniform thickness throughout. This uniformity is very convenient since less care is necessary in adjusting the bands than would be requisite if the thickness varied as is the case with some types of tubes. It is believed that in cutting bands from a tube, as was done in this investigation, the width may be obtained accurately to about 0.01 in. In choosing the scale of width there are two antagonistic conditions to be considered:

1. It is desirable that the length increment of the band under load should be large compared with the deflection of the member under test so as to minimize the error in loading due to the variation in length increment of the various bands.

2. The maximum load applied by any band should probably not exceed one-fifth the strength of the band. This would be somewhat dependent upon the quality and resiliency of the material used.

The bands used in this test were of material showing a

strength of about 125 lb. per inch of width when tested as a band. The elongation at fracture was about 1000 per cent.

It would seem feasible to substitute for bands cut to a predetermined width as in this case, some of the better grades of para rubber bands, which may be purchased in definite sizes. Combinations of such bands could be used in parallel and tested by calibration, so as to obtain the desired force at each point of loading.

For the highest refinement it might be desirable to calibrate the bands, allow a period of rest, make the test and recalibrate after a second period of rest, using as a calibration curve the mean of the first and last determinations. In the opinion of the writer this double calibration should not be necessary. In order to justify this belief and to determine whether or not any appreciable change may be expected in the characteristics of the rubber bands within a reasonable time, a second calibration was made on half the bands six months after the calibration made to determine the curves of Fig. 5. The data for the original and secondary calibrations appear in Table II.

In the analysis of this table three things must be borne in mind:

1. The data were intended to serve as a basis for plots. In drawing the representative curves the slight variations will not appear, hence the algebraic sign of the variations has been recognized in computing averages.

2. The elongations may be in error  $\pm 0.01$  in.

3. The testing machine used has a precision of probably no better than  $\pm 0.1$  lb. within the range of load used.

When these last two items are taken into consideration it is very evident from an examination of the averages that the variations are negligible in all the bands quoted except perhaps band No. 3.

If the variation in the properties of the bands during a six months' period are negligible the short time variation need be given no great consideration.

#### Lateral Support

The rib pictured in Fig. 1 was tested to destruction with the apparatus as shown. It is true that these ribs receive certain lateral support at one or more intermediate points by means of the stringers. If it is desired to apply such support,

TABLE II—CALIBRATION OF RUBBER BANDS

Band No.	Length Increment, In.	Load, Lb.		Variation, Lb.
		October	April	
1	1	6.1	6.3	+0.2
	2	9.3	9.4	+0.1
	3	11.8	12.0	+0.2
	4	14.1	14.6	+0.5
				Aver.... +0.25
3	1	13.1	13.6	+0.5
	2	20.6	20.8	+0.2
	3	26.3	26.6	+0.3
	4	31.6	32.2	+0.6
				Aver.... +0.40
5	1	11.4	11.5	+0.1
	2	17.4	17.4	0.0
	3	22.0	22.2	+0.2
	4	26.9	27.1	+0.2
				Aver.... +0.13
7	1	8.8	8.8	0.0
	2	13.4	13.4	0.0
	3	17.1	17.2	+0.1
	4	20.8	21.0	+0.2
				Aver.... +0.08
9	1	6.7	6.5	-0.2
	2	10.1	9.9	-0.2
	3	12.9	12.8	-0.1
	4	15.6	15.6	0.0
				Aver.... -0.13
11	1	4.3	4.4	+0.1
	2	6.8	6.6	-0.2
	3	8.4	8.5	+0.1
	4	10.3	10.2	-0.1
				Aver.... -0.03
13	1	2.9	2.7	-0.2
	2	4.3	4.3	0.0
	3	5.4	5.5	+0.1
	4	6.7	6.6	+0.1
				Aver.... 0.00

there are several ways by means of which this may be accomplished. Three of these will be enumerated below.

1. To the plank *C*, Fig. 1, there may be fastened side pieces of white oak. These should be made with a typical "buck-stave" contour and held rigidly by through bolts. They should extend well below the lower edge of the rib. The inside faces should be polished with oil and be slightly lubricated before the test. They should be made and adjusted, by shims if necessary, so that a clearance of about 0.01 in. is present between them and the rib.

2. This type of support may be modified by using the "wooden buck staves" so separated that a yoke furnished with end rollers may be fastened to the rib at the upper and lower edges, and so adjusted that these rollers shall bear on the supports.

3. Some type of straight-line motion may be used. The supporting frame for this linkage may be fastened to the plank *C*.

In the opinion of the writer the type of lateral support first described should prove satisfactory.

#### Distortion Readings

It has been previously stated that the curves of Fig. 3 give an indication of the distortion of the rib. This is open to a slight objection, at least with the type of rib illustrated by Fig. 1. Several of the loads are applied at points beneath which the web has been largely cut away. At these points there enters a disturbing secondary beam action superposed upon the distortion of the rib as a whole. No attempt has been made to correct for this effect.

With the calibration curves at hand it is possible by means of the nuts at *N*, Fig. 4, to adjust the length of the stirrups during the test so that the load actually applied is exactly equivalent to that computed in the preliminary calculations according to the method shown by Fig. 2.

#### Extension of the Principles Involved

While this method of testing was developed to meet the exigencies arising in the testing of aircraft wing ribs, it is felt that it possesses the possibility of wide application. A number of ribs may be tested as a unit with any system of loading which experimental evidence or theoretical aerodynamics may suggest. A spar, a wing section, or any portion of the frame or of the completed craft may be loaded and the behavior of that portion may be investigated. The magnitude of the forces involved may be many times greater than those arising in the test herein described. Rubber tubing may be readily obtained which will yield bands showing a strength of 400 lb. per inch of width. Using bands of this type 6 in. wide will permit the application of forces of 500 lb. each.

With such forces spaced 2 in. apart, loads of 3000 lb. per lineal foot are possible. Under loads of such magnitude a very massive member must be used to replace the number *E*, Fig. 4. It would also seem possible to conduct tests in which the forces shall not be confined to a single plane. The chief difficulty to be surmounted would be that of constructing a suitable supporting frame to afford points of attachment for the various devices which would be found necessary in the application of the desired loads.

## Alien Enemies and Enemy Property

WHO is and who is not an alien enemy and what is and what is not enemy property, are clearly set forth in a statement recently issued by the Alien Property Custodian, A. Mitchell Palmer. It is surprising to some of us to learn that a German citizen may not be an enemy, while a peaceful American citizen sometimes is. Such however seems to be the case.

Enemy property, according to the Alien Property Custodian, includes any and every kind of property, money, chattels, securities, lands, indebtedness, accounts receivable, etc., which belongs to an enemy. Even if the property is held in the name of another—by a dummy or in trust—if the real beneficial interest belongs to an enemy, it is enemy property.

An enemy under the Alien Enemy Act is:

1—Any person regardless of citizenship or place of birth, which is within the boundaries of Germany, Austria-Hungary, or their allies, or within the territory actually occupied by their military or naval forces. A peaceful and law-abiding German or Austrian citizen residing in the United States is not an enemy; but an American citizen living in enemy territory is an enemy.

2—A person residing outside of the United States and doing business within the territory of enemy countries or their allies.

3—A corporation, if incorporated within the territory of enemies or their allies, or incorporated in any neutral country and doing business within the territory of enemies or their allies.

4—An official or agent of an enemy Government or any subdivision thereof.

5—All natives, citizens, or subjects of Germany or Austria-Hungary interned by the War Department.

6—All citizens or subjects of Germany or Austria-Hungary resident outside of the United States who are (a) wives of officers, officials or agents of Germany or Austria-Hungary, wherever resident; (b) wives of persons within the territory (including that occupied by military and naval forces) of Germany or Austria-Hungary; or (c) wives of persons resident outside the United States and doing business within enemy territory.

7—Citizens or subjects of Germany or Austria-Hungary who are prisoners of war or who have been or shall be interned by any nation associated with the United States in the war.

8—Citizens or subjects of Germany or Austria-Hungary who since April 6th, 1917, have disseminated or shall hereafter disseminate propaganda to aid any enemy nation or to injure the cause of the United States, or who have assisted, or shall assist in plotting against the United States or any nation associated with the United States in the war.

9—Citizens or subjects of Germany or Austria-Hungary who are included or who shall be included in the "Enemy Trading List" published by the War Trade Board.

10—Citizens or subjects of Germany or Austria-Hungary who, at any time since Aug. 4, 1914, have been resident within enemy territory.

Numbers 2, 6, 8, 9 and 10 apply only to persons resident outside of the United States.

Three-quarters of a billion dollars' worth of property have been reported to the Alien Property Custodian at Washington already, but from an investigation throughout the country it is known that there is much more not yet located.

Every one can help the nation by mailing the Bureau of Investigation, Alien Property Custodian, Washington, D. C., reports or information on enemy-owned property in his vicinity.

AFTER the war there is no doubt that France will adopt a mixture of alcohol and benzol as the national motor fuel, particularly for commercial vehicles, agricultural tractors, etc., says the *Petroleum Review*. Alcohol as a motor fuel is no stranger to Frenchmen, and would have been adopted years ago but for the lack of a settled policy to prevent speculation and violent fluctuations in prices. Before the war there were no motor vehicles running entirely on alcohol. But for two years the Paris General Omnibus Company used a 50 per cent mixture of benzol and alcohol, and only abandoned it for benzol owing to the steady rise in the price of alcohol. It is the intention of the French Government to secure a monopoly of alcohol, and to encourage its use.



# Exhaust Headers and Mufflers

An S. A. E. Paper Considering the Subject from the Standpoint of Aircraft Engineering—Present Practice Reviewed and Conclusions Drawn

By Archibald Black\*

**I**N the following notes no attempt has been made to treat exhaustively the design of exhaust headers or mufflers for airplane engines. The paper is intended chiefly to record some data collected on this subject during the past several years.

The exhaust header's primary purpose is to carry exhaust gases away from the engine, but it may be designed to perform certain other functions to advantage. The most important of these is probably the muffling of the sound of the exhaust, which may be brought about by a properly designed header.

In present practice the exhaust is taken care of in several radically different ways, the devices of the different designers ranging from the open port to the elaborate combined header and muffler as now used on some machines.

## Typical Constructions

Fig. 1 shows the open port, which was very popular on the old engines and was used until recently on the Curtiss 90-hp. JN-4 type engine. In that type no effort was made to carry away the gases or to muffle the noise. Fig. 2 shows the "stub tube" method, used on some Hall-Scott installations and recommended by the Hall-Scott Company for its engines. In this system each cylinder is furnished with an individual exhaust pipe several inches long, which points straight out from the engine and is cut off on the outer end at an angle of about 45 deg. to prevent the air from causing a back pressure when the airplane is moving. While this arrangement assists the cooling of the engine, it gives the maximum of noise and would appear therefore not entirely satisfactory for either military or sporting machines.

Fig. 3 illustrates what has come to be known by many as the German system on account of its origin on machines of that nation and apparent popularity among German designers. Tubes extend upward from each cylinder into the common header, which is of streamline section and points upward and slightly to the rear, directing the gases over the top of the upper wing. This reduces the noise heard from below and appears to be a very practicable, although not final, solution of the problem.

Fig. 4 shows an adaptation of the German system used on recent Curtiss JN-4 machines.

Fig. 5 is the original L-W-F header, consisting of short tubes run at right angles into a manifold tube, the front end being closed and the rear end connected by a flexible metallic tube to a straight pipe leading along the body to the rear of the pilot, the end being open to permit the escape of the gases. This design was discarded, after the first few machines, in favor of the method illustrated in Fig. 6. Here the individual pipes sweep backward on a liberal radius into the manifold, and the flexible pipe is replaced by a smooth steel tube, which is perfectly straight on some

models, depending upon the engine used. Fig. 7 shows the new header and muffler as fitted to some of the Curtiss machines. This header connects to a tube, which extends backwards along the body and terminates in a muffler.

The muffler is simple and most ingeniously designed; the exhaust tube is slotted and the metal bent outward to form two parallel flanges separated by spacers as shown in Fig. 8. The author had no opportunity to examine the earlier of these mufflers, as installed on R-4 machines, but the following description was reported to him by the field department of the L-W-F Company. The slot was about 5 to 6 ft. long and about  $\frac{1}{8}$  in. wide, starting near the engine and running back to the end of the tube, which tapered from the full section of the engine to a comparatively small section, open to the atmosphere, at the rear end.

One of the Curtiss engineers stated that no material loss of power was found to be caused by the use of this muffler. It has been generally conceded by those who have heard the engine running with the muffler in place that the noise of the exhaust is reduced to much less than its former volume. This bears out the author's experience with similar devices installed on several engines; these are referred to later in this paper.

At a later date the author made an examination of a similar muffler installed on one of the Curtiss company's JN machines equipped with Hispano-Suiza engines. This muffler had no large opening in the rear, the slot extending around the end instead. The slot was about 4 ft. long and  $\frac{1}{16}$  in. wide, approximately an allowance of about 0.04 sq. in. of slot per b.hp.—an extremely small area.

Fig. 9 shows a method of muffling the exhaust gases devised by Deperdussin, the French constructor. This is shown as

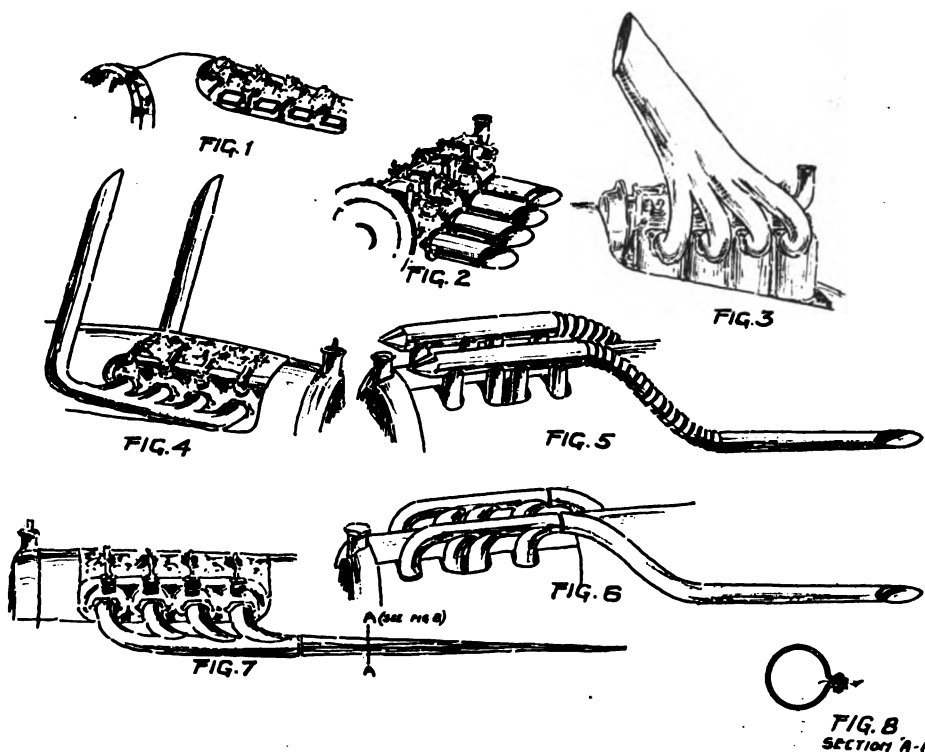
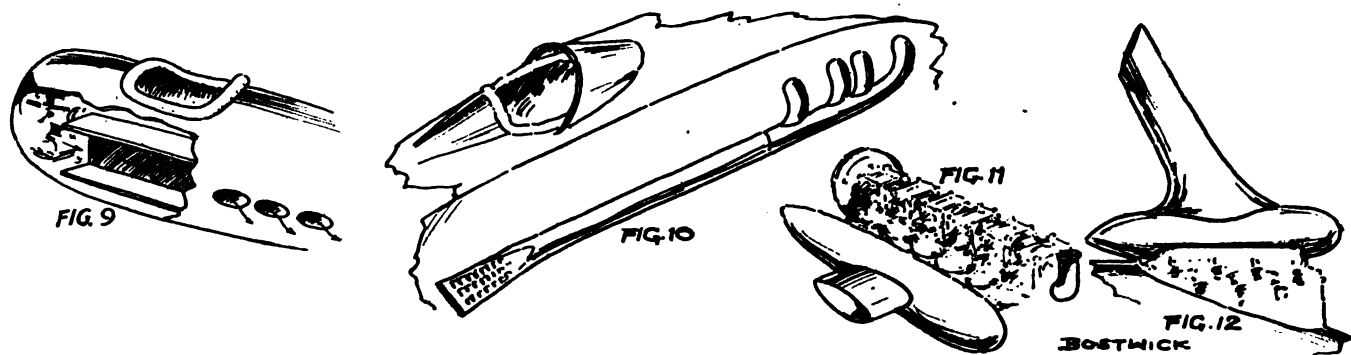


FIG. 8  
SECTION A-A

\*Chief Engineer, L-W-F Engineering Company, Inc.

Various designs used in airplane engine exhaust header construction



Other methods of solving the exhaust problem in airplane engine design

applied to an engine of the rotary type, the gases being carried through internal ducts to outlet holes at the rear of the body.

The French "Spad," Fig. 10, is furnished with exhaust headers extending backward for about 6 ft. from the engine. These headers are 3 in. inside diameter and terminate in a muffler consisting of a tube, round at the end, fastened to the exhaust header, which is flattened towards the rear, where it ends up about  $\frac{1}{2}$  in. in height and is considerably wider than the diameter of the front end. This rear end is closed except for four slots similar to those in top and bottom, described below.

In the flattened part, both on top and bottom sides, are a number of slots 1 in. long and  $\frac{1}{4}$  in. wide, with round ends. Each muffler has 78 such slots, giving a total area of 0.1267 sq. in. per brake horsepower for two such mufflers, based on 150 b.h.p. (the rating of the Hispano-Suiza).

The exhaust pipe allows 0.08836 sq. in. cross-section per b.h.p. and has considerable capacity due to its length. This capacity, by allowing expansion of gases, should assist the action of the muffler considerably. The above figures are exact measurements.

Fig. 11 shows the manifold used on later "Mercedes" engines. No detailed information on the construction of this manifold has been obtained by the author.

Fig. 12 illustrates a manifold used on Farman and Breguet machines, which appears to be similar in design to the "Mercedes" referred to above. The author has examined the Breguet manifold but could not obtain as much detailed information as desired. The inside apparently contains no baffle plates and the pipes from the cylinders enter tangentially to the body. This construction is evidently designed to reduce the velocity of the gases by causing them to expend their energy in eddy currents in the main chamber.

Fig. 13 is a scale drawing of one of the mufflers tested under direction of Prof. W. T. Fishleigh at the University of Michigan a few years ago. Five mufflers of different designs were experimented with and detail reports were published in *Horseless Age* in May, 1915. Of those tested, the muffler shown here was rated as the best in muffling ability and low back pressure, and one of the two best in low horsepower losses. This muffler was also the lightest of the five. Although the most efficient of those tested, it showed a b.h.p. loss of 3.6 per cent with engine delivering 38 b.h.p. This device weighed 14.5 lb. and had a capacity of 847 cu. in.

Fig. 14 is a scale drawing of one of the mufflers tested under the direction of Profs. H. Diedrichs and G. B. Upton of Cornell University. Details of the tests are given in the Second Annual Report of the United States Advisory Committee for Aeronautics. The results of tests of the particular muffler shown are given in part in Table I. It will be noted that this muffler caused a loss in horsepower of only 1.5 per cent, from which it would appear that it is efficient enough to justify its application in many cases to airplane engines.

Another type of muffler was experimented with recently by J. L. Cato of the L-W-F Company. This muffler was somewhat similar to the "Spad" device, but it had a slot in the end instead of being closed and was provided with small semicircular louvres in the side instead of slots. The areas allowed and the results obtained were in general very similar to those of the "Spad" muffler.

The two main considerations in the design of exhaust head-

ers and mufflers are the elimination of back pressure and the reduction of noise, which two requirements are, unfortunately, generally incompatible in practice. It is a simple matter to design headers fulfilling one, but not both conditions. The combining of both calls for a careful study and proportioning of even the smallest features of the device.

Research work of the manufacturers of blowers and air moving machinery is of considerable help in this work. F. L. Busey conducted a series of experiments\* to determine the effects of bends in air ducts. The curves published by him, combined here in Fig. 15, show that, when the radii are small, bends in square pipe offer more resistance than bends of the same radius in round pipe. The reverse is the case when the radii are large. This change of condition takes place when the radii equal about 0.6 times the diameter or side.

The American Blower Co. also has made some tests and publishes among its data sheets one giving the resistance of bends in terms of equivalent length of straight pipe.

It will be noted from Fig. 15 that the resistance of the bend is lowest when the radius is equal to  $2\frac{1}{2}$  times the diameter; that nothing is gained by making it greater than this; and that this resistance rises to a prohibitive value if the radius is less than 1 to  $1\frac{1}{2}$  times the diameter of the pipe. While this curve is based on tests which were made at lower speeds than are probably encountered in an exhaust manifold, Willis H. Carrier† concluded, from results of experiments, that losses in elbows through which air is flowing depend on the radius of curvature of the elbow and not on its size or on the velocity of the air.

It would therefore appear safe to assume that the curve given applies equally to the high velocity of flow in an exhaust manifold. Bends of high resistance in manifolds, if near the engine, will sometimes show up by becoming red hot. Sudden changes in the area of the exhaust pipe should be avoided. The areas of the individual exhaust pipes are usually fixed by the necessity of making their ends conform to the ports in the cylinders in order to obtain this condition. When this is not the governing condition, personal experience with different installations of headers and some investigation of

\*Loss of Pressure Due to Elbows in the Transmission of Air Through Pipes or Ducts.—*Trans. American Society Heating and Ventilating Engineers*, 1913.

†*Fan Engineering*, 1914 Edition, page 114.

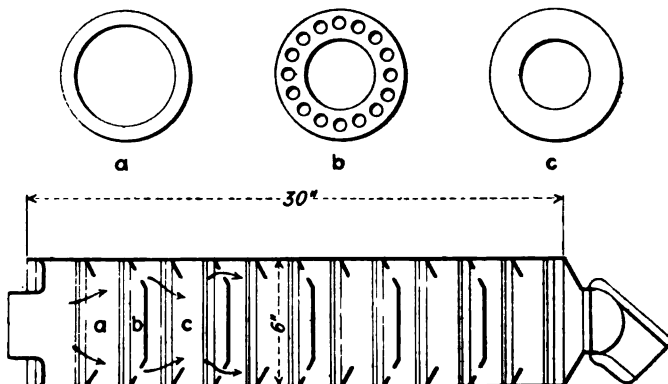


Fig. 13—Muffler design giving best results in test by Professor Fishleigh

the areas of exhaust ports on several successful aircraft engines suggests that 0.14 to 0.16 sq. in. of area per b.h.p. of cylinder is a liberal allowance. The exhaust ports of the Hall-Scott A-5A, Thomas 8, Sturtevant 5A and Liberty, some of the engines studied, averaged 0.1668 sq. in. per b.h.p. As large a radius as possible should be used in these tubes which enter the manifold. The latter should be of large sectional area at the outlet end, tapering down to equal the area of the individual pipe at the other end. Where a tube extension is used it should be as straight as possible and of the same sectional area as the manifold end.

The proper area for the large end of the manifold is best determined for the experiment with several different sizes, noting the effect upon the horsepower of the engine while running on the dynamometer. This best size will probably vary with different engines, being governed, no doubt, by piston speed and the shape of exhaust ports as well as by the brake horsepower of the engine. As these experiments, however, cannot always be made, the author recommends allowing about 0.07 sq. in. of area per b.h.p., which figure is the average of the several American and foreign installations. When two headers are used—as on eight or twelve-cylinder engines—it should be kept in mind that each header handles only half of the total exhaust. For most engines this allowance will be found to be liberal.

Exhaust headers have been developed, by experiment, which have had areas as low as 0.045 sq. in. per b.h.p., but it would not seem advisable in the absence of a series of experiments to attempt to reduce the figure given.

In cases where headers are inclined to overheat, it has been suggested that they be furnished with a series of longitudinal fins, welded to the tube, to increase the radiation. Automobile engines have been built which were equipped with headers having fins somewhat similar to these.

Table II gives the required outside diameter of No. 20 U. S. gage tube for various horsepower, based upon the figure recommended above. This table, while giving satisfactory results, should not be considered final. It would be advisable to remove the manifold and note if there is any change in maximum speed of engine when running without it before the question is considered settled for the particular design.

#### Notes on Muffler Design

A very interesting and instructive treatise on the principles underlying the design of mufflers is found in part of the previously mentioned report of Profs. H. Diederichs and G. B. Upton.

Another interesting report of experiments, previously referred to, published in *Horseless Age*, contains conclusions from results and discussion of the principles of design.

The chief principle to be kept in mind in designing exhaust mufflers is the slowing down of the exhaust gases until their speed is below that of sound. This is accomplished by regular expansion, surface friction and the changing of the direction of flow. Most mufflers embody all three principles in greater or less degree.

It would appear to be a reasonably safe assumption that mufflers of the type shown in Fig. 14 may be designed for engines of any horsepower by making the areas of pipes and volumes of chambers proportional to the horsepower. The muffler shown is drawn to scale and was tested on an engine of 60 to 70 b.h.p.

The Curtiss type muffler seems to be one of the simplest and most effective devices in use, and some experiences of the author and his associates with mufflers of this type may be of interest. Experimental mufflers were designed along these lines, and were tested on engines of different makes. The noise of the exhaust was, in each case, reduced to very little more than the noise of an automobile truck engine of large power. Tests made with and without the muffler in place showed that no difference in the number of revolutions per minute could be detected with the tachometer while the engine was running at full speed. With the engine running at full speed one's hand could be held against the muffler slot without discomfort, in contrast to which it was noticeable that the heat of the gases became uncomfortably great when one's hand was held a couple of feet away from the end of the ex-

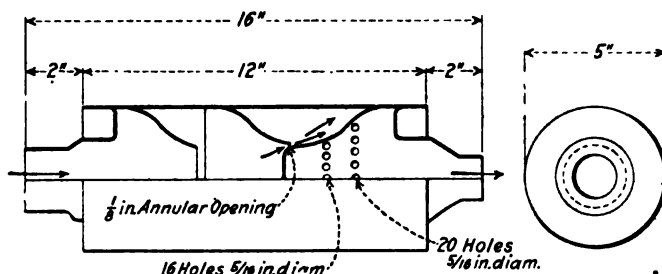


Fig. 14—Muffler used in tests results of which are given in Table I

haust pipe without the muffler. The speed of the gases was reduced to a slight puff.

Other work prevented the carrying on of further experiments, but the results appeared to suggest that the mufflers which were from 4 to 5 ft. long could have been reduced in length without loss in speed of engine or muffling effects.

While these mufflers were in use, several things were noted which called for attention. One engine was of the geared-down type, and when the muffler was in place the sound of the gears appeared to be of considerable volume, this noise being plainly heard above the sound of the exhaust. As these gears were lubricated by the engine oiling system, it would appear that some reduction of this noise could be obtained were the engine designed to permit lubricating them with a light grease instead of oil. It was also noted, with most of the engines, that once the exhaust was muffled, several other noises became apparent. These included the rattle of valve mechanism and noise of the propeller. In flight, while gliding with the engine running slowly, the "singing" of the wires was naturally more noticeable than before. The engines used in the above tests included a Sturtevant 140 b.h.p. Hall-Scott Model A-5-A, Liberty 8 and Liberty 12.

No high degree of accuracy is claimed for the tests described, as they were field and not laboratory tests. The results indicated, however, that in design of mufflers of this type it is advisable that the slot be kept narrow (1/16 in. was found to be satisfactory), and that a net area of 0.05 to 0.06 sq. in. per b.h.p. is ample. It did not appear to be necessary to leave any opening at the rear end as was done in the Curtiss R-4 muffler, better results in muffling having been obtained with the smallest end.

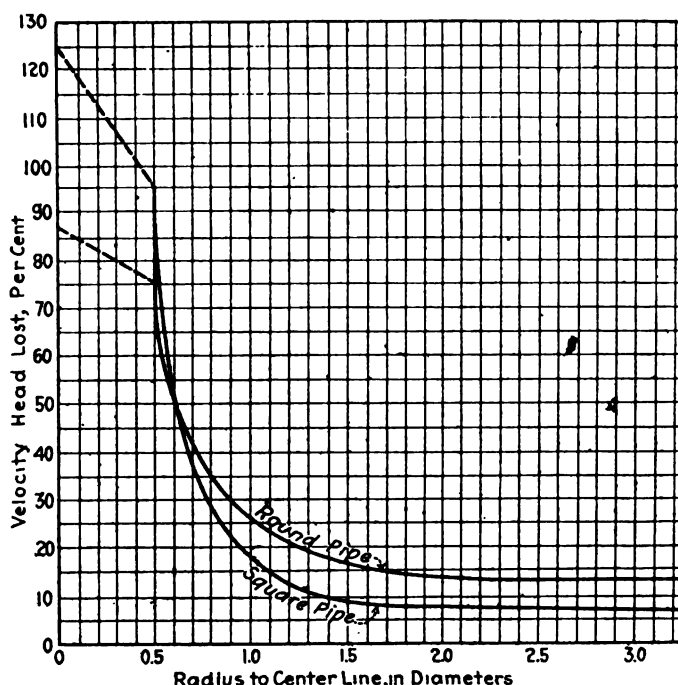


Fig. 15—Curves showing the effect of bends in air ducts



# U. S. A. Ambulance and Trailer

A Review of the Specifications for an Ambulance Body for the Class AA or G. M. C.  $\frac{3}{4}$ -Ton Chassis—Details of the Spare-Parts Trailer and Field Litter

**P**RODUCTION has begun on a large order for ambulance bodies of a design developed by engineers connected with the Sanitary Corps. Deliveries of these bodies will begin in August and the full rate of production is expected to be reached in September. A definite order for five thousand has been placed with two companies and it is understood that the Medical Corps is at liberty to order 7000 more from the same companies. In addition to the ambulance body the engineers have also developed a spare parts trailer and a field litter, both to be attached to the ambulance.

In designing this new body, as in the design of other automotive apparatus at the present time, three prime considerations, each of vital importance, were considered: First, the use to which the vehicle will be put on the other side; second, the methods by which it can be manufactured on this side and finally, that its construction be such as to require minimum shipping space.

## Standard Body Designed

The standard body is designed for application either on the  $\frac{3}{4}$ -ton G. M. C. chassis now used by the Medical Corps, or on the Class AA, U. S. A. military truck. The body will carry eight sitting patients and four lying. The design has been worked out so that two men can load the litters, instead of requiring three as is the case with the present type.

According to the specifications issued by the office of the Surgeon General, the design is intended to provide a strong substantial motor ambulance body, one that can be readily knocked down and assembled in the shortest possible length of time, consistent with boxing of disassembled body in the minimum size of shipping box. The floor, roof, side frames, and division panel, seats, deck frames, etc., are assembled as separate units, complete in themselves. The body is paneled with "vehisote," on the sides and at front division panels. The roof is made up of bows, or rafters, center rails, side rails and headers, and the whole is covered with "agasote." The edges of the roof are protected by sheet steel bent to angle form and screwed through agasote and side rails.

The aim has been to obtain complete interchangeability of parts so that the body can be shipped knocked down and assembled on the other side by comparatively unskilled men. The main parts, such as the sides, floor and roof will be

fastened together by bolts and nuts. The body is strong enough to carry the weight of two wounded men at the top. Although intended for carrying wounded men, the vehicle can be used for Ordnance or Quartermaster service that would ordinarily be required of a  $\frac{3}{4}$ -ton truck.

The specifications provide that all parts must be constructed to definite standard dimensions, with proper tolerances, so that any of the parts can be replaced, properly fitted and adjusted without requiring additional tool or machine work. All drillings, borings and framings must be made in connection with forms, jigs and templates, in order to insure complete interchangeability. The general dimensions of the standard body are as follows:

Length of body over corner posts .....	9 ft. 8 in.
Length of body from back of front division panel	
over rear post .....	7 ft. 10 $\frac{1}{4}$ in.
Width inside .....	4 ft. 8 in.
Front corner posts to center-line of wheel house, 6 ft. 5 in.	
Height from top of floor to top of roof, at center	
outside .....	5 ft. 0 in.
Height from top of floor to outside of edge of	
roof .....	4 ft. 9 $\frac{1}{2}$ in.

It will thus be seen that the body is roughly 10 ft. long, 5 ft. wide, and 5 ft. high. When these dimensions are compared with those of the packing box, which is 10 ft. 1  $\frac{1}{4}$  in. long, 5 ft. 1  $\frac{1}{2}$  in. wide, and 2 ft. 2 in. high, the economy in shipping space can be appreciated.

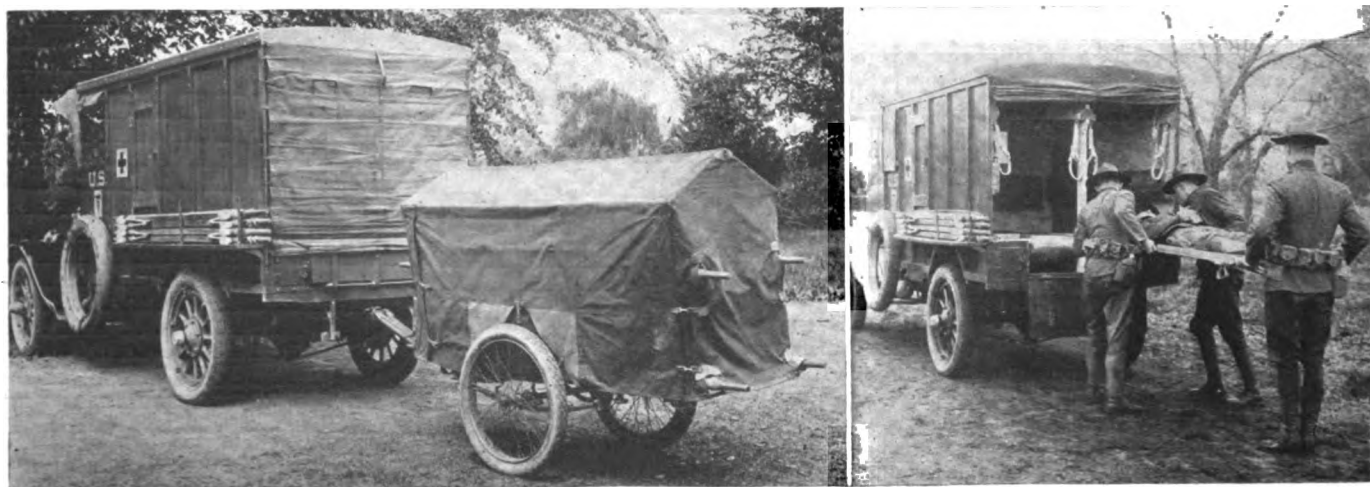
## Chassis a Commercial Product

The  $\frac{3}{4}$ -ton chassis is practically a commercial product with a few changes made as required by the special service. The speed with the governor off is about 40 m.p.h.; with it on about 20 m.p.h.; a four-cylinder engine, giving 27.5 hp. at 1100 r.p.m., is used.

The spring design is especially interesting, since it is the result of a large number of tests of different types. Half-elliptic springs, silico-manganese, graphite-filled, are used, with a heavy type of recoil check or snubber applied to each spring.

The rear springs are 54 by 2  $\frac{1}{2}$  in., with sixteen leaves. The flexibility is 275 lb. per inch, and the rated load 1350 lb.

The front springs, 38 by 2  $\frac{1}{4}$  in. have nine leaves. These



Left: Ambulance drawing litter carrier. Right: Loading the litter carrier on the top tier



are offset, the distance from the axle center to the rear eye being 20 in.; and 18 in. from that center to the front eye. The flexibility of the front springs is 515 lb. per inch and the rated load 900 lb.

The total weight of the ambulance ready for the road, without personnel, is about 4820 lb.; allowing for two drivers at 150 lb. each, eight patients at 200 lb. each, including their equipment, the maximum weight of the loaded ambulance is 6720 lb. The weight of the standard body is 1375 lb., and that of the chassis with driver's compartment is 2840 lb.; the remainder of the 6720-lb weight being accounted for by litters, water tanks and other special equipment.

The spare parts trailer is mounted on a  $\frac{3}{4}$ -ton commercial trailer, but the body is specially designed. The body frame work is of wood, which is covered with 20-gage sheet steel. One of these trailers will be provided for every twelve ambulances, so that enough parts can be carried to make emergency repairs on the road. The interior of the body is divided up into thirty drawers. A work bench can be opened out from the rear. A cover is arranged for the man working as shown in the accompanying illustration. Double doors are provided on each end and on each side, giving access to the sheet steel trays and drawers, which slide in and out on steel angle guides.

The general dimensions of the spare parts trailer bodies are as follows:

Length of body over all .....	94 in.
Width of body over all .....	42 in.
Height of body over all .....	36 $\frac{1}{4}$ in.
Length of lower floor boards .....	37 in.
Curvature of roof .....	1 $\frac{1}{2}$ in.

The field litter carrier has been designed by the Medical Corps engineers in this country. While the Allies have been using wheel carriers for wounded men, nothing like this has been developed. It is said this carrier will increase the effi-



Upper: Litter carrier in use carrying two men.  
Lower: Details of the litter carrier's construction

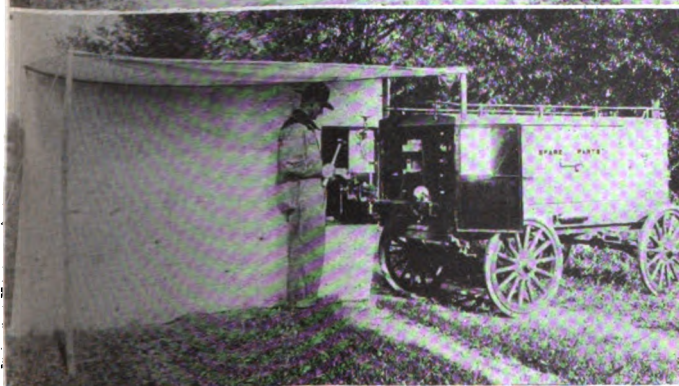
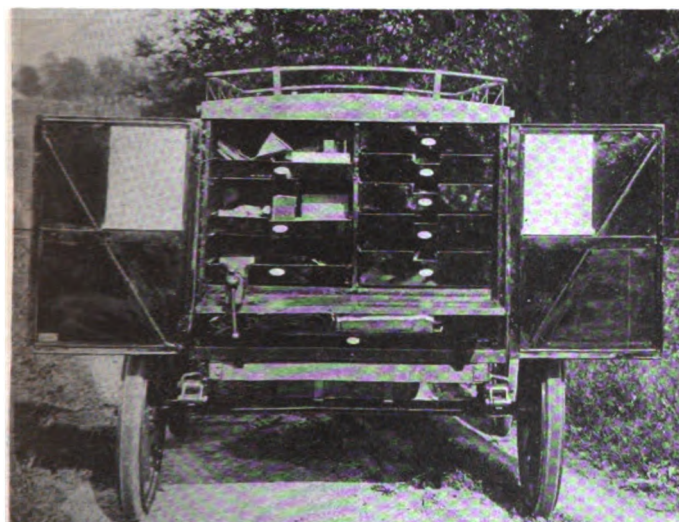
ciency of the Medical Corps stretcher-bearer 100 per cent. Two bearers can draw two wounded men in the litter carrier more easily than they carry one in the litter. The carrier can be hauled over very rough ground. It is designed so that it can be attached as a trailer to the ambulance, thus increasing the latter's capacity 50 per cent.

The two occupants can be completely covered by the curtain, or it can be lifted at the sides, or the top can be moved over to one side altogether.

About 150 carriers have already been ordered for overseas work and it is planned to supply one for every ambulance, except of course the vehicle in each company used for hauling the spare-parts trailer.

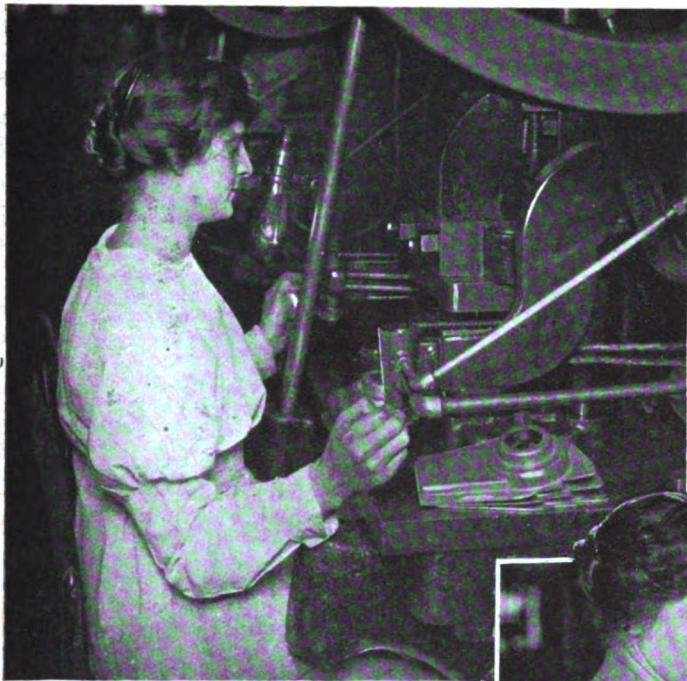
THE standardization movement has extended to the manufacture of farm wagons. The National Implement & Vehicle Association through its Farm Wagon Department has issued a report on the standardization meeting recently held at Louisville, Ky. The manufacturers have agreed to eliminate a large number of types and sizes in farm, valley and mountain wagons. Five classes of vehicles have been decided upon. Sizes of tires for the various types of wagons have also been standardized and the total number of sizes has been materially reduced.

The popularity of the motor car in Canada, and particularly in the Province of Ontario, is evidently increasing steadily. At the present time there are 75,000 cars in that province, this number representing an increase of 25,000 since the beginning of last year. For 1918 the prospects appear to be excellent.



picture is a rear view of the spare parts  
the lower picture it is opened and in use  
as a workshop





*The operative must use both hands to trip this punch press. When in use they are out of danger.*

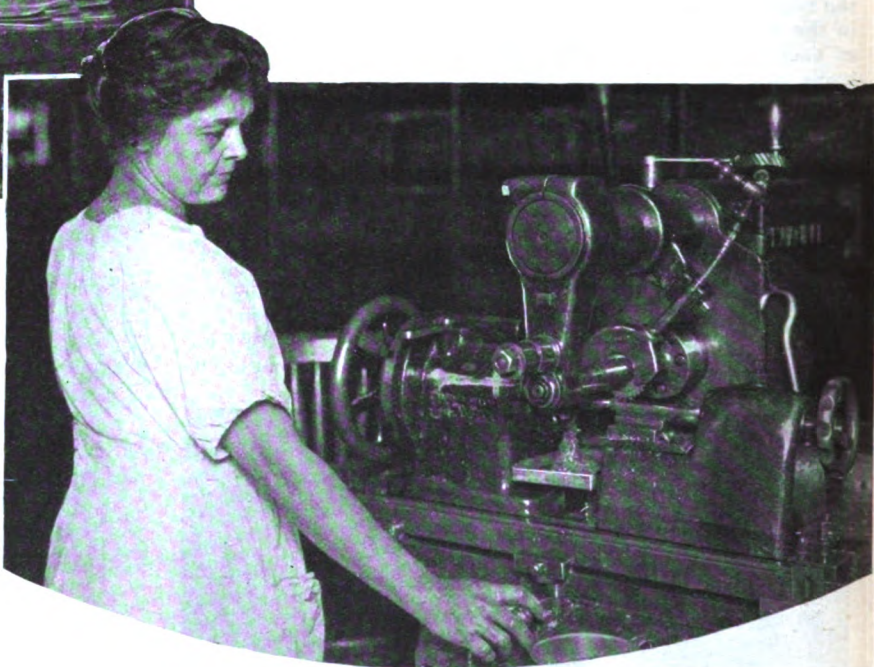
**P**ROSPECTIVE employers of women as operatives on machine tools must give consideration to the safety problem from a viewpoint slightly different from that which only takes into account what is a sufficiently wide range of probabilities when male operatives are used. This is another way of saying that the woman as a machine operator presents certain problems for solution by the safety engineer which the man does not. She has, to begin with, in most cases, an absolute unfamiliarity with machinery of any kind, she has long, flying hair and she wears skirts.

The hair and the skirt problems are being satisfactorily solved by the compulsory wearing of bloomers and caps. But the lack of familiarity with machinery and a more or less natural failure to comprehend the existence of danger where it really is—even though she often imagines it to be where it really isn't—are not counteracted by changing the character of her wearing apparel. Many safety engineers are convinced that a much more thorough safeguarding of machinery is necessary when women are to operate it. Others there are who hold that what is needed to make machinery safe for women is also necessary to make it safe for men.

The photographs reproduced on these two pages were made in the plant of the Dayton Engineering Laboratories Co., at Dayton, Ohio. The study of the problem of developing safety appliances for the machine which the women run in this plant has been most thorough and the installation of safety equipment has been most complete. A glance at the machines shown in the photographs will bear out this statement. The protection of moving parts of the machinery has been made so complete that it has not been found necessary or thought desirable to compel the women to wear caps to prevent their hair from flying

## Safety Equipment for the Protection of Women Operatives

What Has Been Done in An Electrical Equipment Making Plant

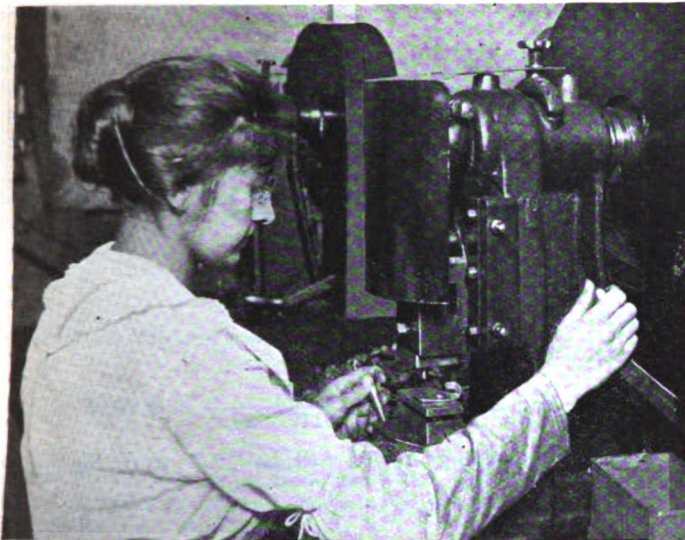


*This mill cutter guard functions also to direct and confine the cutting lubricant*



*Boring drill guarded by extended sleeve which permits only point to project*





*Right—The swinging die in position. The operative uses one hand to trip the press and the other to hold the die in position. When both hands are in use, there is absolutely no danger of mashed fingers. Left—Loading a swinging die in position*

about and getting caught in revolving spindles or the like.

In the photograph of the women operating a multiple drill press, it will be noted that sheet metal guards have been installed to cover the spindles and even the belts and pulleys. In another photograph is illustrated the manner in which the flywheel of a punch press is entirely enclosed.

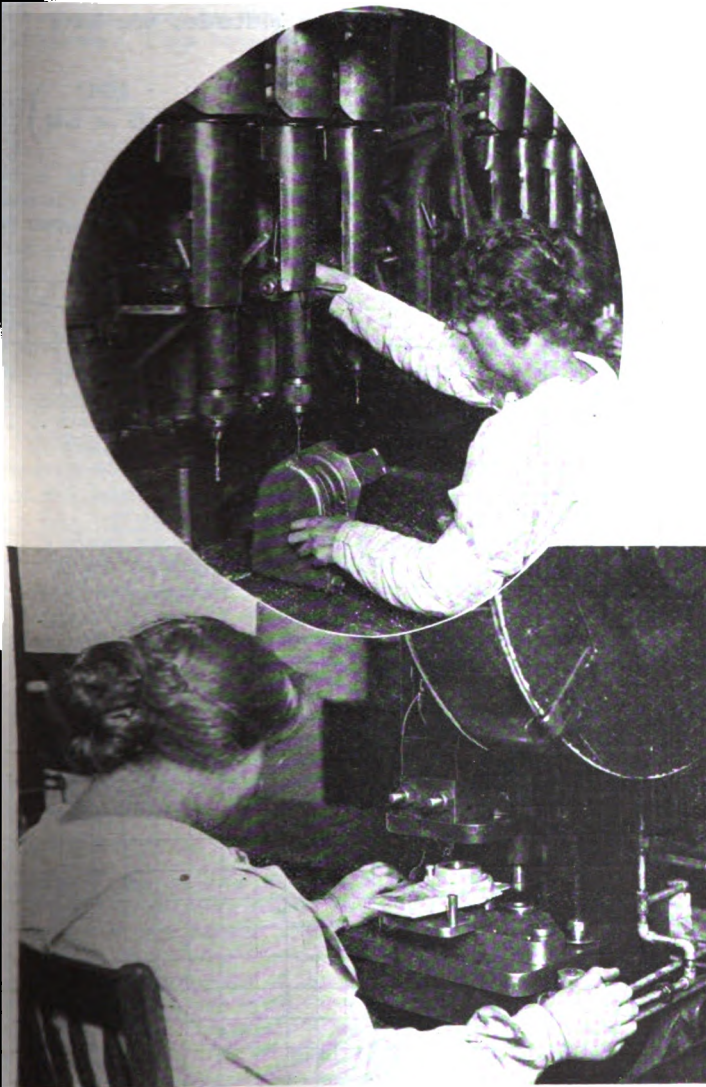
#### Swinging Dies Employed

For all press operations, it will be observed, swinging dies are employed which require that before a piece can be withdrawn from the die or another piece inserted the die must be swung out clear of the punch head and the danger of an accidental drop and resulting injury to a hand is automatically avoided. Furthermore, only such presses are employed as necessitate the use of both hands simultaneously for their operation.

The importance of accident prevention has evidently been given great weight in the Delco plant, which is as it should be. Like sanitation, fire protection and other preventive measures, it is difficult, if not impossible, to overdo it. What the law requires is usually a minimum and therefore not an altogether safe guide for any individual manufacturer who would safeguard his labor supply and maintain his lost time and turnover percentages at the lowest possible point.

#### Nine-Tenths of Accidents Preventable

It has been repeatedly pointed out and it cannot be repeated too often, that nearly 90 per cent of industrial accidents result from preventable causes. And of these, much the larger part are due to carelessness or apathy on the part of operatives and a lack of appreciation of danger. Much can be done, as has been done by the Delco company, to reduce the number and severity of accidents by the guarding of machinery, but it is also essential, experts agree, if maximum results are to be obtained, to secure the whole-hearted co-operation of the employees themselves. Where it is not practical to employ a safety engineer, whose exclusive business it is to see that safety measures are provided and educational work done among the workers, much good can be accomplished by a special safety committee of workers whose duty should be to study the causes of accidents, to suggest suitable means of prevention and to make frequent inspection of machinery and plant.



*Upper—Revolving parts of the drill press are covered with sheet metal guards as a means of absolute safety. Lower—The swinging die is shown here in position. Note the guarded flywheel*

# Predicting Strength and Efficiency of Airplane Propellers—II

By F. W. Caldwell

(Concluded)

The efficiency of the propeller can be computed by a method of trial as follows: First assume an efficiency of 80 per cent. The thrust will then be

$$T = \frac{0.80 \times 356 \times 550}{191} = 820 \quad (6)$$

The slip-stream velocity can be computed from the impact formula (2), and then

$$v = \frac{T}{AV \frac{\rho}{g}} = \frac{820}{104 \times 191 \times 0.00238} = 17.3 \text{ f.p.s.} \quad (7)$$

which means that the slip is 9 per cent.

From the Froude method the theoretical efficiency can be found as follows:

$$e_1 = \frac{V}{V + \frac{v}{2}} = \frac{191}{200} = 0.955 \quad (8)$$

## Analysis of Propeller Efficiency

Assuming that the section at 0.75 radius is representative of the propeller as a whole and that the value of  $L/D$  at this section is twenty, the efficiency by the aerofoil method can be obtained from the chart shown in Fig. 3. It is first necessary to find the corresponding value of  $ND/V$ , which is

$$\frac{ND}{V} = \frac{1400}{60} \times \frac{0.75 \times 11.5}{200} = 1.01 \quad (9)$$

The aerofoil efficiency is found from Fig. 3 to be 85 per cent. The product of the two efficiencies (see equation 8) is  $0.955 \times 0.85 = 81$  per cent. A further correction due to the spiral component of the slip-stream will reduce this to 80 per cent. Since the assumption made in computing the slip-stream velocity was correct it need not be recomputed.

The drag of the supporting surfaces at ground level and at a plane velocity of 191 f.p.s. will then be  $3400 \div 12.3 = 276$  lb. The parasite resistance, that is to say, the propeller thrust minus the wing drag will be  $820 - 276 = 544$  lb.

At 20,000 ft. altitude the air density can be taken as 50 per cent of the density at ground level. As a first approximation assume that the propeller speed will increase in proportion to the cube root of the horsepower (the horsepower being proportional to the engine speed, since constant torque is assumed), and in inverse proportion to the cube root of the density; then in level flight

$$N_1 = 23.3 \sqrt[3]{\frac{N_2}{23.3} \times \frac{1}{0.5}} = 33 \text{ r.p.s.} = 1980 \text{ r.p.m.} \quad (10)$$

Assuming a constant torque the engine will then deliver 503 hp. Assuming 80 per cent propeller efficiency

$$T = \frac{503 \times 0.80 \times 550}{V} = \frac{221,500}{V}$$

As a first approximation to determine  $K_r$ , assume the velocity to be proportional to the cube root of the horsepower delivered and inversely proportional to the cube root of the air density. Then

$$V = 191 \sqrt[3]{\frac{1}{0.5} \times \frac{503}{356}} = 270 \text{ f.p.s.}$$

$$\text{and } K_v = \frac{3400}{420 \times 0.00119 \times 270^2} = 0.0933.$$

The corresponding  $K_v/K_z$  will be 12.3 and  $K_z$  will be 0.00759.

$$\text{Thrust} = \text{Total Drag} = \left( \frac{\rho}{g} K_z S V^2 \right) + \left( \frac{0.5}{1} \times 544 \times \frac{1}{191^2} \right)$$

Since  $\frac{\rho}{g} = 0.00119$  at 20,000 ft. altitude, we have

$$\frac{221,500}{V} = \left( 0.00119 \times 0.00759 \times 420 + \frac{191^2}{0.5 \times 544} \right) V^2$$

Whence

$$V = 270 \text{ f.p.s.} = 184 \text{ m.p.h.}$$

Thus the assumption as to plane velocity are seen to be

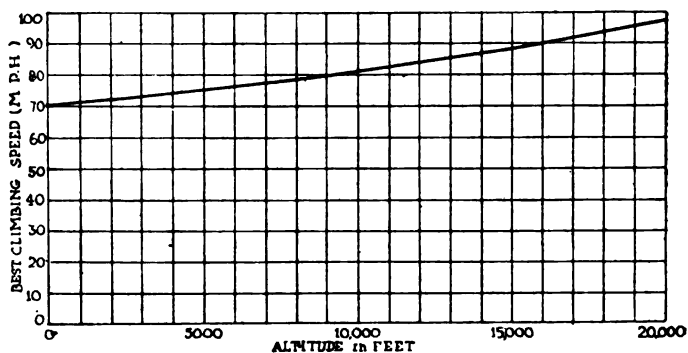


Fig. 15—For absolute value of key,  $L/D$  and wing drag are constant. Power absorbed by drag of wings will then be proportional to speed of plane

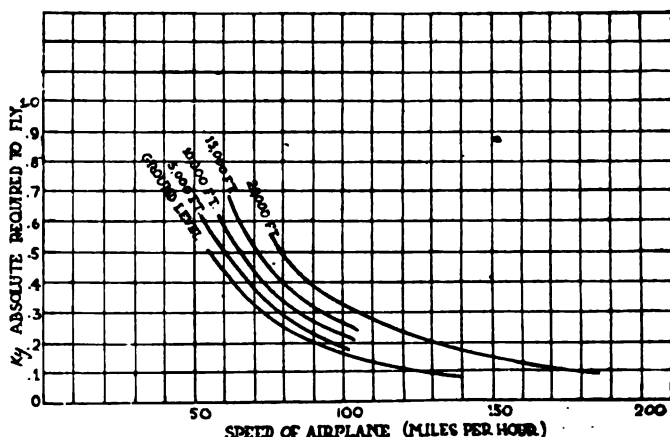


Fig. 16—Propeller for constant torque engine. Best climbing speed at ground level 70 m.p.h.

correct for constant torque, so that they need not be recomputed.

To find the propeller efficiency under the new condition the thrust is first computed from the formula

$$T = \frac{550 \text{ hp.} \times e}{V} = \frac{550 \times 503 \times 0.80}{270} = 820 \text{ lb.}$$

Again the slip-stream velocity will be

$$v = \frac{T}{AV\rho} = \frac{820}{104 \times 270 \times 0.00119} = 24.3 \text{ f.p.s.}$$

The theoretical efficiency will be

$$e = \frac{V}{V + \frac{v}{2}} = \frac{270}{270 + 12} = 0.958.$$

Since  $ND/V$  has the same value as before, the true angle of attack will be the same and the aerofoil efficiency will again be equal to 85 per cent.

The product of the two will as before be 81 per cent, and this will be reduced to 80 per cent by the correction for the spiral component of the slip-stream.

It is apparent therefore that the efficiency of the propeller is the same for the two flying conditions, provided the engine torque is kept constant.

These results can be deduced without making the calculations as follows: The total lift of the plane may be expressed as

$$W = \frac{g}{\rho} K_v S V^2$$

in which  $S$  is constant for all altitudes and  $W$  and  $g$  are approximately constant. In order to maintain a constant angle of attack  $K_v$  must be held constant, then  $\rho V^2$  is constant, and  $V$  is inversely proportional to the square root of the density. For this condition the total drag of the machine will remain constant and the horsepower required to drive the plane will be equal to the horsepower required at the ground level multiplied by the ratio of the plane velocity at altitude to the plane velocity at the ground.

If the speed of the propeller is kept proportional to the velocity of the plane, its  $ND$  and its  $V$  efficiency will be constant. To maintain this speed the engine horsepower must be proportional to the ratio of  $N^3$  multiplied by the inverse ratio of the air densities. But since  $N^3$  is proportional to  $V^3$  it is also inversely proportional to the ratio of air densities. It is consequently necessary to maintain only the engine horsepower proportional to the speed. This is obviously the definition of an engine with constant torque.

The rate of climb to be expected from a plane fitted with a constant-torque engine is shown graphically in Fig. 13. (The calculations for rate of climb are given at the end of the paper.) If an adjustable-pitch propeller were applied to this engine, the propeller speed could be maintained at 1700 r.p.m. during the whole climb. The horsepower available and the rate of climb, Figs. 14 and 15, indicate such an improvement in the performance that the variable pitch feature becomes highly desirable.

#### Ceiling

Evidently the ceiling of such a plane is not limited by aerodynamical considerations, but only by the strength of the materials employed. The engine and propeller speed would continue to increase until something let go. The limiting speed of a propeller of this size would probably be about 2500 r.p.m. in thin air with the materials now in use. This would correspond to an air density equal to 31 per cent of that at the ground, and at an altitude of about 34,000 ft. In flying at greater heights it would be necessary to throttle the engine in order not to over-stress the propeller, so that the ceiling would be in the neighborhood of 45,000 ft.

In conclusion I wish to emphasize the fact that the variable-pitch propeller is, to a certain extent, limited to special cases. The design of a propeller for an engine with constant torque presents no difficulty, except that the climbing rate near the

ground must be reduced, owing to the slow speed of the engine. This is not serious and can be entirely overcome by the use of a variable-pitch propeller. The interesting feature of this development is the great speed to be expected. It is not out of the question to attain speeds of 200 m.p.h. at an altitude of 30,000 ft.

#### Conventional Design Compared to Adjustable Pitch Propeller

The following assumptions will be made in calculating the climbing rate with a fixed blade propeller.

1. Engine output = 170 hp.
2. Propeller diameter = 8 ft. and  $(A) = 50.3 \text{ sq. ft.}$
3. Radiator area = 3.3 sq. ft. Effective area = 50.3 — 3.3 = 47.
4. Velocity of airplane = 120 m.p.h. = 176 f.p.s.
5. Engine speed = 1600 r.p.m. = 26.7 r.p.s.

The calculations are as follows:

In order to compute the thrust assume a propeller efficiency of 79 per cent.

$$\text{Thrust} = \frac{550 \times \text{hp.} \times e}{V} = \frac{550 \times 170 \times 0.79}{176} = 420 \text{ lb.}$$

$$\begin{aligned} \text{Velocity of slip stream, } v &= \frac{T}{AV\rho} \\ &= \frac{420}{47 \times 176 \times 0.00238} = 21.4. \end{aligned}$$

$$\text{Slip} = \frac{v}{V} = \frac{21.4}{176} = 12.2\%.$$

$$\begin{aligned} \text{Theoretical efficiency (Froude method)} e &= \frac{V}{V + \frac{v}{2}} \\ &= \frac{176}{186.7} = 94.2\%. \end{aligned}$$

$$\text{True } P_e = \frac{186.7}{26.7} = 7.00 \text{ ft.}$$

We must now determine the value of  $\frac{ND}{V}$  and in doing

this it may be assumed that the section at 0.75 radius is representative of the propeller as a whole.

$$\frac{0.75ND}{V + \frac{v}{2}} = \frac{0.75 \times 1 \times 0.8}{7.00} = 0.858.$$

Assuming  $K_y/K_x = 20$ ,  $e_s = 86.5$ .

Then true  $e = 0.942 \times 0.865 = 0.815$ .

which is reduced to 80 per cent by the spiral component of the slip stream. (The assumption of 79 per cent in computing thrust is nearly enough correct so that it need not be recomputed.)

$$\text{The effective pitch angle } \phi = \frac{0.75\pi ND}{V + \frac{v}{2}} = 20.3 \text{ deg.}$$

Assume that the true angle of attack from chord is 0.5 deg. and that blade angle  $(\theta) = 20.8 \text{ deg.}$

$$\text{Output} = 0.80 \times 170 = 136 \text{ hp.}$$

#### Calculation of Propeller Efficiency Under Climbing Conditions

Assume climb at 65 m.p.h. = 95.9 f.p.s.

The speed in climbing = 1475 r.p.m. = 95.4 f.p.s.

Assume efficiency = 60 per cent.

$$\text{Thrust} = \frac{0.60 \times 550 \times 1475 \times 170}{95.4 \times 1600} = 542 \text{ lb.}$$

$$v = \frac{542}{47 \times 95.4 \times 0.00237} = 50.9.$$

$$\text{Slip} = \frac{50.9}{95.4} = 53.4\%.$$



$$e_1 = 100 \frac{V}{V + \frac{v}{2}} = 100 \times \frac{95.4}{120.8} = 79\%.$$

$$\frac{0.75ND}{V} = \frac{0.75 \times 1475 \times 8}{60 \times 120.8} = 1.22.$$

Effective pitch angle  $\phi = 14.5$  deg.

Angle of attack = blade angle — effective pitch angle

$$\frac{K_y}{K_x} = 20.8 - 14.5 = 6.3.$$

From Fig. 3,  $e_s = 79\%$ .

$e = 0.79 \times 0.79 = 62.3\%$ . This is reduced by the spiral component of slip stream to 60 per cent.

$$\text{Output} = \frac{0.60 \times 1475 \times 170}{1600} = 94 \text{ hp.}$$

Before going further to determine the climbing rate let us obtain figures similar to the above for an adjustable pitch propeller. For this assume that

Speed = 1970 r.p.m. during climbing.

$$\text{Output} = \frac{1970 \times 170}{1600} = 209 \text{ hp.}$$

Efficiency = 55%.

Air speed = 65 m.p.h. = 95.4 f.p.s.

$$\text{Thrust} = \frac{0.55 \times 550 \times 209}{95.4} = 655 \text{ lb.}$$

$$v = \frac{665}{47 \times 95.4 \times 0.00238} = 62.5 \text{ f.p.s.}$$

$$\text{Slip} = \frac{62.5}{95.4} = 65.5\%.$$

$$e_1 = \frac{V}{V + \frac{v}{2}} = \frac{95.4}{126.7} = 75.3\%.$$

assuming  $\frac{K_y}{K_x} = 20$ ,

$$\frac{0.75ND}{V} = \frac{0.75 \times 1970 \times 8}{60 \times 126.7} = 1.55.$$

$e = 0.86 \times 0.753 = 64.7$  per cent, which is reduced by spiral component of slip stream to be 59 per cent.

Output =  $0.59 \times 209 = 123$  hp.

#### Comparison of Climbing Rates

Assume

Weight = 1400 lb.

Power required to fly at 65 m.p.h. = 35 hp.

*With the Fixed Pitch Propeller*

Excess power for climbing =  $94 - 35 = 59$  hp.

$$\text{Rate of climb is } \frac{59 \times 33,000}{1400} = 1390 \text{ f.p.m.}$$

*With Adjustable Pitch Propeller*

Excess power for climbing,  $123 - 35 = 88$  hp.

$$\text{Rate of climb is } \frac{88 \times 33,000}{1400} = 2070 \text{ f.p.m.}$$

Gain in rate of climb = 49%.

The increasing speed of engine during climbing will have the tendency to overspeed the power plant while climbing and to allow the speed to become normal in level flight. The desirability of this feature is still open to question.

#### Calculations of Efficiency During Climbing

The following calculations apply to an adjustable pitch propeller on a constant torque engine:

(1) At ground level:

$$\frac{\sigma}{g} = 0.00238 \quad A = 104 \text{ sq. ft.}$$

$V = 103$  f.p.s. Engine output, 445 hp. at 1700 r.p.m.  
Assume efficiency = 55%.

$$T = \frac{0.55 \times 445 \times 550}{103} = 1310 \text{ lb.}$$

$$v = \frac{1310}{0.00238 \times 104 \times 103} = 51.4 \text{ f.p.s.}$$

$$e_1 = \frac{V}{V + \frac{v}{2}} = \frac{103}{128.7} = 0.80.$$

$$\frac{ND}{V} = \frac{1700 \times 11.5 \times 0.75}{60 \times 138.6} = 1.764.$$

$$\frac{K_y}{K_x} = 16$$

then from Fig. 3,  $e_s = 0.720$ .

$e = 0.720 \times 0.80 = 0.576$ , which is reduced by the spiral component of the slip stream to be 53 per cent.

Output (useful) =  $445 \times 0.53 = 236$  hp.

(2) At 10,000 ft. altitude

$$\frac{\sigma}{g} = 0.00178 \quad A = 104 \text{ sq. ft.}$$

$V = 118.7$  f.p.s. See Fig. 15.

Output = 445 hp. at 1700 r.p.m.

Assume efficiency = 56%.

$$T = \frac{0.56 \times 445 \times 550}{118.7} = 1155 \text{ lb.}$$

$$v = \frac{1155}{0.00178 \times 104.7 \times 118.7} = 52.5 \text{ f.p.s.}$$

$$e_1 = \frac{V}{V + \frac{v}{2}} = \frac{118.7}{145} = 0.819$$

$$\frac{ND}{V} = \frac{1700 \times 11.5 \times 0.75}{60 \times 153.9} = 1.59$$

$$\frac{K_y}{K_x} = 16. \quad e_s \text{ (from Fig. 3)} = 0.74.$$

$e_1 = 0.819 \times 0.74 = 60.5$  per cent, which is reduced by spiral component of slip stream to be 57 per cent.

Output (useful) =  $445 \times 0.57 = 254$  hp.

(3) At 20,000 ft. altitude.

$$\frac{\rho}{g} = 0.00119. \quad A = 104 \text{ sq. ft.}$$

$V = 144$  f.p.s. See Fig. 15.

Output = 445 hp. at 1700 r.p.m.

Assume efficiency = 62%.

$$T = \frac{0.62 \times 445 \times 550}{144} = 1055 \text{ lb.}$$

$$v = \frac{1055}{0.00119 \times 104 \times 144} = 61.7 \text{ f.p.s.}$$

$$e_1 = \frac{V}{V + \frac{v}{2}} = \frac{144}{175} = 0.823.$$

$$\frac{ND}{V} = \frac{1700 \times 11.5 \times 0.75}{185 \times 60} = 1.32.$$

$$\frac{K_y}{K_x} = 16. \quad e_s \text{ (from Fig. 3)} = 0.74.$$

$e_1 = 0.79 \times 0.823 = 65$  per cent, which is reduced by spiral component of slip stream to 62 per cent.

Output (useful) =  $445 \times 0.62 = 276$  hp.

#### Engine with Constant Torque

Calculation of  $K_y$  necessary to maintain flight at different speeds and altitudes.

Table showing values of  $K_y$ .

$\rho/gK_vSV^2 = 3400$ .  $S = 420$ ,  
whence

$$K_v = \frac{8.1}{\frac{\rho}{g} \times V^2}$$

To obtain rate of climb, the thrust and the wing drag can be computed. The difference between thrust and wing drag at maximum speed will be the parasite resistance. The parasite resistance for other speeds can be figured from the ratio of the cube of the velocities, and the wing drag by the usual method. From the sum of these two the power required to fly can be computed and when this is subtracted from the useful power delivered the excess horsepower and consequently the rate of climb can be figured.

For 130 m.p.h., assume  $K_v = 0.0935$ .  $\frac{K_v}{K_s} = 12.3$ .

$$\text{Wing drag} = W \left/ \frac{L}{D} = \frac{3400}{12.3} = 276 \right.$$

Power delivered to plane =  $0.80 \times 356 = 285$  hp.

$$\text{Wing drag} = 276 \times \frac{191.5}{550} = 96 \text{ hp.}$$

Assuming engine speed of 1150 r.p.m. at the ground, in climbing at 70 m.p.h. the engine will give 293 hp. Assuming 58 per cent propeller efficiency, the thrust will be  $\frac{0.58 \times 293 \times 550}{103} = 911$  lb., and

$$v = \frac{911}{0.00237 \times 104 \times 103} = 35.8 \text{ f.p.s.}$$

$$e_1 = \frac{V}{V + \frac{v}{2}} = \frac{103}{120.9} = 0.853.$$

$$\frac{ND}{V} = \frac{1150 \times 11.5 \times 75}{60 \times 120.9} = 1.38.$$

Assuming a  $\frac{K_v}{K_s}$  of 13 for this condition, the aerofoil efficiency will be 60 per cent, and  
 $e = 0.67 \times 0.853 = 57\%$ .

The figures used in plotting the curves in Fig. 1 are:

$V$  = Velocity of plane, ft. per sec.

$v$  = Velocity of slip stream, ft. per sec. =  $0.15V$ .

$D$  = Diameter of propeller, ft.

$D_1$  = Equivalent propeller diameter =  $0.580D$ .

The following calculations are used only to compute the power absorbed:

$b$  = Max. blade width, ft.

$b_1$  = Weighted average blade width =  $0.75b$ .

$\rho/g$  = Air density = 0.00237.

$e$  = Efficiency of propeller.

$$T = \text{Thrust} = \frac{\text{Hp.} \times e \times 550}{V}$$

$$\rho/g \times K_v = 6.3 \times 10^{-4}.$$

$$\frac{K_s}{K_v} = 20 \text{ (assumed).}$$

$f$  = Factor for power absorbed by blade.  
Aspect ratio assumed as 6. Number of blades = 2.

Factor for blade shape  $\begin{cases} = C \\ = 0.95 \end{cases}$

Note that the blade form used is not the same as Fig. 2.

$$\text{Effective disk area } (A) = (D^2 - 0.05D^2) \frac{\pi}{4} = 0.95 \frac{\pi}{4} D^2.$$

$$v = \frac{T}{\beta/g \times A \times V}$$

$$0.95 \times \frac{\pi}{4} \times D^2 \times V \times v \times \beta/g = \frac{\text{Hp.} \times e \times 550}{V}$$

$$D = 1437.5 \sqrt{\frac{\text{Hp.} \times e}{V^3}}$$

The following are used only in the derivation of the chart in Fig. 1:

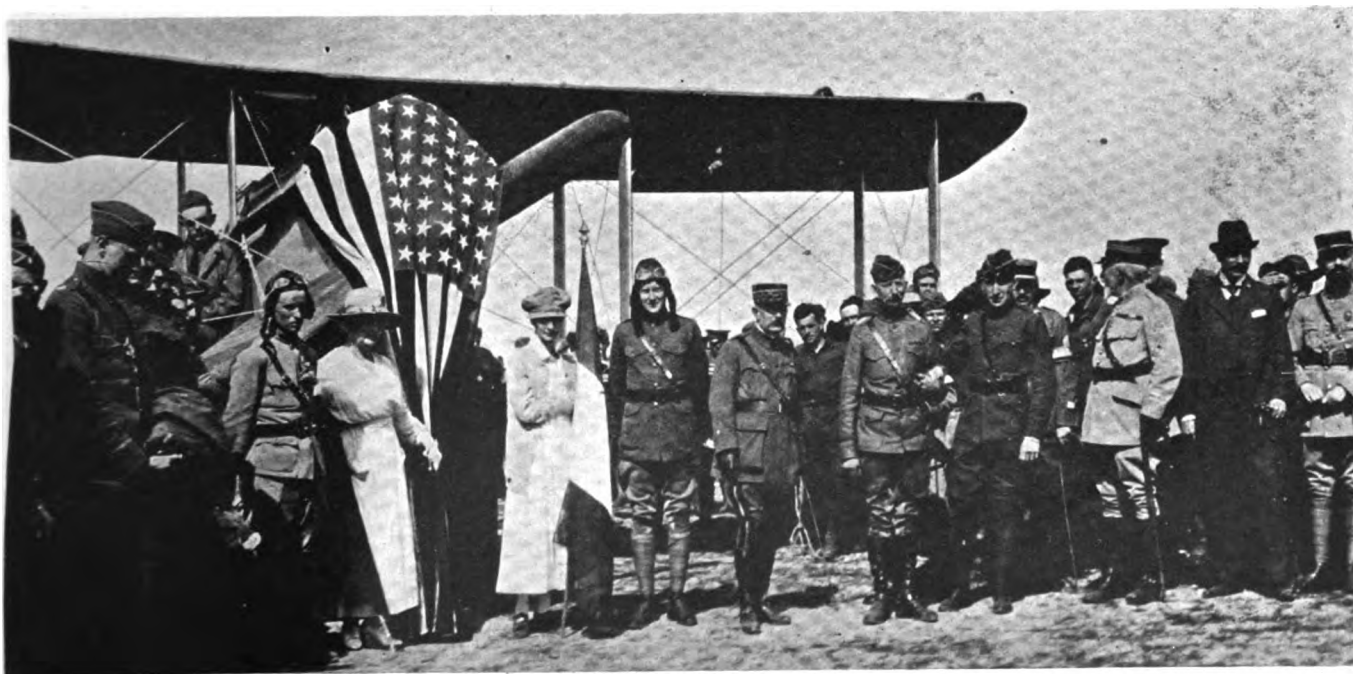
$$C \times 2 \times \rho/gK_v \times b_1 \times R \times V^3 \times f = \text{Hp.} \times 550.$$

$$f = \frac{8800 \text{ Hp.}}{\rho/gK_v \times D^3 V^3 \times C}$$

$$\cot \phi = \frac{2\pi R N}{V} \text{ (At any radius } R).$$

$$\frac{ND_1}{V} = \frac{\cot \phi}{\pi}$$

$$\text{R.P.M.} = \frac{32.9 V \cot \phi}{D}$$



The first flight of a Liberty plane in France. Representatives of the Allied countries and welfare workers were present at the christening before the flight

# Converting an Automobile Assembly Room for Shell Manufacturing

Use of 3-In. Pipe and Wooden Beams Solves Problem of Hanging Line Shafting in Sawtooth Assembly Room—How Car and Shell Making Run Parallel Through the Same Shop

**W**HILE the making of shell in a plant designed for the manufacture of automobiles calls for the solution of certain minor problems of equipment, it also develops the fact that in many ways the car-producing establishment is admirably fitted for this kind of work.

The government has found that the 155 millimeter trench mortar shell lends itself particularly well to the manufacturing facilities of automobile plants, and there are certain representative concerns which are rapidly getting into production on this kind of work.

The conversion from automobile manufacture to shell manufacture, however, calls for some radical changes in the equipment, and it is interesting to note how these changes may be made with the least possible expense and the greatest possible efficiency.

The progressive assembly floor of a manufacturing concern is the part of the shop generally turned over for this work. As a rule the requirements of progressive production call for a long and often narrow room, which also works out very well for shell manufacture.

The first principle which should be observed is that the shell manufacture should be divorced absolutely from that of automobile manufacture. The two departments

should be distinctively separate, and each should stand alone without dependence upon any units in the other departments.

The illustrations herewith depict the manner in which a long assembly floor in an automobile factory, with an output of about thirty cars per day, was divided so as to allow car manufacture to go on to a curtailed extent and at the same time provide an ideal layout for the manufacture of the 155-millimeter trench mortar shell.

The building, which is 750 ft. long and 40 ft. wide, was divided longitudinally approximately in the center by a wire fence which prevented passage between the two departments. This is clearly shown in the accompanying illustration, where car manufacture will be noted as proceeding on one side and shell manufacture on the other.

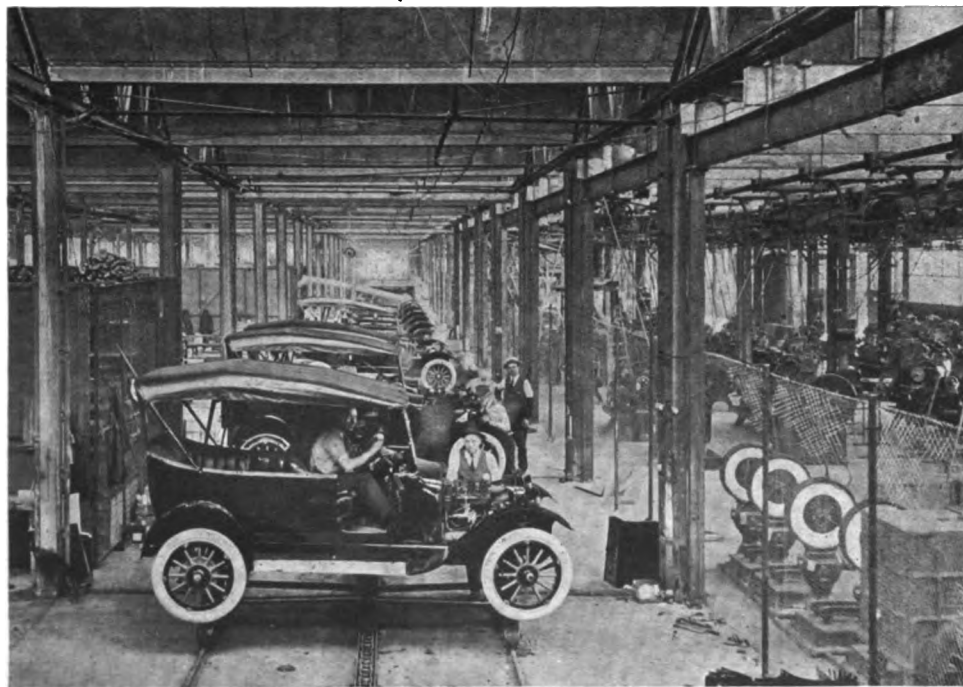
As no line shafting is to be found in the assembly department of an automobile plant, it was necessary to install the line shafting in a building which had not primarily been designed for it. The building itself is of structural steel type, being the modern sawtooth style.

It was necessary, therefore, when installing the line shafting, to increase the overhead supporting strength of the structure. This was done by means of the wooden beams which are clearly indicated in one of the photographs illustrating this article.

The line shafting supports were built up of 3-in. pipe, clamped over the wooden beams in such a way that they could be readily moved if necessary.

The castings supporting the line shaft bearings are supported from this pipe in a very satisfactory manner, giving an installation which is exceptionally flexible.

The electric motors for the shaft drive are also supported overhead from the I-beam, which forms a part of the permanent structure of the building. At the point where these motors are hung the additional live load is compensated for by the installation of an upright of wood placed be-



*On the automobile side of the wire fence the cars come along the assembly chain on one side. The shell making machinery is on the other side*





*Showing how the munition manufacturing plant was divided from the automobile manufacturing plant by the wire fence down the center of the building*



*The receiving end of the plant. At the left are the cylindrical forgings, which are the shell blanks. These are printed by the United States Government. At the right are frames ready to be taken down the assembly chains to the automobile department*

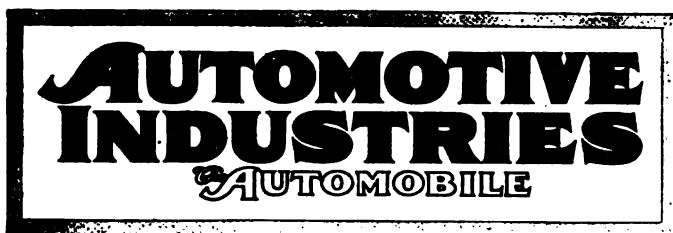
neath the I-beam. This upright not only supports the load of the electric motors, but also acts as additional support to take the stresses imparted by the line shafting.

With this arrangement, the shell manufacture and the motor car manufacture run parallel. The raw stock for both products starts from the same end of the building, one on one side and the other on the opposite side. An illustration which shows this is given in the accompanying view, in which the shell blanks can be seen piled up on one side and the frame stock for automobiles on the other side.



*Converting a loading platform into a bonded warehouse*





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## Aircraft Co-operation

FOR some months it has been a matter of wonder why those concerns engaged in the manufacture of Liberty aircraft engines should not have co-operated much more than they have, particularly when engine production has fallen more than 100 days behind the schedule and is continuing to fall behind. There is nothing that speeds up production like co-operation. We do not know of a single case where all of the factories engaged on the manufacture of Liberty engines and parts have been called together to discuss ways and means for stimulating production. There have been get-together meetings of the engineers, but not of the factory heads.

It was expected that when John D. Ryan took control, the sole reason or his taking it being that production must be speeded up, he would get all of the makers together and hold conferences on ways and means for accelerating production. So far, we know of no such conference having been held.

When Charles M. Schwab assumed control of pro-

duction for Emergency Ship Building Fleet he immediately got all of the ship builders working in his field together. It was not one conference but several. He was appointed to increase production and he set about on the co-operative basis to do it. Not only did he get the heads of the ship building yards together but he went further and talked co-operation with the workers. With Schwab there was only one avenue for increased production and that lay through greater co-operation, greater co-operation of worker with worker, greater co-operation of worker with employee and vice versa, and greater co-operation among the builders.

Cannot a chapter be taken from production in the Shipping Board and applied to advantage to our present aircraft situation?

Factories engaged in manufacturing aircraft engines should bear in mind that their individualities and local prejudices must not stand in the path of production as they might in peace days. These factories are a portion of our fighting army. Co-operation in all our army activities is the fundamental of success. Burying individual whims is innate in military training. The same must apply to our factories, which when engaged in this war work are not individual enterprises in the sense they were in peace days. In peace days a production delay was a factory expense but to-day that same delay is an international affair, a matter of world concern.

## Quenching Media

ONE of the arts that should be greatly advanced by activities in connection with the war is that of heat treatment of steel. Many of the parts entering into ordnance material require special heat treatment, and airplane engines also embody many hardened steel parts. The requirements of the automobile industry already have led to a great increase in the demand for heat-treating equipment and materials, and the conversion of automobile factories to shell manufacture and airplane engine manufacture will not check this growth. As a result of the increased demand for heat-treating equipment and material, considerable research work is being done along these lines at the present time. This was aptly illustrated by a paper on "Oils for Quenching" presented to the American Drop Forgers' Association by George Pressell. It appears from this paper that practically every known oil has been investigated as to its cooling properties and its permanency when used for quenching.

Many different qualities are required in steel for various purposes, and different quenching media are used to obtain different qualities. Water being a simple chemical compound, is not subject to chemical change at the high temperature to which the medium is raised by the red hot steel that is plunged into it. Oils, on the other hand, are of rather complex composition and when raised to a high temperature are subject to oxidation and chemical changes. Only certain constituents of the oil oxidize and precipitate out, and the remainder then

changes in its physical properties. As a rule it becomes more viscous and less capable of carrying off the heat from the steel quickly.

While viscosity is thus one of the qualities affecting the value of a quenching medium, another important factor is the temperature of vaporization. If this is too low a layer of bubbles will form around the object to be quenched and effectively insulate it against the cooling influence of the liquid.

The two classes of oil so far used most extensively for quenching are mineral oil and fish oil. Mineral oil of low flash point undergoes a chemical change when heated by the steel, becoming more viscous and therefore less effective as a quenching medium. Fish oil, on the other hand, is subject to rapid oxidation and whale oil is still more given to this trouble. The greatest stability is shown by a product of the distillation of wool grease. This oil possesses the further advantage of great fluidity and marked refrigerating properties. Price, of course, is an important consideration, and we can imagine that a product resulting from the distillation of wool grease is not particularly cheap, but the immunity from oxidation and chemical change warrant a higher price being paid for the oil, for not only does this chemical inertness permit of using the same oil for a very long time, but the results obtained in quenching are more uniform.

Wool grease itself is a product which until recently was allowed to go to waste. The discovery of new and important uses for this grease will serve to render the degreasing process more valuable and to extend its application. The science of by-products is a most interesting one and has never been cultivated so diligently as in these times of high prices and scarcity of materials.

## Clerical Work and Female Labor

THE announced intention of the newly organized Women in Industry division of the War Labor Policies Board to exert its influence to the end that women shall first replace men in clerical and other office positions with manufacturing establishments to the greatest possible extent before they are called upon to do the work of men in the shops seems like a logical course of action.

Women have done remarkable work in industrial pursuits and have shown that they are capable of doing much that it was formerly thought they could not do in the way of heavy labor. But it is not yet unquestionably established that they are really fitted physically to do continuously some of the kinds of work that they have done for a relatively short period of time.

There are, of course, some women who can do almost anything that a man can do and keep on doing it indefinitely. But that is not true of all women and is certainly not true of a class of women who have been prompted by one motive or another to seek employment in shop work. The class referred to is made up of those women who have not been accustomed in any way to the restraint of industrial employment or the physical exertion entailed by it. They are the women who will very

largely make up the addition to the ranks of labor which the sex will contribute. They should be placed first in positions where the work is of a kind that it has been demonstrated by long experience women can do efficiently and without bodily harm.

It is certainly not exercising good judgment to have men performing light work in the office of a manufacturing plant when women, unaccustomed to it, are doing heavy work in the shop. We should use the women on the light work first.

## A Convincing Short Haul Argument

THE compilation and publication of figures showing the relative tonnage carried by motor trucks over the highways between Akron and Cleveland, Ohio, and the three railroads running between the Sixth City and the center of tire-making, during the 9 months ending July 1, call attention once more in a most emphatic manner to the immense possibilities that lie in the development of short-haul motor truck routes for the relief of railroad congestion.

The road from Cleveland to Akron is 40 miles long and the service which motor trucks are rendering on it is equivalent to that which could be performed by the use of no less than 885 railroad cars each week. These 885 railway freight cars were, therefore, released for service in long-haul work or for service which is more directly vital to the winning of the war, and congestion at the terminals at both ends of the run was reduced to a proportionate extent.

During a recent week motor trucks carried a total of 3175 tons of freight over this one Ohio route, while the railroads paralleled it with a total carriage of but 4970 tons, which is almost an even break between the two systems of transportation.

But great as this relief is, it is by no means all that the motor trucks are doing in this case and the many others similar to it. The 3175 tons of freight carried over the entire route from one end to the other is but part of the freight carried over this road, some of it from terminals to intermediate points, some between intermediate points and some long-distance matter which went over the highways because it could be more expeditiously transported that way than by railroad. Such freight comprised new passenger cars on their way to take their places in the scheme of things economic and new motor trucks, many of which were headed for localities in which they will carry on and extend the kind of work which the Akron-Cleveland trucks are doing.

Much has been done toward showing the world how the motor truck can help, how our roads can and must be used as an organized part of the country's transportation system. Much still remains to be done, for the country as a whole and many of those who sit in high places do not even yet grasp the full extent of the possibilities. Widespread publicity given to what has been and is being accomplished on the Akron-Cleveland route and others like it will be most effective. To even the most dubious it should be convincing evidence.



# □ Latest News of the

## Order 75,000 of Four Truck Models

**Model TT, Four-Wheel-Drive, Adopted for Heavy Hauling—Ford for Light Work**

WASHINGTON, July 25—Seventy-five thousand trucks and passenger cars have been ordered to date. Four trucks, including the Class AA, A, B and TT, form the cargo truck program. The TT truck, of which official announcement of adoption was made to-day, is a four-wheel drive type designed by the Engineering Ordnance Department. Several models have been completed and tested. This truck was designed in reply to a request from General Pershing, who stated that the cars and trucks now used in France were not satisfactory. The TT truck is especially suitable for hauling large guns over rough country and has the ability of a tank to go over places generally considered impassable to other vehicles.

The Ford passenger chassis, following the request of the American Expeditionary Forces, has been adopted as a standard chassis for use in the army as a passenger car, light ambulance, light truck and so forth. There are now 3000 Ford ambulances in use in France, and this number will soon be increased to 8000. The Ford Motor Co. is working on an order for 5000 light delivery trucks, production of which began July 22 at the rate of 200 per day. The principal reasons for the wider use of the Ford are the ease of repairing, cheapness of operation, large production and the extremely low initial cost and the fact "that it can be used where many other passenger cars cannot."

The other two types of passenger cars tested and selected are the Dodge chassis and the Cadillac chassis. These are not new and are the regular models with certain additions and deductions. They will be produced in other factories if the needs of the government require it.

The AA truck, which is the GMC  $\frac{3}{4}$ -ton model, was decided upon because of its low gasoline consumption and its light weight. The principal change from the regular model is a superior spring development needed because this model is to be used not only for cargoes but as a heavy ambulance also. Seven thousand, five hundred of these trucks are being ordered from various factories.

The Class A truck, which is the White  $1\frac{1}{2}$ -ton truck with some changes, was selected after tests of many commercial trucks in all conditions of weather and load. It was adopted according to the Motor Transport Service because of lower gasoline and oil consumption, more

satisfactory performance both in Mexico and France, high speed work with pneumatic tires and the low cost of spare parts, the cost being approximately equal to the cost of the chassis complete. The Class A is to be used for staff observation, reconnaissance and as a high-speed truck.

One of the principal reasons for retaining the Class B model, originally known as the Liberty truck, says the Motor Transport Service, is its maintenance. Eighteen thousand of these trucks have been ordered. The cost of this truck is less than that of any other commercial trucks of the same capacity. The cost of the spare parts combined is identical with the cost of the chassis.

The Class B truck has given satisfactory service, a test of 15,000 miles, and was found to have greater strength, more power, more ability and to be better qualified on rough roads, an important factor, because this truck will operate in a zone of fire.

In rejecting many trucks under test the Motor Transport Service states that the rejections were in no way reflections on the commercial value of these vehicles. A majority of these were made for city work and consequently could not be expected to do exceptionally heavy rough work as required in France.

### Huge Airplane Program Expected

NEW YORK CITY, July 25—Occasional hints have been given regarding the airplane program for the next 12 months, and while nothing official or specific has been announced, the program gives promise of being an enormous one. Rumors of building 68,000 Liberty engines have been current. Of these 50,000 would go into airplane work and the remainder might find use in other fields. It is to be hoped that the production of planes will go over the 25,000 mark.

These figures may appear small in comparison with some of the pro-optimistic announcements of 14 months ago, when some people talked of 40,000 airplanes in a year, and others ventured to suggest possibilities of 100,000 in a year.

A program of 25,000 fighting planes is a very conservative one. Great Britain is producing more than 50 per cent above this total at the present time and has been doing so for some months. America's program should be 50,000 planes in the fiscal year, or more if possible.

### Moore is White New York Manager

CLEVELAND, July 23—William H. Moore, formerly manager of the White Co., Pittsburgh branch, has been appointed manager of the New York branch, to succeed R. H. Johnston, who was recently assigned to special executive work, with headquarters in Washington.

## Bristol Type Plane Abandoned

**Discontinued Manufacture Because It Is Tricky and Hard to Fly—Substitute Type**

WASHINGTON, D. C., July 25—The discontinuance of the Bristol fighting airplane which has been manufactured at the Curtiss Airplane Corp. in Buffalo, is apparently due to a variety of reasons. It was intended that the Bristol plane, which is an adaptation of a British fighting plane, would use a twelve-cylinder Liberty engine. This engine has too much power for the plane.

For a month there have been occasional rumors regarding the failure of this plane. It has been known that the plane is very hard to fly and might be classed as dangerous. The original British Bristol has been designated a tricky plane but in the adaptation of the plane in America these troubles were increased. The reason seems to be that the upper wing produces a strong down draft, which exerts a downward pressure on the elevator. The result is a tricky machine and one that is very hard to manage. While this characteristic is present in the British prototype it was not serious.

For a time it was thought this defect might be remedied and although 100 of such machines were in production 2 months ago, it was found impossible to make a satisfactory flying machine out of it.

It has been suggested that an eight-cylinder Liberty engine would be about the correct size for a plane such as the Bristol. A year ago when the Liberty engine program was outlined, the program included an eight-cylinder type using the same cylinders and valve mechanism as the twelve. This program was disturbed last fall when it was decided to produce only the Liberty twelve.

Within the last few months it has been decided, although not officially announced, to start the manufacture of the Liberty eight. This seems to be due to the fact that the Liberty twelve is too powerful for many of the planes. In this connection it is reported that the Liberty twelve is too powerful for the DH-4 plane in which it is at present being used, and it has been suggested that a Liberty eight would have sufficient power for this plane in many cases.

It is understood that a new type of combat plane resembling the British Spad and will be known as the S. E. 5 will be built. It is to be manufactured here for use in France. This probably will be equipped with a Hispano-Suiza engine.

# Automotive Industries

## British Standardize Planes to 5%

### Plan of S. A. E. to Further American Work Told at Dinner to Sir Henry Fowler

NEW YORK CITY, July 19—Sir Henry Fowler, representing the Royal Air Service of Great Britain in America, and also having in charge securing of materials for production of much of Great Britain's 3000-a-week airplane program, was given a testimonial dinner this evening by the Council of the Society of Automotive Engineers. The dinner was an informal affair which twenty attended. President Chas. F. Kettering, in presiding, told of the excellent co-operation between British aircraft engineers and American aircraft engineers in standardization work. This co-operation began with the international convention last January.

Sir Henry Fowler in referring to the possibility of greater standardization in airplanes, as well as in airplane engines, told of recent British experiments in which different engineers were asked to bring out a design that would meet certain war requirements. These engineers working along their individual lines produced machines that differed only in 5 per cent of their total. In other words, these machines were practically 95 per cent standardized. If it is possible to obtain machines that are 95 per cent standard by engineers working separately on the same assignment, it should not be difficult to obtain practically 100 per cent standardization with these engineers co-operating and working together on the same job.

The necessity for greater standardization in aircraft work was the dominating thought at the dinner. The S. A. E. has drafted a plan of aircraft standardization work which it believes could be satisfactorily worked out. This would bring together standardization work for the navy as well as the army. It would centralize this work in one person, together with a committee, which would bring about much quicker results than at present where a decentralized policy of standardization is resulting in chaos. The British policy of standardization is centralizing it in one person who has the authority to carry it out. This person has an organization of committees and sub-committees representing the various industries involved so that decisions are not arbitrary but the result of mature consideration.

#### Airplane Report After Aug. 1

WASHINGTON, July 24—Government control of all aircraft factories holding

Government contracts is likely to be recommended by the Senate Aircraft Investigating Committee in its report which will soon be made public. The Committee is still holding hearings and it is likely that the report will not be made public until after Aug. 1. Members of the Wright-Dayton Aircraft Co. were examined yesterday.

The Liberty engine, it is reported, will be highly praised by the Committee. Its weight and power have been found of great value. It is reported that contracts for 60,000 of these engines will be placed during the next few weeks for various types but principally the Liberty 8's to be used in American tanks. It is said that only the Liberty engine will be used hereafter in tank construction in this country.

Control of the aircraft factories will probably be recommended through a centralization of the several factories now holding contracts. It is said that the Committee will find the earlier criticisms of the Senate fully justified and will give credit to John D. Ryan for bringing the program up to what is now considered a fairly satisfactory condition. Some of the members of the Committee promise "sensations" in the report but refuse to make them public now.

#### Pierce to Bring Out New Model With Twenty-Four Valve Engine

BUFFALO, July 24—The Pierce-Arrow Motor Car Co. will begin deliveries on Sept. 1 of a new passenger car model equipped with a 6-cylinder engine having 24 valves, detachable cylinder heads and thermostatic control of the cooling system. There will also be certain other detail improvements in the chassis which, so far as dimensions go, will be similar to the smaller one of the two models now produced.

#### Deutsch Enters Signal Truck

DETROIT, July 23—S. Deutsch, formerly vice-president of the Clus Mfg. Co., Milwaukee, and sales engineer of the Stewart Mfg. Co., Chicago, has been elected vice-president and director of the Signal Motor Truck Co., Detroit. He will have charge of production and sales.

#### Oakland Goes Into Truck Manufacture

PONTIAC, MICH., July 23—Within 90 days the Oakland Motor Car Co. will have on the market a 1-ton truck. It will be of 130 in. wheelbase and have turning radius of 25 ft. to the left and 21 ft. to the right. It will be equipped with solid 34 x 3½ front tires, and 34 x 5 rear tires. No schedule of production has been determined.

## M. T. S. Spends 15% of All Money

### Motor Transport Service Completes Organization—Branches in Four Cities

WASHINGTON, July 23—Fifteen per cent of the United States Army averages of personnel, expenditures, service and equipment, it is reported, is in the hands of the Motor Transport Service, which displays that division's great importance and emphasizes the value of the internal combustion engine in this war.

The Motor Transport Service, headed by Col. Fred Glover, and created a few months ago, as announced in AUTOMOTIVE INDUSTRIES, is just completing its organization as shown in the chart herewith. The various appointments as made from time to time have been announced previously. The latest include the creation of four branch offices in New York, Cleveland, Detroit and Chicago which will have charge of production and inspection for their respective districts. Capt. John Devore is in charge of the Cleveland district, Major Wilcox of the Ordnance Department, the Detroit district; Captain Jaco of the Engineer Corps, the New York district and Major Edgerton of the Quartermaster Department, the Chicago district.

More than 6000 of the class B, 3-ton standard Army trucks have been delivered. (Continued on page 168)

#### To Examine Kenly in Aircraft Hearing

WASHINGTON, July 22—The examination of Major General William L. Kenly, Chief of the Department of Military Aeronautics, Saturday is expected to conclude the hearings of the Senate Military Sub-Committee investigating aircraft production. The committee will probably draft a report within the next week. It is expected that the report will not touch upon the alleged extravagances and mishandling of Government money, that phase of the situation being entirely in the hands of the Department of Justice and Charles E. Hughes, President Wilson's special investigator.

General Kenly's testimony was not made public, but it may be said it was chiefly a discussion of remedies for conditions found by the committee.

#### Olds to Manufacture Trucks

LANSING, July 23—The Olds Motor Works is planning to bring out a ¾-ton truck in the near future. It is stated that the output will be 8000 trucks for the coming year.

# The Government's Labor Program

Plans Completed for Federal Recruiting and Distribution of Nation's Labor Supply—Unskilled Shortage Now 500,000 and Soon Will Be More Than 2,000,000

WASHINGTON, July 20—The war industries are at present short 500,000 unskilled workers and coming needs are for between 2,000,000 and 3,000,000 more, according to Nathan A. Smyth, Assistant Director General of the United States Employment Service in charge of its unskilled labor section, who addressed leaders of industry management and labor here to-day. The conference comprised industry management and labor authorities from 28 states east of the Mississippi River, who were here to learn the details of the Government's war labor recruiting program, and who will form the community labor boards which will enforce the new labor regulations in the various localities.

It is also said that the demand for skilled workers exceeds the immediate available supply and before long will require the taking over of every tool maker and dye sinker for war work.

On the other hand, several speakers, including employment managers of large corporations on war work, told how the United States Employment Service efficiently has supplied their labor needs. One example was that of the American National Corp. at Hog Island, for which the Employment Service secured 30,000 men.

The complete program for supplying war labor was outlined. The need for a program was attributed to the growing inability of war industries to secure required labor resulting from:

## Causes of Labor Shortage

Decreased labor supply due to cessation of immigration since 1914.

Competitive recruiting for labor.

Restlessness of labor.

Stripping of war industries through reckless labor recruiting.

Hoarding of labor supply by individual states.

The program will be enforced promptly by the co-operation of every patriotic citizen; ultimately by the full force of every Government department.

The principles of the plan are based on the fact that:

In time of war all labor resources constitute a common supply for the benefit of war industries.

Industries not directly connected with the war should contribute equitable shares of their labor to important war needs.

Equitable distribution of non-war workers can be secured only through central agencies, directed by President Wilson, to have sole direction of all recruiting of civilian workers in war work.

Recruiting of labor must be solely conducted so as not to take men from war work, railroads or farms.

Movements of labor should be made and placed as near as possible to the demand.

Competitive increase in wages should be

prohibited and war wages stabilized so far as possible.

The new program will be carried out by the recruiting and distribution of labor through the United States Employment Service of the Department of Labor. Paid officers of the service and agents of the Public Service Reserve, the recruiting branch of the service, whose agents are largely volunteers, will conduct recruiting.

## Recruiting and Distribution Plans

Distribution of labor will be controlled by the Employment Service.

Local community boards comprising representatives of employers and the service will assist recruiting and distribution.

Control of private and prevention of competitive recruiting will be accomplished by the United States Employment Service backed by the power of other Governmental departments.

It is expected that these agencies will:

Eliminate competitive recruiting promptly.  
Standardize wages as soon as the War Labor Policies Board announces a wage scale.

Operate successfully through the 500 branches of the United States Employment Service.

The program applying to the recruiting of unskilled labor will be effective Aug. 1. It will handle unskilled labor first because the shortage is more acute, but will shortly take over all war labor problems.

The program will be extended to cover "hiring at the gate" when it is sufficiently organized, and will take over non-war work labor in case competitive recruiting by non-war employers proves injurious to war industries.

In the meantime employers are permitted to do their own recruiting of skilled labor but after Aug. 1 must not:

Offer superior inducements to men already employed in war work.

Advertise unless authorized by the Employment Service.

Arrange to advance pay for transportation of labor except with the consent of the United States Employment Service.

Employers not engaged in war work may recruit labor themselves but must not:

Offer superior inducements to workers in war work.

Advertise for labor without the consent of the Employment Service.

## Women Not Included

The new recruiting program for the present does not cover the recruiting of women workers.

It includes only at this time plants whose maximum force exceeds 100 men. Labor may be recruited privately for

railroads and farms. War work is taken to mean the manufacture of any product or erection of any structure directly or indirectly connected with the war.

Coal mining is not wholly war work.

Railroads and farms are engaged in war work to the extent that they are to be protected from recruiting by other industries.

An employer engaged only partially in war work is prohibited from recruiting labor himself for his war work to the same extent as if he were engaged wholly in war work. He will receive the benefits of the Government's recruiting program in getting labor for his war work. He will be expected to contribute from his non-war organization for war work purposes. He will have the same rights for securing labor for non-war work as employers engaged wholly in non-war work.

Unskilled labor is defined as meaning common labor.

A card system may be devised later by the Employment Service, but none is contemplated for the present.

An organization of 100 workers means an organization where 100 males, exclusive of clerical and administrative force, is employed.

Employers can establish the fact that they are doing war work by submitting the facts to the state director of the United States Employment Service of their state.

## No Restriction of Choice

Employers will not be restricted in their choice of the men recruited for them. They can exercise the right of choice either at the plants or at the points where the labor is recruited. Employers can hire men who come unsolicited, but this is not considered advisable by the Service. Employers partially engaged in war work will be allowed to use only labor sent by the Service in private work under permit.

The state directors of employment are to be referred to in all doubtful labor cases. Appeal can be taken from them to the director general of Employment Service at Washington, who in serious cases will secure a decision from the War Labor Policies Board. Workers are not under compulsion to get into war work except from a sense of duty, and are free to take any job offered by the Service they may prefer. They can secure work in any way, by their own solicitation or through the Employment Service, but it is urged that they use the Service. Workers will be told conditions of employment and terms as far as possible before they are enlisted for the work. They do not have to accept the position if transported under Government auspices if they do not want to, but must refund the transportation costs.

There is no limitation to the length of time a worker must stay at the position secured for him by the Service. He may change his job whenever he desires. There will be no form of black list created. Transportation will be paid to the point of employment or advanced and deducted from wages. This will be later uniformly established by the War Labor



**Policies Board.** Wages will not be paid during the time of going to the job. Cost of feeding workers en route will be made a part of the transportation.

Demands for unskilled labor will be ascertained by blanks distributed to all employers through the various Government departments. All employers should have received such blanks before July 20. If not received they should apply to the state director of the Employment Service.

Unskilled labor will be divided into quotas to prevent any state or community from being drained unfairly. The quotas will be determined by the United States Employment Service, according to estimates secured from each state showing the extent to which workers have already been sent to war industry and what unskilled labor still remains in non-war industry. The quotas will be distributed on the basis of the male population in the respective states corrected by the estimates of changed conditions due to the war and according to the extent of the population in agricultural work. Quotas will be announced as soon as all data are received.

It is expected that all employers in non-war work will take back the workers recruited for war work when they are no longer required in the latter industry.

Local labor supplies will be issued so far as adequate to meet local demands. Where the supply is not sufficient it will be distributed primarily among employers requiring similar numbers, assigning to the employers who need larger numbers of men those brought from other states.

#### Will Advance Transportation

The United States Employment Service will transport the workers out of its funds and collect this cost from concerns benefited. Movements of men for any considerable distance will be considered only in parties escorted by officers of the Employment Service. They will be examined by experts, physically and mentally, as to qualifications before being transported.

Employers requiring war workers should fill in the blanks received from the Service and all additional blanks weekly as demand for workers require. Employers engaged in non-war work can secure assistance from the Service if they desire it, but may recruit workers separately from the Service provided they do not offer superior inducements.

Individual workers desiring war work should register with the nearest branch office of the United States Employment Service or with the local agent of the public service reserve. Individual workers are warned not to leave non-war jobs before the Service secures war work for them.

A non-essential industry is any industry not engaged in war work directly or indirectly.

#### Packard Leases Adjoining Plant

**DETROIT, July 23**—The Packard Motor Car Co. has leased for 3 years the plant formerly occupied by the National Body & Trimming Co.

## Industrial Condition Reports

### Score of Regional Representatives Will Collect Data on Sources of Supplies

**WASHINGTON, July 22.**—For the purpose of keeping the Government advised concerning sources of supplies and industrial conditions in all parts of the nation, twenty regions have been created with regional representatives. National conditions in providing new resources, conversion possibilities, direct contact between the War Industries Board and business, and uniform methods will be handled by these representatives. They have been appointed as follows:

Region No.	Headquarters	Representative
1.	Boston	Stuart W. Webb
2.	Bridgeport	D. B. Pierce, Jr.
3.	New York	Wm. F. Morgan
4.	Philadelphia	Ernest T. Trigg
5.	Pittsburgh	George S. Oliver
6.	Rochester	Esten A. Fletcher
7.	Cleveland	Wm. B. McAllister
8.	Detroit	A. H. Templeton
9.	Chicago	D. E. Felt
10.	Cincinnati	Edwin C. Gibbs
11.	Baltimore	
12.	Atlanta	
13.	Birmingham	T. H. Aldrich
14.	Kansas City	F. D. Crabbs
15.	St. Louis	Jackson Johnson
16.	St. Paul	
17.	Milwaukee	August H. Vogel
18.	Dallas	Louis Lipsitz
19.	San Francisco	Frederick J. Koster
20.	Seattle	

To illustrate the conversion possibilities the War Industries Board points out that a former Pennsylvania linoleum factory is now making 4.7-in. shells, a Duluth horseshoe manufacturer is turning out trench picks, a Milwaukee rowboat motor maker is manufacturing hand grenades and trench pumps, a Detroit stove company is producing bombs and anchor parts, and a New York shirt-waist manufacturer is making signal flags.

The regional organizations will be under the supervision of Charles A. Otis Chief of the Resources and Conversion Section of the War Industries Board.

#### Plans Tractor Courses for Owners

**CHAMPAIGN, ILL., July 23**—The Department of Farm Mechanics of the State University of Illinois is arranging a series of 2-week tractor courses which will run from Oct. 15, 1918, to March 17, 1919. The attendance will be limited to 50 pupils for each course, recruited from tractor owners and automotive dealers.

Eight hours of each week day will be devoted to the study of tractors and tractor equipment. The time will be divided between two lectures and six hours of laboratory practice.

#### Metzger Heads Truck Committee

**LANSING, MICH., July 20.**—William E. Metzger of Detroit has been elected chairman of the Committee on Motor Truck Highways and Express Routes appointed by Governor Sleeper to further

the plan of motor truck expresses in this State. Fred Z. Pantlind of Grand Rapids was chosen vice-chairman and Burt Wickham, assistant secretary of the War Preparedness Board, secretary. Arrangements for a complete census of the possible routes in the State, through the various Chambers of Commerce, Boards of Trade and other civic organizations, will be started at once. Resolutions were also adopted asking a change in the State constitution so that regular rates can be made for the various routes, thus controlling them as common carriers under the railroad act.

#### M.A.M.A. Would Support Airplane Show

**NEW YORK, July 20.**—At the quarterly board meeting of the Motor and Accessory Manufacturers Assn. it was decided that this body will support an airplane show if such is permitted to be held by the War Department. The show committee of the association was instructed to make its usual contracts with the National Automobile Chamber of Commerce covering both the New York and Chicago shows.

E. W. Beach has resigned as a member of the executive committee because of his affiliation with the Bureau of Aircraft Production in Washington but will remain a member of the Board of Directors. His place on the executive committee will be taken by William M. Sweet.

One new member, the Sewell Cushion Wheel Co., Detroit, was elected to membership.

#### Working Hours and Industrial Efficiency

In the article on pages 89 to 91 inclusive of the July 18th issue of AUTOMOTIVE INDUSTRIES which dealt with the effect of long working hours on industrial efficiency, the diagrammatical illustrations for cases one and two were transposed accidentally with those for cases three and four respectively.

#### Ajax to Move Executive Offices

**NEW YORK, July 23**—The Ajax Rubber Co., Inc., has taken over the four-story building in West Fifty-seventh Street owned by the American Society of Civil Engineers. This will be altered considerably and used as the company's executive and general offices. The Ajax organization will move from 1796 Broadway to this building on Dec. 1.

#### To Study Hazards to Women in Industry

**WASHINGTON, July 22**—A committee has been appointed to investigate the special hazards to women in war industry. It will visit various centers where women are at work on war contracts and make investigation. The first trip will be to Niagara Falls, N. Y., to study the women's work in mechanical industries. The committee includes Lt. Col. Mock of the Surgeon General's office, Chairman, Capt. A. D. Reiley, Ordnance Department, Dr. Alice Hamilton, Department of Labor, and others from various governmental departments.

## Women Are Efficient in Metal Trades

National Industrial Board Report Shows Them Especially Valuable in Repetitive Work

BOSTON, July 23—The National Industrial Conference Board has just issued a report concerning the employment of women in the metal trades which summarizes data obtained from 131 metal working establishments employing a total of 335,015 men and 49,823 women. The main conclusion of the report is that the employment of women, in this branch of industry, has met with a high degree of success. In the plants from which data were received, women were for the most part employed on the lighter classes of work while men did the heavier work and that which required a high degree of skill. As has been evidenced almost everywhere that investigations have been made regarding the use of women in industries, they have been found most valuable on work of a repetitive character and on this kind of work, the report indicates, they were found to do better work and to turn out more of it than men. They are also given credit in the report for taking better care of their tools and being more steady and dependable. The opinions of most of those who furnished the Conference Board with information seemed to agree that the best methods of training women for metal work is provided by the vestibule school or by special classes at the factory where they are to work.

The principle of equal pay for equal work has been rather generally accepted among the manufacturers who reported. That women learn more quickly than men, especially the type of men that are now available, was pretty generally agreed to by the employers making returns. They are also considered to have a more wholesome attitude toward their work. In only eight plants was woman regarded as the inferior in this particular.

The report shows that in sixty-four establishments of the ninety-seven furnishing specific information on the relative output of men and women, and where men and women were employed on the same processes, the output of women was equal to, and frequently greater than, that of men. In only fifteen establishments was the output of women less than that of men on all operations on which both were employed. In the remaining eighteen their production, although less in some operations, equaled or exceeded that of men in others.

"A highly favorable account of the efficiency of women," says the report, "comes from an automobile plant where they are employed in twenty-three departments on assembling and inspecting materials and on many types of machine work. In this case the comparative output of women on identical processes was almost invariably greater than that of



*New collar insignia of the Air Division  
of the Signal Corps*

men, and in some cases quite disproportionately so. This establishment reported an instance where a woman employed on a nut tapping machine turned out at the end of her first week about double the output of the man working next to her. After endeavoring to equal her speed for a few days the man quit and was replaced by another woman, who is now very nearly the equal of the first.

"Whether technical training would make women the equal of men in work of higher character cannot be determined from available experience. It is noted, however, that there are certain operations which no employer reports as being performed as well by women as by men—for instance, lapping and brazing, both of which require considerable skill. Again women have not proved themselves the equal of men in such comparatively heavy work as chipping castings and machine filing.

"The permanence of women's position in the metal trades will depend in part on the attitude and economic strength of male workers after the war. Surprisingly little opposition to the introduction of women has thus far been encountered from men—possibly because of the relatively small number of women thus far employed or because the urgency of the step was recognized. Whatever the ultimate experience may be, the ability of women to perform a large variety of operations in the metal trades has been convincingly demonstrated."

### Curtiss Subsidiary in Atlantic City

ATLANTIC CITY, N. J., July 23—The Curtiss Flying Machine Co., a subsidiary of the Curtiss Aeroplane & Motor Corp., Buffalo, will establish an aircraft plant on the Inlet, where about 100 men will be employed. The company has received a contract from the Navy Department for seaplane parts.

### Gasoline Up One-Half Cent a Gallon

NEW YORK, July 20—The price of gasoline has been advanced one-half a cent a gallon in New York City and environs. The Standard Oil Co. has sent out notices to all its customers to the effect that beginning to-day the wholesale price is to be 24½ cents a gallon. The Gulf Refining Co. and the Texas Co. have both made a similar increase. The Tidewater Oil Co., which has refineries in New Jersey, has not yet advanced the price of gasoline, though an increase is looked for by dealers.

## Makers Constantly Change Plans

Manufacturers Unable To Tell  
What Will Happen Next—  
Conditions Unsettled

DETROIT, July 23—There has never been a time when it was more difficult for manufacturers to guess what will happen. Passenger car makers cannot plan for more than a week ahead. Frequently plans must be changed the next day and rearrangements are almost constantly being made due to the unsettled condition of the steel situation.

Already the majority of car manufacturers are below 33 1/3 per cent of their normal output and rapidly nearing the 25 per cent line. A number of them have reached a production equal to 25 per cent of their normal capacity.

The present coal scare is considered by some manufacturers as good propaganda as it has had its effect in frightening many into supplying themselves with fuel, and that otherwise they would have been lax in doing so. Never in the history of Detroit has so much coal been stored. This has taken many manufacturers out of the market and makes more fuel available for other purposes later.

### To Investigate Eastern Aircraft Plants

WASHINGTON, July 23—Attorney-General Gregory, William Frierson and Charles E. Hughes, who have been investigating aircraft production at Dayton, will return to Washington shortly. The next investigation will be at eastern aircraft factories, to be made within the next few weeks.

### A. A. A. Sanctions Chicago Speedway

CHICAGO, July 23—The Speedway Race to be held next Sunday, which will be sanctioned by the A. A. A., is to be a Class E, non-stop, special invitation, 5-cornered match race. There will be 4 heats, the distances of which have not yet been determined. The contestants are Ralph De Palma, Ralph Mulford, Louis Chevrolet, Arthur Duray and Dario Resta. The management has posted \$15,000 and each driver will post \$2,000. The total will be divided according to the points of each driver, dependent on his position at the finish.

### Dart Adds to Personnel

WATERLOO, IOWA, July 23—The Dart Truck & Tractor Corp. has made several additions to its forces. M. D. Millner has been added to the purchasing department. Frank Wermes has been appointed superintendent and production manager. The sales department has been increased by the addition of F. W. Kleist, formerly western manager of the Sheldon Axle Co.; John R. Williams, formerly assistant sales manager of the Velie Motors Corp., and Dwight L. Mink.

## Chicago Exposition Draws 90

### Makers Sign Up for Automotive and Accessories Exhibit on Municipal Pier

CHICAGO, July 23—Ninety exhibits have been secured thus far for the Automotive and Accessories Exposition which is to be held Sept. 14-21 on the Municipal Pier. The list follows:

S K F Ball Bearing Co. .... Hartford  
Hoosier Auto Parts Co. .... Muncie, Ind.  
A. F. and B. Specialty Co. .... Milwaukee  
Milwaukee Forge Machinery Co. .... Milwaukee  
Higgins Spring & Axle Co. .... Racine, Wis.  
Arrow Grip M. Co. .... Glenn Falls, N. Y.  
Clark Publishing Co. .... Madison, Wis.  
Indiana Mfg. Co. .... Indianapolis  
Carborundum Co. .... Niagara Falls, N. Y.  
Fordowner ..... Milwaukee  
Motor Vehicle Publishing Co. .... New York  
Essankay Products Co. .... Chicago  
U. S. Shaw Co. .... Chicago  
System on the Farm. .... Chicago  
Twin City Varnish Co. .... St. Paul  
H. G. Paro Co. .... Chicago  
Ekern Bros. Mfg. Co. .... Flandreau, S. D.  
Automotive Accessories Co. .... Baltimore  
Perfex Radiator Co. .... Racine, Wis.  
New Lite Lens Co. .... Chicago  
U. S. Auto Supply Co. .... Chicago  
Brown and Caine, Inc. .... Chicago  
Metal Specialties Mfg. Co. .... Chicago  
Geo. D. Bailey Co. .... Chicago  
Jefferson Electric Mfg. Co. .... Chicago  
Atlas Specialty Mfg. Co. .... Chicago  
The Reliance Co. .... Chicago  
Harry Newman ..... Chicago  
Advance Accessories Corp. .... Chicago  
Bailey Non-Stall Differential Corp. .... Chicago  
Milwaukee Auto Engine & Supply Co. .... Milwaukee  
The Zinke Co. .... Chicago  
Shurnuff Mfg. Co. .... St. Louis  
Romort Mfg. Co. .... Oakfield, Wis.  
Champ Spring Co. .... St. Louis  
Standard Underground Cable Co. .... Pittsburgh  
Metal Ware Corp. .... Chicago  
Burgess Mfg. Co. .... St. Joseph, Mich.  
Blake Mfg. Co. .... South Bend, Ind.  
Challoner Co. .... Oshkosh, Wis.  
Cooper Auto Specialty Co. .... Thomasville, Ga.  
Motor Car Equipment Co. .... New York  
The Duplex Engine Governor Co. .... Brooklyn  
Van Cleef Bros. .... Chicago  
Edelman & Co. .... Chicago  
Cummings Foster Corp. .... Chicago  
Perry Auto Lock. .... Chicago  
Defender Auto Lock. .... Detroit  
McIntyre Mfg. Co. .... Chicago  
The Dayton Wire Wheel Co. .... Dayton  
W. D. Sullivan. .... Chicago  
Dole Valve Co. .... Chicago  
Empire Auto Specialty Co. .... Chicago  
Koupet Auto Top Co. .... Belleville, Ill.  
Heinselman Bros. Co. .... Belleville, Ill.  
Presto Cloth Mfg. Co. .... Toledo  
Wood Hydraulic Hoist Body Co. .... Chicago  
A. A. Lawder Sons Co. .... Chicago  
The Wyman Sales Co. .... Chicago  
Baiso Oil Co. .... Toledo  
Baiso Oil Co. .... Council Bluffs, Iowa  
Agrimator ..... Chicago  
Falls Motor Corp. .... Sheboygan Falls, Wis.  
Buller Coupler Sales Co. .... Madison, Wis.  
Orange Judd Co. .... Chicago  
White Star Refining Co. .... Detroit  
American Manganese Steel Co. .... Chicago  
La Crosse Tractor Co. .... La Crosse, Wis.  
Hooven Radiator Co. .... Chicago  
Electric Steel Truss Wheel Co. .... Chicago  
Guaranteed Tractor Corp. .... Chicago  
Sumter Division, Splittorf Electrical Co. .... Chicago  
Commercial Truckmobile Co. .... Chicago  
One Wheel Truck Co. .... St. Louis  
Winther Motor Truck Co. .... Winthrop Harbor, Ill.  
Traffic Motor Truck Corp. .... St. Louis  
Hudford Co. .... Chicago  
Mechanical Belt Co. .... St. Joseph, Mo.  
K & D Lamp Co. .... Cincinnati  
New Era Specialty Co. .... Grand Rapids, Mich.  
Eclipse Valve Grinder Co. .... Kansas City  
Link Belt Co. .... Chicago  
Harding & Co. .... Chicago  
Anderson Electric Specialty Co. .... Chicago  
Atlas Auto Supply Co. .... Chicago  
N. A. Petry Company. .... Philadelphia  
Reflex Ignition Co. .... Cleveland  
Nilson Tractor Co. .... Minneapolis  
Forschler Motor Truck Mfg. Co. .... New Orleans  
Gray-Heath Co. .... Chicago

The products of the following companies will be exhibited in the Gray-Heath Co. section:

L. P. Halladay Co. .... Streator, Ill.  
New York Coil Co. .... New York  
A. C. Savidge Co. .... Indianapolis  
Cuno Engineering Corp. .... Meriden, Conn.  
Cole Gasoline Gauge Co. .... Chicago  
Wright Roller Bearing Co. .... Philadelphia  
Newton Horn Co. .... Brooklyn  
"X" Laboratories ..... Boston  
Hudson Motor Specialty Co. .... Philadelphia  
James P. Neerup Co. .... Chicago  
F. W. Oettinger Co. .... New York  
Lockfast Tire Carrier Co. .... Cleveland  
Standard Speedometer Co. .... Boston  
General Appliance Co. .... Boston  
Hansen Mfg. Co. .... Cleveland  
Gibraltar Jack Co. .... New York  
Halsted Mfg. Co. .... New York  
Bell Mfg. Co. .... Detroit  
Continental Piston Ring Co. .... Memphis  
A. E. White Machine Works. Eau Claire, Wis.  
Harris & Reed Co. .... Chicago  
Barcolo Mfg. Co. .... Buffalo  
Friden Mfg. Co. .... San Diego, Cal.

### Charge Unfair Competition Methods

WASHINGTON, July 22—The Goodyear Tire & Rubber Co. is charged with unfair methods of competition by the Federal Trade Commission. The company has been notified to appear at a hearing here Sept. 3. The complaint charges the Goodyear company of unfair methods by seeking special agreements with retail dealers to maintain standard resale prices on its tires, inner tubes and accessories. The company is further charged with an attempt to mislead the public in its nation-wide advertising of Goodyear service stations, these stations being, it is alleged, independent of the Goodyear company and maintained by dealers and dependent upon them. The service, it is declared, is furnished by dealers regardless of the makes of tires used by their customers.

It is charged that an arbitrary control over the business of dealers is maintained by threats of price discrimination which forces dealers to maintain excessive stock supplies of Goodyear products, to maintain standard prices for these, to report "underselling" by other dealers, and to specify Goodyear equipment on passenger cars, motor trucks and motor cycles which the dealers may handle.

It is further alleged that the company sells tires at dealers' prices direct to large truck users on condition that a fixed percentage, usually 90 per cent, of a company's monthly requirements be filled with Goodyear tires and supplies. Competing tire makers, it is set forth in the complaint, are injured in their business by these "unfair" practices, as are the dealers and the public.

The Goodyear attorneys and managers in New York state that an excellent defense exists against the charges and that many of the items mentioned in the complaint are quite common in merchandising generally.

### Crowther Plant Sold

ROCHESTER, July 23—The plant of the defunct Crowther Motor Car Co. has been sold to a Buffalo tire manufacturing concern. The new firm, which has been incorporated under the name of the Rochester Tire Corp., will begin work at once. The building is of the single-story type, 150 x 200, and has about 30,000 sq. ft. of floorspace.

## British Aviators to Fly Over West

### Brig.-General Lee To Head Demonstration Flight Over 16 Mid-West Cities

WASHINGTON, July 23—Brig. General Charles F. Lee, commanding the British Aviation Mission in this country, will make an airplane tour of the middle western states, assisted by Captains J. J. Hammond, James Fitz Morris, W. A. Hannay and G. E. Hunter. The tour will be a practical demonstration of aerial fighting. All of the officers engaged are distinguished members of the Royal Air Forces and have seen active service. They will start from Indianapolis on or about Aug. 14, and stop at 16 of the principal mid-western cities, making total air flights of 2500 miles. They will show the various air "stunts" and will point out in public talks the necessity for teaching advanced flying to our aviators.

Airplanes used will include a De Havilland fighting machine, a Bristol fighter and 2 British Avro training planes. It is also possible that some Sopwith Camels and S. E. 5's will be available as these are expected from abroad, and will be used if they arrive in time.

The itinerary will include air flights by at least 3 machines between Indianapolis, Cincinnati, Dayton, Columbus, Cleveland, Buffalo, Detroit, Toledo, Chicago, Milwaukee, Minneapolis, St. Paul, Des Moines, Omaha, Kansas City and St. Louis, probably in the order mentioned. Flights will be made over cities, the fliers going through aerial battle tactics and all the air antics known. The tour will extend through August and end early in September. Captain G. D. Hunter, R. A. F., has gone to Indianapolis to start a trip around the proposed circuit, making arrangements and selecting landing sites.

### Automotive Corp. to Make Royal Tractor

LOUISVILLE, KY., July 23—The Automotive Corp. has taken over the manufacture of the Royal tractor, and will start active production immediately at Napoleon, Ohio.

The Automotive organization, which recently purchased the assets of the Sun Motor Car Co., Elkhart, Ind., was organized in Delaware. The officers are: President, George G. King; vice-president, Robert Crawford, formerly president of the Sun Motor Car Co.; secretary and treasurer, William Hulin, formerly secretary and assistant treasurer of the Pan-American Motors Corp. C. W. Babcock, formerly associated with the Kelly-Springfield company, has been appointed manager of the truck department.

The Royal tractor has two wheels and is driven by means of a pair of lines in the same manner that a team of horses is driven. Kerosene is used for fuel, and the speed varies from 1½ to 8 m.p.h. The tractor will pull 14 plows and can be used with all present farm implements without any change.



## To Take Over Detroit Return Load Work

Transportation Association Has Been Formed to Sell Highway Haulage at Fixed Rates

DETROIT, July 22.—Selling highway transportation to shippers and consignees by the employment of highly trained investigators and the establishment of fixed rates for highway haulage between Detroit and points within a radius of 180 miles, are the outstanding objects of the Detroit Transportation Assn., which is being formed here by John F. Myers, formerly of the firm of Houghton & Myers, Inc., distributors of Stegeman trucks in the Detroit territory. This association may eventually prove to be the solution of the Return Loads Bureau idea as a permanent institution for the reason that it is attacking the problem of highway transportation where most of the Return Loads Bureaus have failed, viz., in selling highway transportation to the shipper of goods and to the consignee.

The membership of the new association will be made up of individuals and companies having either motor trucks or horse wagons to hire out. Private truck owners whose vehicles are idle for part of their time will also be eligible. The association will be financed by its members, who will pay certain sums as monthly and eventually yearly dues. These dues have not yet been determined, but will be decided upon by the number of members in the association, the idea being to set the dues at a figure which will just pay the operating expenses, but not form any sinking fund. Under this proposed plan of organization the larger the number of members, the smaller the dues.

More than thirty applications for membership in the association have already been received. It has been suggested that the monthly dues per member be \$20 a month, or \$240 a year, but this may be reduced if sufficient members are enrolled.

The new association will take over the work of the Detroit Return Loads Bureau, now handled by John F. McNally.

### Goodrich Has Training School

AKRON, July 22.—As part of the Government's plan to educate 90,000 men for specialized work in American universities this year the B. F. Goodrich Rubber Co. has provided a special classroom and working benches for the students. The men make daily tours of inspection through the tire-making departments; listen to lectures by department heads; repair tires that have been through every possible manner of abuse; learn how to demount and mount rims quickly; learn what to avoid in adjusting a rim to a wheel, and read manuals and books dwelling on the care and repair of tires.

The soldiers are drilled in quick and effective methods of repairing not only

automobile and motorcycle fabric tires but also cord tires for automobile and airplane use. This work is in co-operation with the University of Akron.

It is the plan of the Government to establish scores of American tire repair stations back of the lines on the Western front where American ambulances, officers' cars, Signal Corps cars, dispatch riders' motorcycles and all pneumatic tired vehicles and planes may instantly and efficiently have their "shoes" cared for.

### Makers Submit Headlamps for Test

ALBANY, N. Y., July 20.—Forty-three manufacturers of devices designed to control light emanating from headlamps have submitted their products to Secretary of State Francis M. Hugo for testing as provided under the new State law. Under the terms of this measure, such devices are to be tested and if they conform with the requirements of the headlamp law, a certificate of approval will be issued to the manufacturer. It is expected that the names of the manufacturers whose devices comply with the requirements will be made public in the near future.

### Ford Heads Labor Umpires

WASHINGTON, July 23.—Ten citizens appointed by President Wilson to act as umpires in labor controversies which cannot be settled by agreement of the members of the War Labor Board include: Henry Ford, Matthew Hale, Boston; James Harry Covington, Washington; Charles Caldwell McChord, Washington; V. Everit Macy, New York; Julian William Mack, Chicago; Henry Suzallo, Seattle; John Lind, Minneapolis; William R. Willcox, New York, and Walter Clark, Raleigh, N. C.

These men will settle the arguments between employers and employees when the War Labor Board is unable to reach that end. Up to this time there has been no need for such umpires, and the President's appointment is merely to meet a possible future problem of this kind.

### Truck Plant Being Enlarged

KENDALLVILLE, IND., July 22.—The Noble Motor Truck Corp. has purchased a site of 10½ acres on which a building will be erected that will add 140,000 sq. ft. of floorspace to the plant. The railroad spur has already been laid and building operations will begin soon. In the past the Noble truck has been manufactured in the 2-ton size, but as soon as the new addition is completed 1 and 3-ton trucks will also be turned out.

### To Double Service Truck Capacity

WABASH, IND., July 20.—The Service Motor Truck Co. has started work on two new buildings which will double the present floorspace of the organization.

## Electric Automobiles Unknown in Chile

Need Co-operation with Lighting Companies and Salesmanship to Popularize them

SANTIAGO, CHILE, July 19.—There are no electric automobiles in Chile. Despite the fact that Chile is a nation populated by 4,000,000 people who engage in farmwork and foreign trade throughout large cities where there are few hills and fair pavements, there are no electric automobiles to be seen, according to a pamphlet on "Electrical Goods in Bolivia and Chile," issued by the Department of Commerce.

Gasoline passenger car business is good and there are many agents, but none has ever attempted to push the electric, nor have the electric light companies offered encouragement in this direction. Conditions, states the report, are especially good in Santiago for the use of electric, as the streets are paved with asphalt or well-laid Belgian blocks and there is scarcely any grade. The central station has day circuits so that facilities for charging batteries could be easily arranged either in the home or at a garage.

The weather is ideal, for it never is cold enough to do any damage, the lowest temperature in 65 years being 26 deg. Fahr. The rainfall is not excessive, averaging only 15 in.

### Use Cars for Trucking

A number of secondhand gasoline passenger cars have been equipped with homemade bodies and are being used for trucking in competition with 2-wheeled ox carts. One of the mines operated by American capital uses 5-ton gasoline trucks which are the only automobile trucks in the country excepting a few used for demonstration purposes by large importing houses.

There is undoubtedly, the report states, a tendency toward the wide-spread development of this type of conveyance and it is possible that the electric car will benefit by the movement, but this cannot take place until an active campaign is begun to acquaint the people with what the electric automobile can do. On account of the absence of roads or boulevards in the country the gasoline car has not the advantageous position with respect to the electric which its long-distance touring radius gives it elsewhere. The two points in favor of the electric in the United States, namely ease of operation and cleanliness, do not apply in Chile, where the owner seldom drives. and it is only within the last year that women have driven cars at all. One point against the electric is the price, for with the same money or less one can buy a much larger gasoline car, and size is important because the large car looks imposing and because families are large.

In order to be successful in introducing electric vehicles it would be imperative

to have a live agent push them and get concessions from a lighting company in the matter of special rates for current. The agent would have to furnish expert help to keep the batteries in good condition as few people would understand them. If these conditions are complied with there should be a fair business in this line.

#### Making Poplar Propellers at Kelly Field

KELLY FIELD, TEX., July 20.—Poplar propellers instead of mahogany are being manufactured at Kelly Field. This is the only aviation camp in the country which makes its own propellers and is also the only one employing poplar.

Propellers made at Kelly Field are said to cost the Government less than 20 per cent of the price paid for them in buying from private concerns. Poplar contains less moisture than most of the other varieties of wood used for propeller making and is therefore better suited for a hot, dry climate where absorption of moisture often causes one made of other material to break. Eighty men are employed in the shop when it is operating at full capacity.

#### New Body Model for Stephens 76

FREEPORT, ILL., July 20.—A new 6-passenger body is in limited production by the Stephens Motor Branch of the Moline Plow Co. The body follows closely the lines of the former 4-passenger model but is longer, to accommodate two auxiliary seats. It is fitted to the same chassis as used in other Stephens models. The finish is in green with a fine gold stripe, and natural wood wheels. Among the refinements are Blackmore curtain openers, bullet lights, rear tonneau light, an electric light under the hood, accelerator foot rest, Johnston plate glass window in the rear curtain, dash gasoline gage, and oversize 33 x 4½-in. tires. The price is \$1,850, f.o.b. factory.

#### Ford Employees Laid Off

DETROIT, July 23.—The Ford Motor Co. has temporarily laid off 10,000 men, according to a report received here. Practically all of these were employed in the passenger car division.

## Settle Army Truck Program

White 1½-Ton Model Substituted for Original A—¾-Ton G. M. C. to Be AA

WASHINGTON, July 22.—The White 1½-ton truck, manufactured by the White Co., Cleveland, Ohio, will replace the original A, 1½-ton standardized Army truck, developed by the Quartermaster's Department, according to authoritative advice received by AUTOMOTIVE INDUSTRIES. This announcement definitely settles the three standard Army trucks program which will include for the AA the G. M. C. ¾-ton truck, for the A the White 1½-ton truck, and for the B, the original B 3-ton heavy duty war truck.

It is understood that the White truck will be known as the A truck and will undergo certain changes in its specifications similar to those made in the AA and recently announced. No decision has been reached as yet as to the quantity of A trucks to be ordered, and bids have not been requested of the manufacturers. Major Brown, of the Motor Transport Service, in charge of this work, is making a trip through the middle West partly to determine the manufacturing possibilities for the A truck.

These decisions definitely settle the Army truck program, and point to a victory on the part of those who were opposed to the original standardized truck plans. It will be recalled that earlier there was considerable opposition on the part of certain standard truck makers to the first scheme, whereby standard ¾-ton, 1½-ton and 3-ton trucks designed by engineers called to Washington, were to form the bulwark of the United States Army Motor Transport Service. There was opposition created by some who felt that the original A and AA trucks were not mechanically correct, and by others who preferred to see their own trucks used by the army.

There was much feeling displayed on both sides for a time. The disagreement resulted in a reorganization of the Motor Transport Section into the new Motor

Transport Service under Colonel Fred Glover, and in a series of tests ordered by Secretary of War Newton D. Baker. It is said that the selection of the G. M. C., the White and the original B trucks are the result of these tests although persons on each side of the controversy claim that the tests were not complete enough or of long enough duration to secure adequate results.

#### 219,292 Passenger Cars in Michigan

LANSING, July 23.—Michigan had 219,292 licensed passenger cars on July 1, according to figures given out by the automobile division of the State department. In addition, there were 23,420 commercial vehicles, 6505 motorcycles, 561 dealers' licenses, 19,420 chauffeurs and 5446 transfers to other owners during the first half of the calendar year.

The license fees on the same date had reached a total of \$2,689,490, of which \$1,311,712 went to the counties in which the cars were owned, for good roads, while the balance went into the state highway fund. During the first quarter the money collected was \$1,587,172, and the second quarter, or since April 1, \$1,102,318.

#### Sanford Price Increased

SYRACUSE, N. Y., July 20.—The Sanford Motor Truck Co. has advanced the price of its 3½ and 5-ton trucks, effective Aug. 1, as follows:

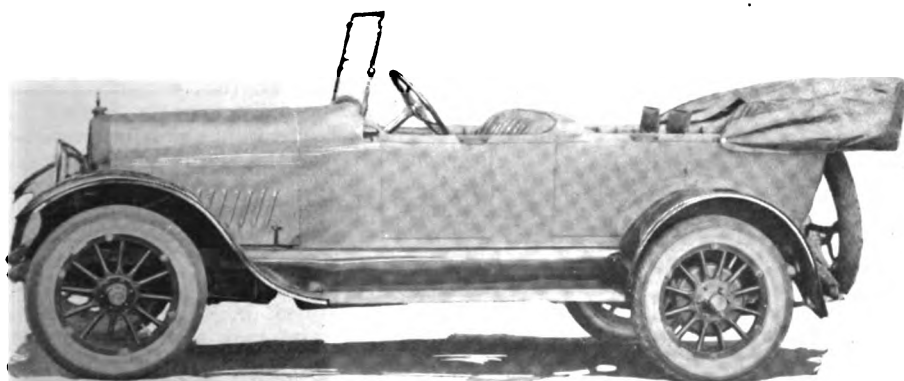
Model	Old Price	New Price
W-35, 3½-ton.....	\$3300	\$3975
W-50, 5-ton.....	4600	4750

#### Ford Tractor Assn. Formed

DEARBORN, MICH., July 22.—For the purpose of discussing future policies of distribution and deciding the question of parts, distributors of Fordson tractors met in Des Moines, Iowa, on July 10. Representatives of forty-five states were present. All distributors agreed to sell parts at uniform prices regardless of the states in which they were located. As a result of this meeting the Ford Tractor Assn. was organized. C. L. Herring of Des Moines was elected president, C. L. Flint of Providence secretary, and C. H. Northway of New York treasurer.

#### Ford Notes to Be Bought

DETROIT, July 22.—The Auto Investment Co. has been formed by local business men for the purpose of buying notes given for the purchase of Ford cars. Under the plan, customers can purchase used Ford cars on liberal terms and provide the dealers the means of disposing of their customers' notes. Officers of the company are: President, Charles R. Talbot, vice-president of the National Bank of Commerce; vice-president, Paul Meyer, general manager of the Detroit Sales Co.; secretary and treasurer, Maurice W. Fox, president of the Maurice W. Fox Co.



The new six-passenger Stephens Salient Six Model. This is built on the lines of the four-passenger model, but is longer to accommodate two auxiliary seats

## Motor Transport Service Spends 15% of All Money

(Continued from page 161)

ered to the Government to date. They are being turned out at the rate of 75 a day. The original program called for the production of 10,000 trucks by Aug. 1, but a serious delay in the delivery of engines and axles has prevented completion of the program as planned. It is now expected that all of the axles will have been delivered by Aug. 15 and possibly the engines by that same date. The delivery of the first 10,000, it is anticipated, will be completed by Sept. 15. Lieutenant Colonel Edwin S. George, who has been in charge of the procurement and purchasing of the Motor Transport Service since its inception, has been promoted to a colonelcy, and now is the second highest ranking officer in the Service under Colonel Glover.

### More Lightless Nights Ordered

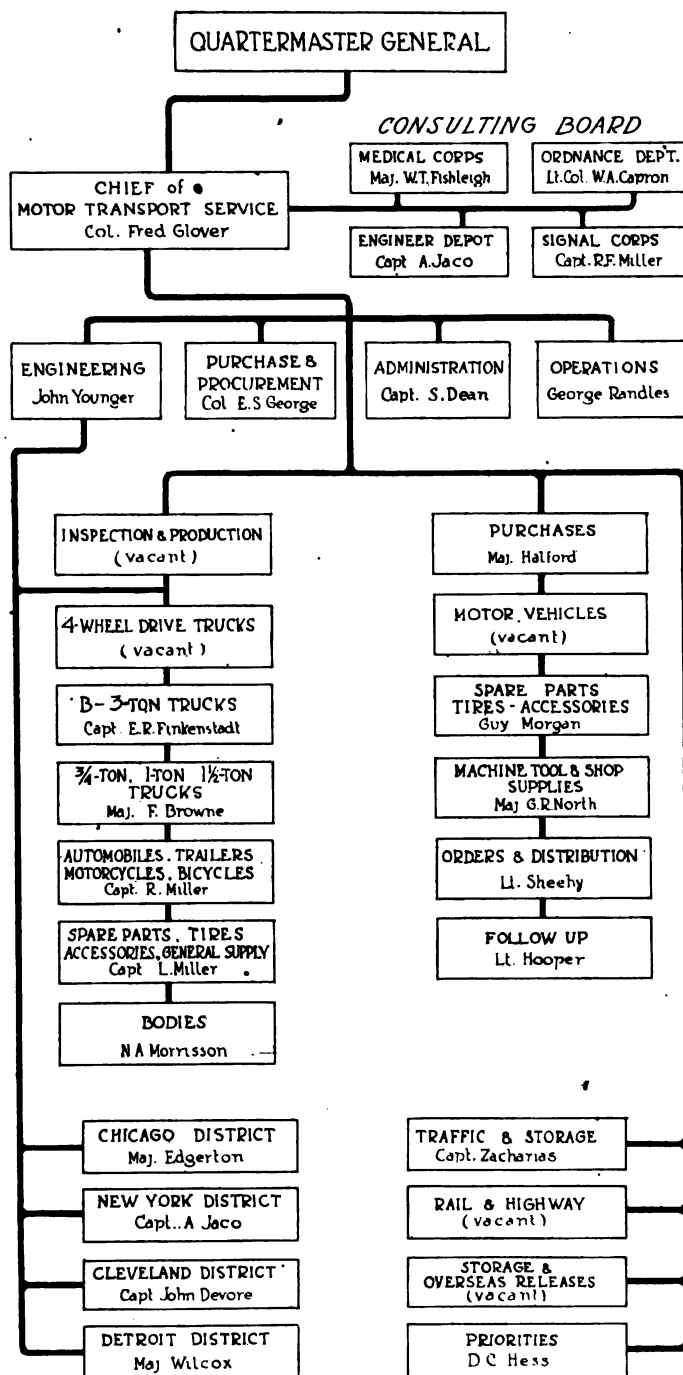
WASHINGTON, July 22—Lightless nights, effective July 24, are ordered by the Fuel Administration for an indefinite period. The order prohibits the use or consumption of coal, gas, oil or other fuel for illuminating or displaying advertisements, announcements or signs, or for the external ornamentation of any building on Monday, Tuesday, Wednesday and Thursday nights of each week in New England and the States of New York, Pennsylvania, New Jersey, Delaware, Maryland and the District of Columbia. The order also applies on Monday and Tuesday of each week in all remaining states. The order excepts only bonafide roof gardens, outdoor restaurants and outdoor moving picture theaters. Illumination or display by night in shop windows or any signs in show windows will be discontinued from sunrise to sunset and discontinued entirely on the lightless nights designated by the order. Street illumination will be reduced to that amount necessary for safety.

It is anticipated that 500,000 tons of coal a year will be saved by this plan.

### Truck Service Operating on Schedule

DETROIT, July 22—The Inter-City Trucking Service, Inc., recently formed, is operating daily express service between Detroit, Flint and intermediate points. Operating 3-ton Denby trucks, the company sends out trucks from Detroit and Flint every morning, Sundays excepted, which pick up and deliver freight between the two cities.

Centrally located receiving stations are maintained in the larger towns, where shippers may send consignments at any time. Connections with other motor delivery companies in the state enable the Inter-City company to receive freight and guarantee delivery to many points in Michigan not covered by its own route.



Plan of organization of Motor Transport Service

### Official Telegrams by Red Cross

WASHINGTON, July 23—The American Red Cross Motor Car Service, which includes more than 6000 women, will carry the official telegrams containing information regarding overseas casualties to the homes of the relatives of the killed or wounded. The original khaki uniform of this service has been discarded and replaced by a new regulation uniform of the Red Cross Oxford gray. Commanders will wear three silver diamonds embroidered on their shoulder straps. Captains will wear two silver diamonds, first lieutenants one, and second lieutenants a gilt diamond. Pearl

gray tabs on the collar will indicate staff officers. Service stripes will be worn on the sleeves.

As a result of a conference recently held in Washington at the call of the director of the Bureau of Motor Corps Service, the motor service in six of the principal cities of the country which previously had been independent in its organization, was amalgamated with the Red Cross Corps. This makes the Red Cross Motor Corps Service a thoroughly co-ordinated institution, able to meet the local and interlocal demands for transportation throughout the land on a nationalized basis.



## 52 Manufacturers at Salina

### French Commission to Attend— S. A. E. to Stage Tractor Conservation Dinner

SALINA, KAN., July 22.—The list of exhibitors for the National Tractor demonstration which is to be held here July 29-Aug. 2, is practically complete, and includes 52 manufacturers of tractors and implements and 27 manufacturers of accessories.

A commission representing the French Government has made reservations at demonstration headquarters, and will remain throughout the week collecting data. It is expected the commission will include Lieut. Mattaine and Mr. Chace.

The Society of Automotive Engineers will hold a tractor conservation dinner at the Hotel Lamer on Wednesday, July 31, at 8 p. m. This dinner will be the big get-together of demonstration week, and it is expected that there will be a very large turnout. Following the dinner there will be seven or eight 20-minute talks by leading tractor engineers and manufacturers on pertinent subjects. The aim is to stage a dinner similar to the Orville Wright dinner recently held at Dayton, where aviation subjects were handled so successfully. Dinner tickets are \$2.50 each.

Following is the complete list of exhibitors to date:

#### Tractors and implements

Advance-Rumley Thresher Co.	LaPorte
American Tractor Co.	Peoria
American Ford & Tractor Co.	Oklahoma City
Aultman & Taylor Co.	Mansfield
Avery Co.	Peoria
Beeman Cardon Tractor Co.	Minneapolis
Bull Tractor Co.	Minneapolis
Bullock Tractor Co.	Chicago
Case T. M. Co., J. I.	Racine
Case Plow Works	Racine
Cleveland Tractor Co.	Cleveland
Dart Motor Co.	Waterloo
Dauch Mfg. Co.	Sandusky
Deere & Co.	Moline
Electric Wheel Co.	Quincy
Emerson-Brantingham Co.	Rockford
Ford, Henry, & Son	Dearborn
Four-Drive Tractor Co.	Big Rapids
Frisk Co.	Waynesboro
Grand DeTour Plow Co.	Dixon
Gray Tractor Co.	Minneapolis
Guaranteed Tractor Co.	Chicago
Hart-Parr Co.	Charles City
Hessian Tiller & Tractor Co.	Buffalo
Holt Co.	Peoria
Interstate Tractor Co.	Waterloo
International Harvester Co.	Chicago
Joliet Oil Tractor Co.	Joliet
LaCrosse Tractor Co.	LaCrosse
LaCrosse Plow Co.	LaCrosse
Lyons-Atlas Co.	Indianapolis
Lamson Tractor Co.	New Holstein
Moline Plow Co.	Moline
National Tractor Co.	Peoria
Nilsson Tractor Co.	Minneapolis
Parrett Tractor Co.	Chicago
Peoria Tractor Co.	Peoria
P. & O. Tractor Co.	South Bend
Port Huron Engine & Thresher Co.	Port Huron
Rock Island Plow Co.	Rock Island
Roderick Lean Mfg. Co.	Mansfield
Russell Co.	Massillon
R. & P. Tractor Co.	Alma
Simplex Straw Spreader Co.	Kansas City
South Bend Chilled Plow Co.	South Bend
Square Turn Tractor Co.	Norfolk
Three P. Auto Tractor Co.	Davenport
Turner Mfg. Co.	Port Washington
Vulcan Motor Corp.	Moline
Vulcan Mfg. Co.	Evansville
Wallis Tractor Co.	Racine
Waterloo Tractor Co.	Waterloo

### Liberty Plane Poster for Cadillac Workers

*Men engaged in the airplane division of the Cadillac Motor Car Co. are constantly impressed with the patriotic nature of their work. Huge posters with patriotic appeals are published periodically and hung on the walls throughout the shops*

## The Bird that will Wing the Kaiser

The De Havilland Four, the type of airplane for which most of the Liberty Motors will be used, is the fastest airplane in the world, according to Theodore M. Kappin, industrial correspondent of the New York Tribune. Mr. Kappin's report says in part:

"I have all the flying data. I have all the engineering data, and I have all the data of the airplane itself, and I have all the data of the airplane itself, and I have all the data of the airplane itself."

"The Liberty Motor is a great reinforcement to the Allied armaments of the war, and it is a great reinforcement to the Allied armaments of the war, and it is a great reinforcement to the Allied armaments of the war."

"It is a great reinforcement to the Allied armaments of the war, and it is a great reinforcement to the Allied armaments of the war, and it is a great reinforcement to the Allied armaments of the war."

"America was late, but America has not lost."

"We are on the verge of a tremendous production. Cadillac and her corps of loyal workmen have responded nobly, but there is much yet to be done. Our part of this great program calls for our best—our brains, our skill, our strength, our patriotism, and our manhood. Let's give all these to the limit and help hand the Hun the finishing wallop."

CADILLAC MOTOR CAR COMPANY

#### Accessories

American Manganese Steel Co.	Chicago
Bosch Magneto Co.	New York
Buda Motor Co.	Harvey
Byrne-Kingston Co.	Kokomo
Champion Spark Plug Co.	Toledo
Automotive Parts Co.	Indianapolis
Diamond Chain Co.	Indianapolis
Hyatt Roller Bearing Co.	Chicago
McQuay-Norris Mfg. Co.	St. Louis
Modine Radiator Co.	Racine
Timken Roller Bearing Co.	Canton
Spittdorf Electric Co.	Chicago
K-W Ignition Co.	Cleveland
Hooven Radiator Co.	Chicago
Vacuum Oil Co.	New York
Nuttall Co., R. D.	Indianapolis
Gurnee Ball Bearing Co.	Jamestown
Remy Electric Co.	Chicago
SKF Ball Bearing Co.	Hartford
Oakes Co.	Indianapolis
Domestic Engineering Corp.	Dayton
Lalley Light Co.	Detroit
Mutual Oil Co.	Kansas City
U. S. Ball Bearing Co.	Chicago
Universal Light Co.	Salina
Alamo Light Co.	Omaha

#### Cadillac Making Census of Employees

DETROIT, July 23—The Cadillac Motor Car Co. is taking a census of its employees and classifying each person according to the character of work he can do. When the investigation is completed all the names will be placed in a card index under the proper classification. Each name will appear as many times as the number of different kinds of work he is fitted for. In other words, if a man is fitted for. In other words, if a man is a drill press operator and also can operate an "Acme" screw machine, he is listed under both classifications, thus enabling the company to put its hands on all the operators of a certain kind at one time.

It has been brought to the attention of the officials of the company frequently where one man could be fitted in several various positions. By means of the information gathered in the census, the company, if necessary, can transfer men from one department to another, thereby placing them where they are most needed. The census has already revealed places where men can be released for more important work and replaced by women.

#### Cleary to Handle Cadillac Advertising

DETROIT, July 23—Due to the resignation of L. N. Burnett, advertising manager of Cadillac Motor Car Co., who has joined the colors, John A. Cleary has been called from Philadelphia to take charge of the advertising department until more definite arrangements can be made. He has been handling the advertising of the eastern distributors.

#### Chevrolet to Vacate New York Plant

NEW YORK, July 23—The Chevrolet Motor Co. will vacate its manufacturing plant in New York City about Sept. 1. The entire equipment is to be removed to the Tarrytown, N. Y., plant and manufacturing activities for eastern territory centered there. The principal offices, however, will remain in New York at Broadway and 57th Street.

## Men of the Industry

*Changes in Personnel and  
Position*

### Marathon Executives Enlist in Army

CUYAHOGA FALLS, OHIO, July 20.—Three of the executives of the Marathon Tire & Rubber Co. have joined the colors. Secretary Raymond D. Jenks has enlisted in the Gas Defense Service at Washington and reports for duty at once; Purchasing Agent Russell Farley has enlisted in the Ordnance Department and is stationed at the Rock Island Arsenal. Floyd R. Biggs, factory representative in Kansas City, has enlisted in the infantry service.

C. F. Batchelder, for the last 2 years assistant sales manager of the Dort Motor Car Co. and for 10 years previous sales manager of the John Deere Plow Co., St. Louis, has been appointed eastern division sales manager of the Olds Motor Works, Lansing. He succeeds N. W. Barton, who has been transferred to New York City with the Oldsmobile Co. of New York.

George L. East has resigned as assistant sales manager of the Olds Motor Works, Lansing, Mich., to become associated with the Gulf Oldsmobile Co., New Orleans, in the distribution of the Oldsmobile throughout Louisiana. His connection with the Olds company dates from 1907, and includes 5 years as advertising manager, several years as wholesale representative, and 1½ years as assistant sales manager.

Homer Beckenbach, formerly assistant sales manager of the Cleveland branch of Willys-Overland, Inc., has entered Government service as inspector in the drop-forging department of the Ordnance Department in Detroit.

E. F. Howells has been appointed district sales manager for the Sanford Motor Truck Co., Syracuse. His territory will include New York and Pennsylvania. He was formerly Philadelphia manager for the Chase Motor Truck Co.

George C. Whitman has joined the Oakland Motor Car Co. as social service director. He will formulate plans for the betterment of working conditions among the employees.

George Woelfel, Jr., formerly secretary to Commissioner William M. Webster of the National Assn. of Automobile Accessory Jobbers, has joined the Zinke Co., Chicago, as special representative.

H. O. Penland, sales engineer of the U. S. Ball Bearing Mfg. Co., Chicago, with headquarters in Cleveland, has been pro-

moted to the managership of the company's Cleveland office.

Warren A. Maxwell, son of S. W. Maxwell of the Michigan State Automobile School, Detroit, and formerly associated with the Detroit service branch of the Studebaker Corp., has received a commission as second lieutenant in the Aviation Section of the army.

E. F. Sullivan has been appointed chief engineer of the Homer-Laughlin Engineers Corp., Los Angeles. He will design a small creeper-type tractor which will be shown in the September demonstration.

M. H. Breeze, formerly publicity manager for the B. F. Goodrich Co. and associated with that company's Cleveland branch, has resigned and has joined the Metal Parts Co., Detroit.

### Fisk Export Manager Starts on Trip

NEW YORK, July 16.—John B. Maus, export manager of the Fisk Rubber Co., has sailed on an extended business and research trip through Latin-American countries, and will be gone for a year or longer. His itinerary embraces Cuba, Chile, Peru, Bolivia, Ecuador, Argentina, Brazil, Uruguay and the north shore of South America, as well as Central American colonies.

### Diamond-T Distributors Changed

MILWAUKEE, July 20.—Distribution of Diamond-T trucks in the State of Wisconsin has changed hands through the sale of the agency by John H. Ryan to the Upham-Schacht Co. Ryan will continue to distribute in the states adjacent to Wisconsin from new headquarters in Minneapolis and St. Paul.

### Goodyear Branch Managers Transferred

AKRON, OHIO, July 22.—The Goodyear Tire & Rubber Co. has made several changes in its personnel of branch managers. L. C. Alexander, formerly supervisor of salesmen for the Indianapolis district, has been appointed manager at Cincinnati, succeeding E. G. Shick, promoted to the automobile tire department at Akron. J. S. Taylor, formerly sales supervisor of the Southern district, is now manager at Jacksonville, Fla., succeeding J. J. Kendall, now in the Federal service. H. C. Davies is acting branch manager at Dallas, Tex., replacing R. S. Brace, also in the Federal service. J. M. Dine, formerly branch manager at Omaha, has been appointed assistant manager at the Chicago branch, and C. A. Cramer, formerly manager at Cedar Rapids, has succeeded him at Omaha. E. L. Luthy has been promoted from supervisor of sales at Chicago, to branch manager at Cedar Rapids.

### Floyd Robinson Dies

DETROIT, July 20.—Floyd M. Robinson, former advertising manager of the Regal Motor Car Co., Detroit, and later with the Marion-Handley Co., Jackson, Mich., in the same capacity, is dead.

## New Companies Formed

*Latest Additions to Ranks of  
Automotive Industries*

### Gillette Men Form New Rubber Company

EAU CLAIRE, WIS., July 22.—Interests identified with the active ownership and management of the Gillette Rubber Co. have organized the Chippewa Rubber Co. to engage in the manufacture of rubberized fabrics of all kinds, principally waterproof covers, hospital sheeting, rubber coats and similar goods. A 2-story factory adjacent to the Gillette plant is being completed and will be ready to start regular production Sept. 1. From 75 to 100 men and girls will be employed at the start. The Gillette and Chippewa companies are distinct and separate. Officers of the new company are: President, Edward Hutchens; vice-president and general manager, E. C. Gavin; second vice-president, J. J. Ott; secretary, R. B. Gillette; treasurer, S. B. Woodward, New York. The capital stock is \$250,000.

### To Make Puncture-Proof Tire

MILWAUKEE, July 22.—The Everwear Rubber Co., which was organized a short time ago with an authorized capital stock of \$200,000, will manufacture a substantially punctureless, no-blowout, inner tire of a new type. The company has purchased all patent rights, which were granted to the inventor Jan. 12, 1918. The inner tire is of the pneumatic type, but is protected by a cellular cushion hoop separating the tube from the casing.

### Dependable Truck & Tractor Formed

GALESBURG, ILL., July 22.—The Dependable Truck & Tractor Co. has been organized here for the manufacture of commercial vehicles, and is now seeking a suitable factory. Officers have been elected as follows: President, C. V. Morse; vice-president, H. C. Pfaff; secretary-treasurer, J. J. Welch. A. E. Patchin has been appointed sales and advertising manager. With the exception of Welch, all the officers were until recently associated with the Pan-American Motors Corp., Decatur, Ill.

### To Make Marco Speed Recorder

EAST MOLINE, ILL., July 22.—The Motor Appliance Co. has been organized here to manufacture automobile appliances, and has taken over the plant of the Ogden Mfg. Co. at Plymouth, Ind. Three specialties will be featured. These are the Marco speed recorder, which records instantly the exact rate of speed made per hour, the total number of miles traveled and the number of stops; the Benson automatic speed signal, and Ogden automobile parts.

## Janesville Machine Co. Reorganized by G. M. C.

JANESVILLE, WIS., July 22.—The reorganization of the Janesville Machine Co., manufacturer of farm machinery, under the direction of the General Motors Corp., which recently acquired the controlling interest, has been completed. The capital stock of \$2,250,000 has been divided into 12,500 shares preferred and 10,000 common shares. The former capital was \$750,000. Officers have been elected as follows: President, J. A. Craig; first vice-president, A. P. Lovejoy; second vice-president, G. V. Sullivan; treasurer, M. G. Jeffris; secretary, E. B. Davis. Mr. Craig was general manager of the company under the former ownership. General Motors made a deposit of \$1,095,000 in the First National Bank of Janesville on the day the transfer was formally made.

### To Auction Detroit-Wyandotte Plant

WYANDOTTE, MICH., July 20.—The plant of the defunct Detroit-Wyandotte Motor Truck Co., consisting of one building, 300 x 60, of approximately 40,000 sq. ft., will be sold at auction on the premises by Samuel L. Winternitz Co., Chicago.

### To Double Allen-Bradley Capacity

MILWAUKEE, July 22.—The Allen-Bradley Co., manufacturer of rheostats, electric controlling devices, and charging sets for storage battery and electric vehicle work, is doubling the capacity of its plant by the erection of a 3-story addition and adding several stories to the present main shop.

### Teetor-Hartley Gets Government Order

HAGERSTOWN, IND., July 22.—The Teetor-Hartley Motor Corp. has received a contract for exhaust manifolds to be used in the new engines which will be installed in tanks. The first order calls for 1500 manifolds.

### Walden-Worcester Opens Chicago Branch

WORCESTER, MASS., July 20.—The Walden-Worcester, Inc., manufacturer of Walden-Worcester wrenches, has opened a branch office in Chicago. It will be under the supervision of Messrs. Craig & Opdyke.

### War Contracts for Edison Industries

NEW LONDON, WIS., July 22.—The Wisconsin plant of Thomas A. Edison Industries, Inc., is completing a contract for approximately 135,000 sq. ft. of airplane construction material for the British Government. Delivery is to be made by Aug. 15. The material consists of panels of 3-ply veneer, the outer plies being of birch and the filler-ply of basswood. It is said to differ materially from this Government's requirements for such material. The New London plant is also manufacturing 20,000 trunk-type filing cases for the U. S. Government for the use of the army in the field.

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

### Hayes-Ionia Expands Plant

GRAND RAPIDS, July 15.—The Hayes-Ionia Co. has completed a 3-story addition to its plant. A short time ago the company took over the plant erected by the Nelson-Matter Furniture Co., moving its general offices from Ionia, Mich. The plant at Ionia is still in operation. More than 1700 men are employed in the two factories, the local plant having the greater number. The two factories have a floorspace of more than 600,000 sq. ft.

### Capital Increase

The Deitrich Motor Car Co., Youngstown, Ohio, has increased its capital stock from \$15,000 to \$25,000.

### Dividends Declared

The Michigan Drop Forge Co., Pontiac, Mich., has declared the July dividend of 20 cents a share upon the common stock, payable Aug. 1 to holders of record July 15.

The Russel Motor Car Co., Toronto, has declared its regular quarterly 1½ per cent dividend on preferred stock, payable Aug. 1. A dividend of 7 per cent on common stock, payable Aug. 1, has also been declared.

The Grant Motor Car Corp., Cleveland, declared its regular quarterly 1½ per cent dividend on preferred stock, payable Aug. 1.

The Falls Motors Corp., Sheboygan Falls, Wis., has declared its regular quarterly dividend of 1½ per cent on preferred stock and a dividend of 5½ per cent in scrip on preferred stock, both payable July 20.

The Packard Motor Car Co., Detroit, has declared a cash dividend of 2 per cent on common stock, payable July 31, to stockholders of record July 15.

The Kelly-Springfield Tire Co. has declared a dividend of \$1 a share on common stock, payable Aug. 1 to stock of record July 15.

The Fisher Body Corp. has declared a regular quarterly dividend of 1½ per cent on preferred stock, payable Aug. 1 to holders of record July 23.

The Chevrolet Motor Co. has declared a quarterly dividend of 3 per cent, payable Aug. 1 to stock of record July 15.

The General Motors Corp. has declared quarterly dividends of 3 per cent on common and 1½ per cent on preferred stock, payable Aug. 1 to holders of record July 15.

The Michigan Drop Forge Co., Detroit, has declared an extra dividend of 10 cents a share on the common stock, payable July 25.

## Bosch Plainfield Plant to Be Occupied by Wasson

NEW YORK, July 20.—The Plainfield, N. J., plant of the Bosch Magneto Co., which, as was told in AUTOMOTIVE INDUSTRIES last week, has been purchased by the Wright-Martin Aircraft Co., is to be occupied by the Wasson Piston Ring Co., which will remove its equipment from New Brunswick, N. J., and turn over its plant to the Wright-Martin company. This will give the Wright-Martin company an additional plant in New Brunswick and will permit considerable expansion. The company is at present producing about 500 engines a day in its New Brunswick plant and about 40 engines a day in the Long Island City plant. Much new machinery was purchased last week.

### Traffic Trucks To Be Shown at Chicago

ST. LOUIS, July 20.—The Traffic Motor Truck Corp. will make the first public exhibition of its 2-ton trucks at the Automotive and Accessory Exposition in Chicago, Sept. 14-21. It is stated that the company is producing at the rate of 300 trucks a month.

### Women Drivers Used at Buick

FLINT, MICH., July 22.—The Buick Motor Co. is using women to drive cars from the assembling plant to the loading platform, and the company says that the plan is working out excellently. Fourteen women are doing the work, and their duties are confined merely to the driving of cars. Besides driving from the assembling plant, the women also take the cars from the warehouse to the company's garage to be delivered to dealers who come to drive cars away. They are well satisfied with this work and are performing their duties as well as the men they superseded, according to an official of the company.

### Automotive Battery Corp. Takes Prest-O-Lite Service

BOSTON, July 13.—The Automotive Battery Corp. has been formed here to take over the service of Prest-O-Lite products in this vicinity. James MacKenzie, formerly in charge of the Willard battery interests at Springfield, Mass., and later purchasing agent at the Watertown Arsenal, is president and general manager. George Bradburn of the Bradburn Motors Co. is treasurer. The company has leased quarters at 701 Beacon Street and has plants at Cambridge and Springfield. J. A. O'Donnell, manager of the Prest-O-Lite branch, retains his position as representative of the factory in New England.

### Sales Increase 100 Per Cent

KENT, OHIO, July 20.—Sales of the Mason Tire & Rubber Co. for June were \$302,123. This is an increase of more than 100 per cent over June, 1917.



# Industrial Review of the Week

## A Summary of Major Developments in Other Fields

### Coal Production Records Touch New High Level

Production records in the bituminous fields are being smashed. Coupled with the cheering news of the victories of our boys and the Allies at the Marne, the successful onslaught on the storehouse of Mother Nature by the mining forces at home furnishes cause for a new song of jubilation. Every soft-coal region is reporting greater output than ever before. For the week ended July 13 the total of bituminous coal shipped from the mines amounted to 13,243,000 net tons, which is more than a million tons above the average weekly requirements set by the Fuel Administration as necessary to meet essential demands. The average weekly production of soft coal from April 1 to date, however, is estimated at 11,568,000 net tons. Therefore, to make up the total deficit of 9,615,000 net tons which now exists it will be necessary to have approximately ten more weeks of production equivalent to that of the week ended July 13, or an output of 12,472,000 net tons during each of the 37 weeks remaining in the coal year, which ends March 31, 1919. During the week under review shipments of anthracite amounted to 42,331 cars, which shows a slight improvement over the forwardings of recent weeks.—*Coal Age*.

### Need of Truck Makers For Steel

(Continued from page 134)

"We are led to believe that for every million men sent to the war front, something between 30,000 and 50,000 trucks will be required.

"It is also suggested that the United States Government will eventually use a large number of trucks at home.

"In order that motor truck plants may be kept up to their top efficiency, and their personnel maintained intact, so that they may meet any demands an enlarged program will make on them, it is necessary that these plants be kept alive in the interval.

"This is only possible through domestic business. Not enough war work is in sight as this time. The domestic business is a hand, and discharges a patriotic utility.

"There seems therefore every reason why the War Industries Board should class motor trucks with such other transportation utilities as locomotive engines, freight cars and steamships, find a means to issue the same priorities that go to war necessities, and see that the necessary materials are available in order that motor truck production be not interrupted.—National Motor Truck Committee of the N. A. C. C."

### Government Places Demands Before Steel Manufacturers

More impressively than in any previous week the Government has put before the steel producers the demands it will make upon the country's capacity in the next six months and the still greater needs of 1919.

It is now realized that the ship program is to be increased next year beyond anything yet believed, that railroad purchases must far exceed those for 1918 after years of starvation buying, and that shell steel must be furnished at a 5,000,000-ton rate. Moreover, the strain great crops have always put upon iron and steel capacity is also to be reckoned with now.

In its third warning to consumers of steel within three months the War Industries Board put the needs of the second half of the year for war and essential industries at 20,000,000 tons of finished steel products, or 3,500,000 tons more than the expected output. A sharp challenge of the 20,000,000-ton estimate came from automobile interests.

No assurance has been given, nor can it be given, the most certain thing in the prospect being that the use of steel for war purposes will increase, while increased production is less likely.—*Iron Age*.

## Summary of General Business Conditions as of June 23, 1918

Following is a Summary of Business Conditions on June 23, as Reported to the Federal Reserve Board:

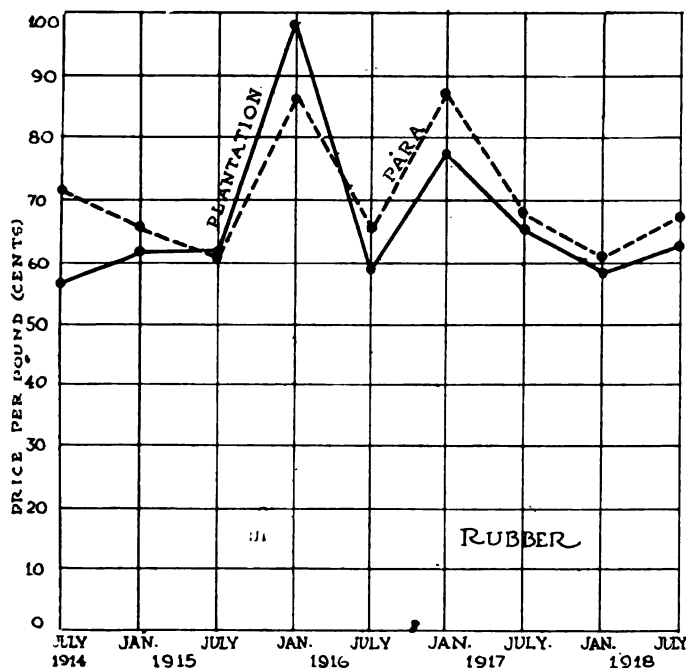
District	General Business	Crop Condition	Industries of the District	Construction, Building, and Engineering	Foreign Trade	Money Rates	Railroad, Post Office, and Other Receipts	Labor Conditions
No. 1—Boston	Active	Average, promising	Busy	Decreased	Increased	Steady and strong	Mixed	Scarce; wages high
No. 2—New York	Very active	Good	Engaged to full capacity; widespread adaptation of production to war essentials.	Dull, except for construction of Army warehouses, shipyards, housing for Government labor and factory construction.	Many restrictions, but large aggregate.	Firm and steady	Post office increase, 19.28 per cent over last year; railroads show increase in gross and decrease in net earnings.	Scarcity and high competitive wage offers, resulting in large turnover.
No. 3—Philadelphia	Very good	Excellent	Very busy	Very little new building.	Large	Firm; no change	Gross receipts increasing.	Shortage acute in all lines.
No. 4—Cleveland	Good	Satisfactory and promising	Busy	Very dull		Increasingly firm	Increase	Unsatisfactory; scarcity.
No. 5—Richmond	Active, limited only by labor and supplies.	Excellent	Active, profitably employed.	Private building negligible; Government work active.	Limited by freight room.	Six per cent; heavy demand and increasing.	Railroad irregular; post office, volume large; reflects increased rates.	Inadequate; unsatisfactory.
No. 6—Atlanta	Good	Very satisfactory	Busy	Inactive	Unsatisfactory	Firm	Post office receipts decrease under last month.	Unsettled.
No. 7—Chicago	Very active	Excellent	Generally at capacity.	Dull		Do	Increase in postal receipts.	Very scarce.
No. 8—St. Louis	Good	Do	Active	Do		Do	Not much change	Nearing settlement.
No. 9—Minneapolis	Do	Do	Do	Fair		Very firm		Good.
No. 10—Kansas City	Do	Good to excellent	Do	Slightly improved		Firm		Equalization of farm demand and supply.
No. 11—Dallas	Quite satisfactory	Fair to good	Do	Building activities below normal; Government work has right of way.	As satisfactory as shipping space available permits.	Firm, heavy demand but slight evidence of increase.	Railroad increase and higher tariffs not noticeable in travel; post office increase.	Unsatisfactory; shortage in all branches.
No. 12—San Francisco	Active	Good	Do	Operations generally curtailed.	Increase	Firm	Increasing	More settled.

## AUTOMOTIVE MATERIALS MARKETS

## Material Market Prices

<b>Acids:</b>	
Muriatic, lb. ....	.02-.03
Phosphoric, ct. ....	.35-.39
Sulphuric (60), lb. ....	.11
<b>Aluminum:</b>	
Ingot, lb. ....	.33
Sheets (18 gage or more), lb. ....	.40
Antimony, lb. ....	.13½-.13%
<b>Burlap:</b>	
8 oz., yd. ....	.18½-.19
10 oz., yd. ....	.23½-.24

<b>Copper:</b>	
Elec. lb. ....	.26
Lake, lb. ....	.26
<b>Fabric, Tire (17½ oz.):</b>	
Sea is., combed, lb. ....	1.65-1.70
Egypt, combed, lb. ....	1.25-1.35
Egypt, carded, lb. ....	1.20-1.30
Peelers, combed, lb. ....	1.05-1.20
Peelers, carded, lb. ....	.95-1.05
<b>Fibre (¼ in. sheet base), lb. ....</b>	
	.50



Fluctuations in the prices of Plantation and Para rubber since the beginning of the war

<b>Graphite:</b>	
Ceylon, lb. ....	.07½-.25
Madagascar, lb. ....	.10-.15
Mexican, lb. ....	.03%
<b>Lead, lb. ....</b>	
	.07%
<b>Leather:</b>	
Hides, lb. ....	.19-.33
<b>Nickel, lb. ....</b>	
	.40
<b>Oil:</b>	
<b>Gasoline:</b>	
Auto., gal. ....	.24
68 to 70 gal. ....	.30
<b>Lard:</b>	
Prime City, gal. ....	2.20
Ex. No. 1, gal. ....	1.50-1.52
Linseed, gal. ....	1.82
Menhaden, gal. ....	1.05
<b>Petroleum (crude):</b>	
Kansas, bbl. ....	2.25
Pennsylvania, bbl. ....	4.00

<b>Rubber:</b>	
<b>Ceylon:</b>	
First latex pale crepe, lb. ....	.63
Brown, crepe, thin, clear, lb. ....	.60
Smoked, ribbed sheets, lb. ....	.62
<b>Para:</b>	
Up River, fine, lb. ....	.68
Up River, coarse, lb. ....	.40
Island, fine, lb. ....	.59
Island, coarse, lb. ....	.27
Shellac (orange), gal. ....	.70-.76
Spelter ....	.04½
<b>Steel:</b>	
Angle beams and channels, lb. ....	.03
Automobile sheet (see sp. table) ....	
Cold rolled, lb. ....	.06½
Hot rolled, lb. ....	.03½
Tin ....	.95
Tungsten, lb. ....	2.40
Waste (cotton), lb. ....	.12½-.17

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only. Per 100 lb.	Primes when seconds up to 15 per cent are taken. Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping....	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock .....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping .....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
<b>Automobile Sheet Extras for Extreme Widths:</b>		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 to 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
<b>Black sheet extras to apply to narrow widths.</b>		
Oiling, 10c. per 100 lb.		
Patent levelling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds, ten per cent less than the invoice Pittsburgh price for corresponding primes.		

## Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge		Bid	Asked	Net Ch'ge
*Ajax Rubber Co. ....	63	65		Standard Motor Construction Co. ....	12	14	
*J. I. Case T. M. Co., pfd. ....	80	86	+1	Standard Parts .....	60	62	
Chalmers Motor Co., com. ....	3	6		*Stewart-Warner Speed. Corp. ....	57½	58½	-1½
Chalmers Motor Co., pfd. ....	20	30		*Studebaker Corp., com. ....	46½	46½	+½
*Chandler Motor Co. ....	84½	85½	+4½	*Studebaker Corp., pfd. ....	82½	90	
Chevrolet Motor Co. ....	132	135		Swinehart Tire & Rubber Co. ....	50	58	-4
*Fisher Body Corp., com. ....	37	38	-1	United Motors Corp. ....	32½	33	-½
*Fisher Body Corp., pfd. ....	91	92	+2	*U. S. Rubber Co., com. ....	61½	62½	+1½
Fisk Rubber Co., com. ....	55	58		*U. S. Rubber Co., pfd. ....	103½	105	+1½
Fisk Rubber Co., 1st pfd. ....	98	103		*White Motor Co. ....	42½	42½	+½
Fisk Rubber Co., 2nd pfd. ....	78	83		*Willys-Overland Co., com. ....	20	20½	+½
Firestone Tire & Rubber Co., com. ....	108	111	+10	*Willys-Overland Co., pfd. ....	81½	82½	-½
Firestone Tire & Rubber Co., pfd. ....	93	95					
*General Motors Co., com. ....	153	156	+1	*At close. Listed N. Y. Stock Exchange.			
*General Motors Co., pfd. ....	81	82		<b>OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE</b>			
*B. F. Goodrich Co., com. ....	47	47½	+2				
*B. F. Goodrich Co., pfd. ....	97	100	+1½				
Goodyear Tire & Rubber Co., com. ....	163	167	+2				
Goodyear Tire & Rubber Co., pfd. ....	96½	97½					
Grant Motor Car Corp. ....	2½	3½	+½				
Hupp Motor Car Corp., com. ....	3½	4½	+1				
Hupp Motor Car Corp., pfd. ....	80	85	+4				
International Motor Co., com. ....	30	33	-2				
International Motor Co., 1st pfd. ....	55	65	+5				
International Motor Co., 2nd pfd. ....	35	43					
*Kelly-Springfield Tire Co., com. ....	50	51					
*Kelly-Springfield Tire Co., 1st pfd. ....	82	87					
*Lee Rubber & Tire Corp. ....	19	20	+1				
*Maxwell Motor Co., Inc., com. ....	29	29½	+1				
*Maxwell Motor Co., Inc., 1st pfd. ....	56	57	+2				
*Maxwell Motor Co., Inc., 2nd pfd. ....	27½	23	+1				
Miller Rubber Co., com. ....	111	113	+8				
Miller Rubber Co., pfd. ....	93	95					
Packard Motor Car Co., com. ....	118	125					
Packard Motor Car Co., pfd. ....	94	97	+1				
Paige-Detroit Motor Car Co. ....	18	20					
Peerless Truck & Motor Corp. ....	14	17					
Portage Rubber Co., com. ....	111	113	+8				
Reo Motor Car Co. ....	13½	15					
*Saxon Motor Car Corp. ....	7	8	+1½				

## General Engineer Contracts

WASHINGTON, July 17.—The following contracts have been awarded by the General Engineer Depot, War Department:

July 8, 1918.

American Lubricator Co., Detroit; steam lubricators.

Diamond Chain & Mfg. Co., Indianapolis; links, motor chains.

Gray Motor Co., Detroit; gasoline engines.

July 9, 1918.

Gray Motor Co., Detroit; spare parts for gasoline engines.

Goodyear Tire & Rubber Co., Philadelphia; hose, suction.

Quaker City Rubber Co., Philadelphia; hose. H. W. Johns-Manville Co., Washington; asbestos-felted insulation.

Studebaker Corp. of America, Detroit; automobile spare parts.

July 11, 1918.

Republic Rubber Co., Washington; tire casings.

The Seiss Mfg. Co., Toledo; horns.

July 12, 1918.

The Winton Co., Cleveland; parts of power plants for searchlights.

Dodge Brothers, Detroit; parts for Dodge Brothers cars.

Studebaker Corp. of America, Detroit; rims for Studebaker cars.

Garford Motor Truck Co., Lima, Ohio; hub-dometers.

WASHINGTON, July 22.—The following contracts were placed by the General Engineer Depot of the Army:

July 13, 1918.

United States Graphite Co., Saginaw; graphite compound.

Fir Production Board, Washington; select common fir.

Champion Spark Plug Co., Toledo; spark plugs.

General Electric Co., Washington; exhaust fans.

American Oil, Pump & Tank Co., Cincinnati; portable steel tanks.

Acme Rubber Mfg. Co., Trenton, N. J.; hose.

Goodyear Tire & Rubber Co., Washington; rubber gaskets.

Ford Motor Co., Detroit; parts for searchlight carriages.

Roberts Brass Co., Milwaukee; gate valves.

Republic Rubber Co., Youngstown, Ohio; hose.

## Hide Prices Fixed

WASHINGTON, July 22.—Prices have

been fixed by the War Industries Board for hides as follows:

## Packer Hides

Heavy native steers No. 1, 30 cents.

Heavy butt branded steers No. 1, 28 cents.

Heavy Texas steers No. 1, 28 cents.

Heavy Colorado steers, 27 cents.

Light native cows No. 1, 24 cents.

Country Hides (for Best Sections)

Extremes, 25 to 45 pounds, 22 cents.

Buffs, 45 to 60 pounds, 21 cents.

## River Plate Frigorifico Hides

Maximum price on steers, \$53.00 Argentine gold.

Maximum price on cows, \$40.00 Argentine gold.

The prices are f.o.b., shipped, including export duty and lighterage, but not including salting charges. The prices are the basis for all other differentials which will be published in due course. They are expected to equalize more nearly the actual market conditions as reflected in prices of country hides.

## Women's Division of Labor Department

WASHINGTON, July 22.—A Women's Division in the Department of Labor has been established. Miss Mary Van Kleeck who has been the supervisor of the Women's Division of the Industrial Service Section of the Ordnance Department has been appointed chief. She will serve as a member of the War Labor Policies Board, will co-ordinate the work for other women in the divisions of the Department of Labor, will co-operate with state Departments of Labor and will endeavor to bring about united action by the various states in national problems of women's work. The Women's Division will concern itself primarily with war conditions, but will be mindful of the need for observing and interpreting the tendencies in women's employment which are likely to have permanent social effects.

## Marlin-Rockwell Takes Braeburn Plant

BRAEBURN, PA., July 23.—The Marlin-Rockwell Corp. has acquired the plant of the Braeburn Steel Co. here. The property will be developed and equipment added as a means of insuring continuity of supply of alloy steel.

## Navy Contracts Awarded

WASHINGTON, July 20.—The Bureau of Supplies and Accounts of the Navy has placed contracts as follows:

July 8, 1918.

Winhter Motor Truck Co., Winthrop Harbor, Ill.; truck.

July 18, 1918.

Packard Motor Car Co., Detroit; motor trucks.

Empire Rubber & Tire Co., Trenton, N. J.; tires and tubes.

Ford Motor Co., Detroit; ambulance.

The Burgess Co., Marblehead, Mass.; boxing airplanes.

## Medical Corps Contract Awards

WASHINGTON, July 15.—The Surgeon General of the Army has issued the following contracts and purchases:

June 29, 1918.

General Motor Truck Co., Pontiac; spare parts for chassis.

H. H. Babcock Co., Watertown, N. Y.; ambulance spare parts.

July 6, 1918.

Pemberty Injector Co., Detroit; automatic injectors.

Detroit Graphite Co., Detroit; paint.

Gray Motor Co., Detroit; gasoline engines.

## Indianapolis Elects Automotive Committee

INDIANAPOLIS, July 22.—Members of the automotive committee of the Indianapolis division of the War Industries Board were elected Saturday. Walter C. Marmon, of Nordyke & Marmon, Indianapolis, was elected chairman. Others who will serve on the committee are: Alvin H. Smith, Ford Motor Co., vice-chairman; J. A. Bennell, Haynes Automobile Co., Kokomo; Robert H. Hassler, Robert Hassler, Inc., Indianapolis; George M. Dickson, National Motor Car & Vehicle Corp., Indianapolis; C. E. Lee, Buckeye Mfg. Co., Anderson; R. P. Henderson, Barry Mfg. Co., Indianapolis; E. H. Holmes, Stewart Wire Wheel Corp., and R. O. Bright, Arvac Mfg. Co., Anderson.

## Union Switch Adds Equipment

SWISSVALE, PA., July 23.—The Union Switch & Signal Co. has installed several additional steam drop and shaping hammers. Plans for the extension of the die room and increased facilities for heat treating are being prepared.

## Calendar

## RACING

July 27 — Chicago. Chicago Speedway.  
Aug. 3 — Uniontown. Uniontown Speedway Assn.  
Aug. 10 — Providence, R. I.  
Aug. 17 — Sheephead Bay.  
Sept. 2 — Uniontown. Uniontown Speedway Assn.  
Sept. 7 — Chicago. Chicago Speedway.  
Sept. 21 — Sheephead Bay.  
Oct. 5 — Cincinnati. Cincinnati Speedway.

## SHOWS

July 27 — Syracuse, N. Y. Tractor Demonstration. New York State Food Commission.  
July 29-Aug. 4 — Salina, Kan. National Tractor Demonstration. Auspices of National Implement and Vehicle Assn.  
Aug. 6 — Fulton, N. Y. Tractor Demonstration. New York State Food Commission.

Sept. 2-7 — Indianapolis, Indiana. State Fair. Indianapolis Automobile Trade Assn.  
Sept. 14-21 — Chicago. Automotive and Accessories War Exposition. Municipal Pier.  
Oct. 14-27 — Dallas, Tex. Seventh Annual Texas Automobile Show. Texas State Fair.  
Oct. 16-18 — Ottawa, Ont. International Plowing Match. Tractor and Farm Machin-

ery Demonstration. Experimental Farm.

## ENGINEERING

Sept. 2 — Cripple Creek, Colo. American Institute of Mining Engineers.  
Nov. 14-15 — New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.



# AUTOMOTIVE INDUSTRIES

Engineering

**THE AUTOMOBILE**

PUBLISHED WEEKLY

NEW YORK, AUGUST 1, 1918

Ten cents a copy  
Three Dollars a year

AUG - 7 1918

IV. OF MICH.



## Champion

**Dependable Spark Plugs**

### Big Increase In Porcelain Efficiency

*2½ Times the Resistance  
to Breakage from Shock*

**H**OW to make porcelain for spark plug insulation, offer greater resistance to shock and vibration!

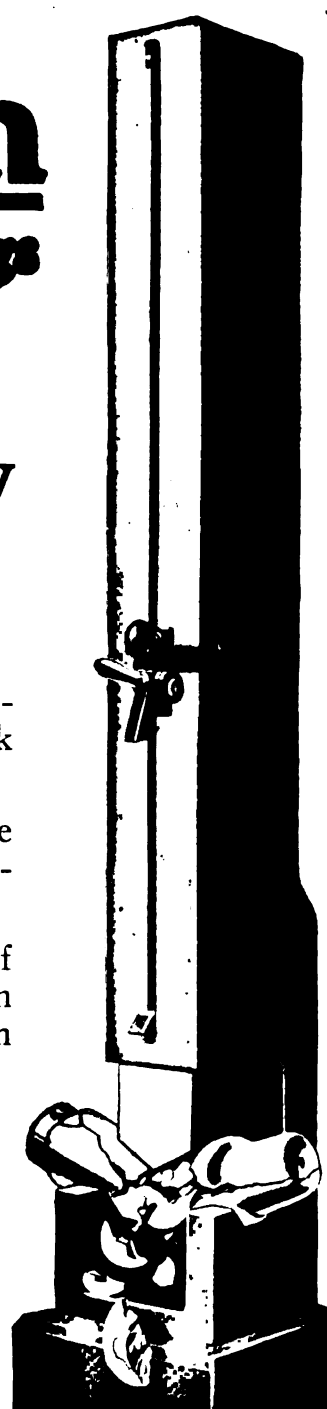
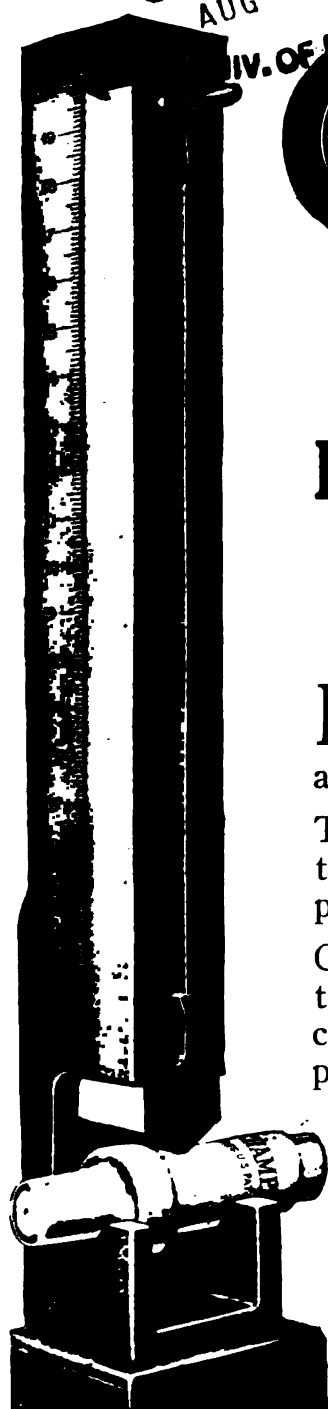
Ten years of original research work and the three-thousand-four-hundred-and-fiftieth experiment revealed the secret.

Champion 3450 Porcelain offers two and a half times the resistance to shock and vibration compared with the best previous Champion porcelain.

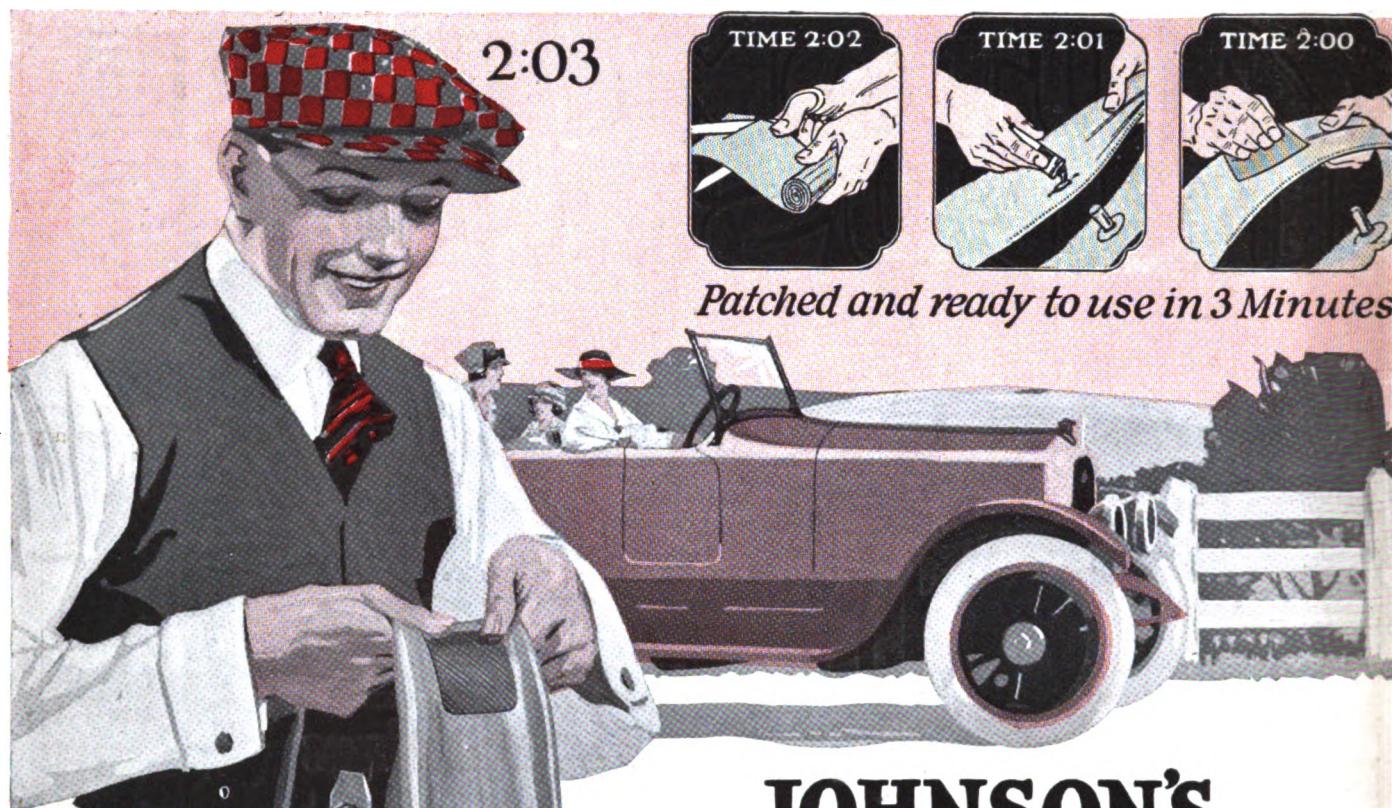
What an increase in that dependability which has given Champions their enormous prestige.

Always it has been to the dealer's advantage to sell Champions—now more than ever.

**Champion Spark Plug Co., Toledo, Ohio**







*Patched and ready to use in 3 Minutes*

# JOHNSON'S Hastee Patch

*Saves Time, Tires and Temper*

WITH Johnson's Hastee Patch the most inexperienced motorist can satisfactorily and inexpensively repair his own tubes. No time, labor or heat required. The Patch can be applied in three minutes—at a cost of 2c—and it's so simple a child can use it.

## *Ready For Instant Use*

With Johnson's Hastee Patch it takes but two or three minutes to make the repair and the tube can be pumped up immediately and is ready for instant use at any speed.

## *Better Than Vulcanizing*

Johnson's Hastee Patch is much better than vulcanizing because there is no danger of burning and spoiling the tube. Johnson's Hastee Patch gives equally good results on a pin hole puncture or a large blow out. It is conveniently put up in strips so the user can cut just the right size patch for each repair.

## *Cut Down Your Tire Investment*

If you'll carry a box of Johnson's Hastee Patch in your tool kit you can get away from the expense of a lot of spare tubes and casings which fast deteriorate during the hot motoring months. A box of Johnson's Hastee Patch in your car answers the same purpose as two or three extra tubes and casings, and there is a saving of 23c over garage vulcanizing on your smallest patch and much more on large ones.

**If your dealer is unable to supply you use attached coupon.**

**S. C. JOHNSON & SON, Dept. A - RACINE, WIS.**



## *Fine for Patching*

*Garden Hose  
Rubber Boots,  
Coats and Gloves  
Rubbers  
Auto Tops  
Foot Balls  
Hot Water Bottles  
And All  
Rubber Articles*

**S. C. JOHNSON & SON, Dept. A. Racine, Wis.**

I enclose 50c for which please send me by prepaid Parcel Post a strip of Johnson's Hastee Patch from which 25 average size patches may be cut. Satisfaction guaranteed or my money back.

NAME .....

ADDRESS .....

CITY & STATE .....



# AUTOMOTIVE INDUSTRIES

## AUTOMOBILE

VOL. XXXIX

NEW YORK—THURSDAY, AUGUST 1, 1918—CHICAGO

No. 5

## Fifty Tractors in National Demonstration at Salina

Plowing 100 Acres an Hour on the Plains of Kansas—  
Many New Machines Exhibited—Lack of Standardization  
Noticed—Need for Real Tests Manifested

By David Beecroft

**SALINA, KAN., July 30** (*Special to AUTOMOTIVE INDUSTRIES*).—Promptly at 1.30 this afternoon fifty tractors of nearly as many different makes started plowing a 240-acre field of Kansas winter wheat land; soon after 4 o'clock all of this was plowed, and incidentally the greatest tractor demonstration ever held had been formally opened.

The fifty tractors were lined up on a stretch one mile in width, and they plowed furrows in some cases one-half mile in length. The entire fifty started almost to a second at a flag signal, and over 25,000 spectators from Kansas and adjoining states followed the machines from one side of the field most of the way to the other.

In these days when wheat is so vital in our war program no sight on this side of the Atlantic could have been more inspiring, and the regret was that Herbert Hoover was not on hand to witness the soul-stirring sight. This plowing demonstration will be repeated three more afternoons.

### Results of Tests Not Made Public

These afternoon plowing demonstrations are only a portion of the program of the National Tractor Demonstrations. Since the middle of last week different makes of tractors have been given belt tests to demonstrate their horsepower over a 2-hour period. In addition to these belt tests there have been fuel economy tests in which the machines under official observation have plowed at their rated speed and with their plow equipment for a 2-hour period. There have been dynamometer drawbar tests in which the drawbar pull for average work has

been officially taken and also the maximum drawbar from machines. All of these tests have been conducted by a committee of agricultural engineers selected from different state agricultural schools under the direction of J. D. Davidson of California.

Unfortunately the results of these different tests have not been made public and will not be made public until after the demonstrations are over. The reason for this is that for months many of the tractor makers have strenuously objected to any form of test that would show fuel consumption per acre plowed, drawbar horsepower and belt performance of the engine.

Those who were insistent on such tests compromised by agreeing that such tests should be held, but that it would be optional with any firm to take them. A second compromise was agreed upon by which the different tractor makers agreed not to advertise during the demonstration any of the results of these tests.

It is for this reason that the present demonstration is robbed of a great factor of interest, as many of these tractor makers who have taken these voluntary tests do not yet know the official figures of their machines.

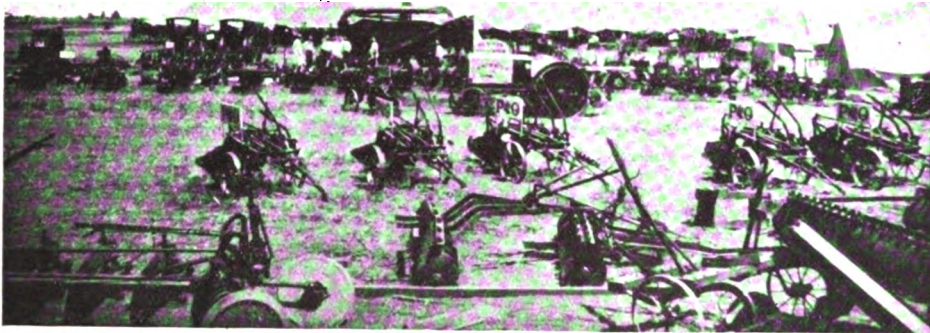
### Should Show Tangible Results

It is probable that before another year comes round sentiment favoring real tests will have worked out a feasible program so that the value of these demonstrations as attendance drawers will be continued. To-day E. E. McCullough, general manager of the National Implement and Vehicle Association, suggested that next year a committee of mechanical engineers from various



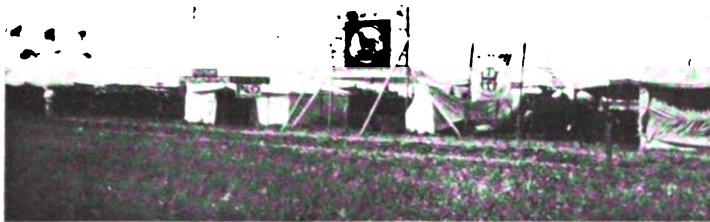
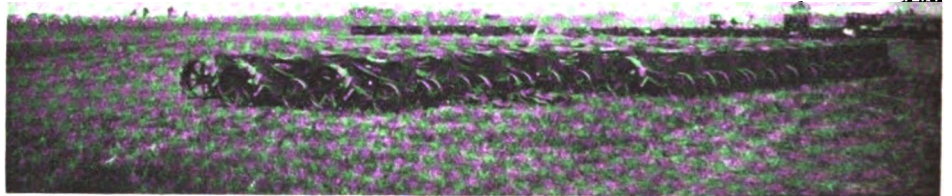
## Tractor and Implement Exhibits at the National Tractor Demonstration at Salina, Kansas

During the Week, 112 Tractors Were Demonstrated, Pulling Practically Every Type of Farm Implement



*A group of farm implements, giving some idea of the variety of the exposition*

*The Fordson tractors were there in force, a whole train-load having been purchased and delivered*



*Where Russell and I. H. C. tractors and P. & O. plows were exhibited*



*The tent of the Port Huron tractor, with several Clevelands in front*



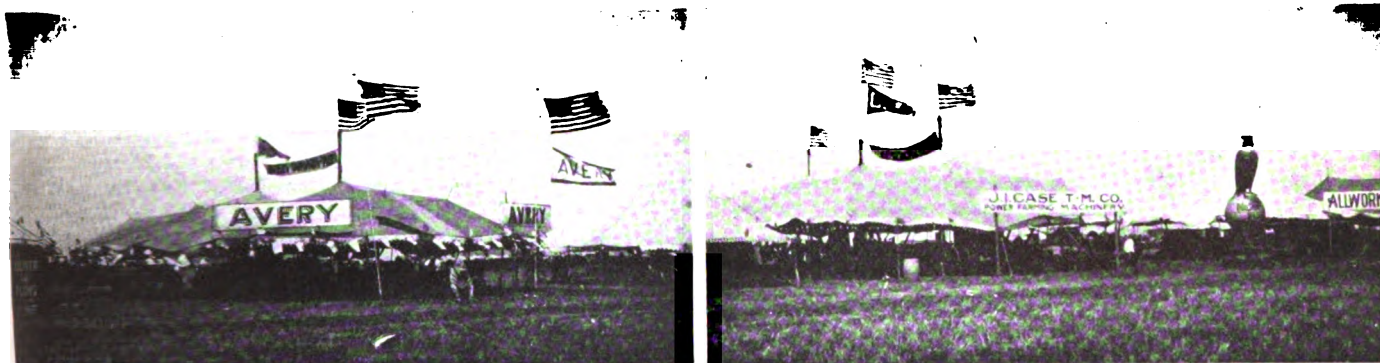
*Where the Hart-Parr line was displayed*



*The exhibition of Oliver plows was complete*



Two more of the tractor exhibitors' tents, the one at the right showing the Port Huron exhibit



Both Avery and Case had extensive lines on exhibition in their tents

agricultural colleges be given official charge of such a series of tests with power to make and give to the public an official report of the tests. It is possible that participation in such will be voluntary, as was the case this year, but there will be the advantage of giving out the results before the demonstrations are over.

It is a question of grave concern as to whether manufacturers would be willing to participate in these demonstrations year after year unless some tangible results such as would emanate from tests could be made public. So far as these afternoon plowing demonstrations are concerned, they are not of much value to makers but appeal to the farmers attending. As such they are of local value only and not of national significance. Real tests would add a national aspect to the demonstrations and give an aspect that would go far toward assuring continued value.

The afternoon plowing demonstrations are much like a selling demonstration of an automobile on a good road. Every tractor is expected to be able to plow on a level field, and when the period of work is confined to 2 or 3 hours there is no opportunity for the spectator to get much of a line on the endurance of the machine.

Fortunately, the present demonstrations have brought out other forms of trials that do give a true criterion of the value of the machine. Starting from days before the present demonstrations opened, the Parrett company started one of its tractors pulling three plows on a continuous 100-hour test plowing night and day. The test was also a non-engine stop affair. Never before has such an official test been undertaken in connection with a public demonstration. The Parrett carried out its schedule and finished the job at 4 o'clock this afternoon.

The official figures are not yet available, but the tractor approximated 1 acre plowed every hour from the start with a consumption of 2 gal. of kerosene per acre. During the test the engine stopped but twice in 103 hours and 20 minutes that it was running. There was one stop of 3 min. 40 sec. caused by dirt in the sediment cup in the kerosene line, and there was a second stop for this same cause which required 2 min. additional.

The tractor was compelled to stop plowing for 13½ hours due to rain, but during all of this time the engine was kept idling at a speed of 360 r.p.m. Very few mechanical troubles

occurred. It was necessary to change one spark plug, which was done with the engine still running. One priming cup was also changed. This official test, in which every ounce of kerosene used was weighed by official observers and in which accurate record of every detail of the test was kept, marks a new era in official tractor performances, and it will do much to stimulate such tests, which are highly desirable.

#### Fordson Is Officially Tested

To-day the big interest of the demonstration was in the debut of the Fordson at an official test and the further fact that Henry Ford was on hand to see his machines. The fact that there are in Salina to-night 284 Fordsons to be delivered this week to farmers in Kansas added a chapter of realism that points more than any other one thing to the future magnitude of the tractor industry. These machines represent 2 days' output of the factory. The machines have already been sold to Kansas farmers through Ford dealers here.

The present demonstrations offer one of the best periods of the year for observing the progress that has been made in tractor designs during the past 12 months. The general entry of automotive makers into this field during the past year has not brought out as much new design and as many new types as was expected a year ago.

From the automobile end Ford has made good in a run-away fashion, some of the leading tractor makers frankly admitting that he has got the jump on them, and also admitting that they did not think it was possible to get into production as Ford has in such a short time.

General tractor development along engineering lines has not made so much progress as was expected. This is largely due to the demand for machines brought about because of the war, and when demand is so great it is not surprising that changes in design and general improvements are not up to expected standards.

There are several new machines, but the most permanent progress has been made by companies that are bulwarks in the field and are counted among the pioneers. Thus, Case has brought out its line of three new machines all built around similar fundamentals, so that this concern has its program for the future incorporated in these. Their case is parallel to that of a motor truck maker who has completed his line with a list of different capacity trucks that cover the

entire field he expects to cater to. Case now has a 10-18 for two plows; a 15-27 for three plows, and possibly four; and a 20-36 for four plow or light work with five plows.

Moline has developed its two-wheel Universal which is now a four-cylinder design with a complete electrical system embracing ignition, starting and lighting, this being the first machine to be so equipped. It goes a step further with electric governor for fuel feed.

An entry from the automobile field is the R & P tractor built by the Republic truck organization. This tractor was shown at the Kansas City tractor show but is not in production yet and consequently cannot be considered as having taken a fixed place in the industry.

#### Many New Models on Hand

Among the pioneer makers are others that have added new models. Avery has a new design which follows previous Avery fundamentals but has a four-cylinder horizontal opposed engine. This marks the first use of this type of engine or even a four-cylinder engine with this concern.

International Harvester, which has always clung to single- and two-cylinder engines for tractor use, has also brought out a four-cylinder design. It too is a horizontal job, but has the cylinders parallel like the fingers on the hand, with the crankshaft at one end. It is a valve-in-the-head design. It was expected that this company would show its new vertical four-cylinder design, but in this the spectators were not to be satisfied.

Several other new tractor models have been brought out. Thus Aultman & Taylor, which has previously built only very large traction engine types, has a new model with a four-cylinder vertical engine, marking the first time this pioneer concern has adopted such an automobile type of power plant. It uses a 4% by 6% Waukesha engine and is rated at 15-30 hp. It clings to the high-wheel design, using 60-in. drivers.

Another new machine is the Frick, a four-cylinder job fashioned after Parrett lines with the vertical engine mounted transversely. There is a Port Huron, a four-cylinder vertical engine job with a combination friction and gear transmission. The Uncle Sam, a newcomer, also uses a vertical type of four-cylinder engine. The same can be said of the Yankee and the Hession, both new machines.

The vertical type of automobile engine has practically usurped the new model field and in doing so has displaced the horizontal twin-cylinder engine in which the cylinders are parallel, with the crankshaft at one end.

The crop of new tractor designs indicates a great lack in variety of what might be designated standard parts for assembled tractors. There is a good variety of vertical engines to select from and the value of this is shown in the general use of this kind of engine in the new models.

#### Need More Standard Parts

On the other hand, no such opportunity for selection can be found in gearsets, and so the gearset situation remains chaotic. One concern has perfected a design which is meeting with general approval. This is Nuttall, but there should be two, three or more supplying such. The demand for good tractor gearsets would warrant much greater activity.

In the steering gear field chaos is literally rampant and there are many—nearly a dozen—steering gear designs that might be described as examples of American ingenuity, but they cannot be described as examples of good engineering. If there were two or three good standardized steering gear jobs the situation would clarify very quickly.

Some standardized design of front axle is needed. There are several very weak designs; in short, there is not any standardized design such as we have in the truck field or in the automobile field. As a result, ingenuity again runs rampant and engineering is thrust into the background. There are too many built-up axles that are not nicely balanced with the job they have to take care of.

There is nothing standardized as yet in the way of the pressed steel frame design. One or two pressed steel frames have come out, the R & P suggesting how easy it would be to arrive at some definite standard of shape.

As a result of no such existing standard there are two or three new tractors in which the channel side members of

the frame are spliced in the center where the stress is greatest. This has been done in order to have the front end high enough to support the engine and the rear end low enough to pass under the axle. Some frames are entirely too heavy for the job, and there are others which are too weak and although reinforced they weave as the tractor approaches under its load.

#### Reduce Weight; Increase Accessibility

This review of lack of standard units for those who would like to bring out a new machine could be continued much further, and the thought in enumerating these various parts is to indicate how tractor engineering standard is being held back.

A practical example of this came up to-day when one machinery concern engaged an engineer to develop a tractor that would be entirely different from others, this being the company's conception of an engineering task. As a result, the job has been described by several as a literal freak in which valve cages are used and many other disproved designs featured. Some tractor companies will have to change their engineering programs, otherwise others cannot very heartily approve of what should be war engineering work.

One engineer admitted to-day that he had told his company, which makes a large traction engine type, that he could cut 9000 lb. out of the tractor and have a more efficient and powerful machine. In these days of metal conservation and fuel conservation we should pause and think how really useful this metal could be made in other ways and how much of the fuel used to carry this 9000 lb. of useless weight could be better used in our war work.

Among engineers there is a good deal of criticism to the effect that several of our new tractor models are not nearly as accessible as they should be, reference being specially made to the need of adjusting or replacing lower crankshaft bearings. No definite policy regarding accessibility can be laid down. At best a path of compromise must be selected.

One engineer declares that the mechanical reliability of the part must be the prime consideration, and it is better to sacrifice accessibility if reliability is achieved thereby. One of our leading electricians when confronted with a similar situation invariably commented that he would willingly sacrifice 10 per cent of electrical efficiency if he gained thereby in mechanical efficiency.

#### Trend Toward Four-Cylinder Engine

It is true that many tractors have the lower pan of the crankcase well fenced in with front axle struts, steering linkages and cross frame braces and in some instances it looks like a rebuilding job to take up a lower connecting rod bearing. Engineers are generally free to criticize, but in seeing the mote in the other engineers' eyes fail to see the beam in their own.

It is almost too early in the industry to place too much importance on the mathematics of tractor specifications. There are a few unmistakable tendencies, one of which is toward the use of the vertical type of four-cylinder engine. The enclosed gearset is equally certain, and while any standardization of design is yet some distance off, the use of forged gears with cut teeth and anti-friction bearings as well as spliced shafts is certain.

Whether the three-plow tractor or the two-plow is to be the leader is very uncertain. Each tractor maker tries to answer this question in accordance with present manufacturing plans. The three-plow man declares that the two-plow job is too small for threshing machines, but the two-plow maker points to the new designs of threshing machines that are being brought out to meet the needs of his machine. The two-plow machine occupies the base of the pyramid, which means great volume of sales, and where there is great volume there are pretty certain to be special designs to go with that volume.

The redesigning of farm machinery for the tractor standard is one of the most encouraging conditions of the present year. The farm machinery field is being literally revolutionized. Plows are being designed, and already have been designed, which admit of speeds which the implement makers

(Continued on page 213)



# War Industries Board May Control All Raw Materials and Finished Products

New Priorities Regulations Include Everything Except Food, Fuel and Feeds—  
Certain Consumers Given Automatic Ratings Under Preference  
List—Board to Confer with Consumers on  
Their Steel Requirements

**W**ASHINGTON, July 30.—A new turn has been given priorities matters through the issuance of Circular 4 by the Priorities Division of the War Industries Board, and under which the complete control of all raw materials and finished products as well as steel and iron, and excepting only fuel, food and feeds, appears likely.

The War Industries Board has let it be known in a statement that steel will continue to be the chief commodity to be governed by the new priority regulations, but the regulations themselves are so framed as to include all raw materials and finished products.

The new regulations are for the duration of the war, and under their terms all consumers are placed under two broad heads as follows:

1. Consumers who get materials:
  - (a) Through Priorities Certificates.
  - (b) Through operating under a General Purpose List.
  - (c) Through being on a Preference List.
2. All other consumers, who are not entitled to Priorities Certificates, do not operate under the General Purpose List and are not on the Preference List will get materials and products only after all requirements in Class 1, above, are filled.

The regulations include classes of consumers similar to those laid down for the steel program; in addition there is what is termed a General Purpose List, this including the following seven divisions under which steel priorities were laid out early in June: (1) *Ships*; (2) *Aircraft*; (3) *Munitions*; (4) *Fuel*; (5) *Food*; (6) *Clothing*; (7) *Railroads*.

Further, there is what is termed a Preference List, under the various headings of which certain consumers are automatically classified and thereby given priority in the receipt of materials and products.

The various classes of consumers include AA, A, B, C and D, with subdivisions in each class indicated by a suffix number, such, for example, as Class AA1.

Class AA comprises all the emergency war work of an exceptional and urgent nature.

Class A comprises all other war work, including aircraft, military tractors and tanks and materials required in their production.

Class B comprises orders for work which, while not primarily designed for the prosecution of the war, are of public interest and essential to the national welfare or otherwise of exceptional importance.

Class C includes all orders and work not covered by priorities certificates or not given an automatic rating in the above classes but which are to be utilized in furtherance of one or more of the purposes embraced in the General Purpose List or the Preference List adopted by the War Industries Board and the Fuel Administration.

Class D comprises all orders and work not embraced in any of the other classifications.

The Preference List is an entirely new part of the regulations, and under it certain consumers are given automatic classification. The complete Preference List follows:

## PREFERENCE LIST

**Aircraft**—Plants engaged exclusively in manufacturing aircraft or supplies and equipment therefor.  
**Ammunition**—Plants engaged in the manufacture of ammunition for the United States Government and the Allies.  
**Army and navy cantonments and camps.**

**Arms (small)**—Plants engaged in manufacturing small arms for the United States Government and the Allies.  
**Chemicals**—Plants engaged exclusively in manufacturing chemicals.  
**Coke plants.**  
**Domestic Consumers.**  
**Electric Equipment**—Plants manufacturing same.  
**Electrodes**—Plants producing electrodes.  
**Explosives**—Plants manufacturing explosives.  
**Farm Implements**—Manufacturers exclusively of agricultural implements and farm operating equipment.  
**Feed**—Plants producing feed.  
**Ferro-Alloys**—Plants producing.  
**Fertilizers**—Manufacturers of fertilizers.  
**Fire Brick**—Plants producing exclusively.  
**Food**—Plants manufacturing, milling, preparing, refining, preserving, and wholesaling food for human consumption.  
**Food Containers**—Manufacturers of tin and glass containers and manufacturers exclusively of other food containers.  
**Gas**—Gas-producing plants.  
**Gas**—Plants manufacturing exclusively gas-producing machinery.  
**Guns (large)**—Plants manufacturing same.  
**Hemp, Jute and Cotton Bags**—Plants manufacturing hemp, jute, and cotton bags.  
**Insecticides**—Manufacturers exclusively of insecticides and fungicides.  
**Iron and Steel**—Blast furnaces and foundries.  
**Laundries.**  
**Machine Tools**—Plants manufacturing machine tools.  
**Mines.**  
**Mines**—Plants engaged exclusively in manufacturing mining tools and equipment.  
**Newspapers and Periodicals**—Plants printing and publishing exclusively newspapers and periodicals.  
**Oil**—Refineries of both mineral and vegetable oils.  
**Oil Production**—Plants manufacturing exclusively oil-well equipment.  
**Public institutions and buildings.**  
**Public utilities.**  
**Railways.**  
**Railways**—Plants manufacturing locomotives, freight cars, and rails and other plants engaged exclusively in manufacture of railway supplies.  
**Refrigeration**—Refrigeration for food and exclusively ice-producing plants.  
**Seeds**—Producers or wholesalers of seeds (except flower seeds.)  
**Ships (bunker coal)**—Not including pleasure craft.  
**Ships**—Plants engaged exclusively in building ships (not including pleasure craft) or in manufacturing exclusively supplies and equipment therefor.  
**Soap**—Manufacturers of soap.  
**Steel**—Steel plants and rolling mills.  
**Tanners**—Tanning plants, save for patent leather.  
**Tanning Extracts**—Plants manufacturing tanning extracts.  
**Tin Plate**—Manufacturers of tin plate.  
**Twine (binder) and Rope**—Plants producing exclusively binder twine and rope.  
**Wire Rope and Rope Wire**—Manufacturers of same.

The following is a list of materials, equipments and supplies which automatically take the classification prescribed:

Manufacture of turbines (all classes).....A-4  
 Repair or construction steam railway locomotives for use on  
 railroads under jurisdiction of U. S. Railroad Administration...A-4  
 Production of electrodes.....A-5  
 Manufacture of wire rope.....A-5  
 Building of ships or other water craft for and under direct  
 contract with U. S. Shipping Board Emergency Fleet Corp....A-5  
 For building all cargo water craft (not pleasure craft) except

those under construction by or for the U. S. Shipping Board Emergency Fleet Corp.....	A-6
Manufacture of machine tools (metal and wood) machinists' tools, small tools, hand tools, mining tools, machinery and equipment .....	A-6
Manufacture of steam railway materials, equipment and supplies (other than locomotives) for use on railroads under jurisdiction of U. S. Railroad Administration.....	B-1
Manufacture of locomotive cranes and travelling cranes.....	B-1
Manufacture of electrical equipment other than turbines (not including electrical supplies as distinguished from equipment).....	B-2
Manufacture of farm implements.....	B-2
Manufacture of textile machinery.....	B-2
Manufacture of tools, implements, machinery and equipment required for production, harvesting, distribution, milling, canning and refining of foods and feeds.....	B-2
Manufacture of binder twine and rope.....	B-2
Manufacture of oil well supplies or equipment, by which is meant supplies for the production of petroleum and natural gas but not including pipe lines, storage tanks of 1,000 bbls. capacity or over, tank cars or refineries.....	B-2

Orders that come under these various automatic classifications must be endorsed by an affidavit to the effect that they have been automatically rated in their particular class and that consumer has filed a pledge with the War Industries Board to the effect that the materials, equipment and supplies will be used in accordance with the classification.

Applications for higher ratings should be made only when it is in the public interest and where automatic ratings will not secure delivery of the order on or near the date required.

Class AA orders and work take precedence over all other classes with classes A, B, C and D following respectively, all irrespective of the dates the orders were placed. Orders with a lower suffix number in similar classes are given preference, as, for example, class A-1 precedes class A-2.

However, the classification of an order means simply that it should be given such precedence over orders of lower classification as may be necessary to insure delivery on the date specified in the order. It does not mean that work shall cease on orders of a lower classification or that the order should be completed and delivery made in advance of lower classification orders if this is not necessary to effect delivery within the time specified.

The one to whom the priority certificate is directed or who has received an order taking automatic classification is expected to make his own production plans to secure maximum efficiency out of his operations.

Special forms of priority certificate applications will be furnished by the Priorities Committee.

As a general rule, when an application is necessary it should be made by the consumer. Orders demanding priority certificates for Government contracts will receive certificates by application made directly to the committee. Government sub-contractors, one or more times removed from a direct contractor but furnishing materials to be used in fulfillment of a direct contract, can secure priority assistance by applying directly to the committee.

Purchasers of materials, commodities or supplies which fall into class B can secure priorities assistance from the committee.

Application for priority should be made against the actual producer or manufacturer and will not be issued except in unusual occasions against jobbers or brokers.

Judging by the several schedules and the Preference List, it is safe to assume that all articles directly required for the war, including such as airplanes, military passenger cars, military motor trucks, military tractors, military motorcycles and tanks, will fall within the priority certificates classifications.

Farm tractors are automatically placed in class B-2, coming under the head of farm implements, and also entitled to priority certificates.

Since Circular No. 4, which contains the above regulations, was compiled several weeks ago, although just issued, it is fair to assume that commercial motor trucks will probably be given a class B automatic rating. This assumption is based on the favorable hearing held last week between the Priorities Committee and the motor truck industry representatives, at which time it was stated that a reasonable supply of steel would be assured the truck makers.

Passenger cars for general use will in the main fall into

class D, but under special occasions may be given a higher rating. Individual consideration will be given various passenger car makers in their requests for the raw materials they need, and such matters as conversion possibilities, unfilled partly completed orders, etc., will be weighed.

The new regulations call attention to the method of securing a place on the Preference List. Applications must be made on special forms which can be secured from H. G. Philips, secretary of Priorities Board.

The Priorities Committee will not handle fuel priorities, which will remain entirely under control of the Fuel Administration. Application for transportation assistance should be made to T. C. Powell, manager of Inland Traffic, War Industries Board, Washington, D. C.

In its statement the War Industries Board makes plain that curtailment of the use of steel will continue to be effected as in the past by means of a reduction of needless lines, varieties and sizes of products, elimination of wasteful styles, models and methods and by the substitution of products or materials.

"As it is obviously impossible," states the board, "to supply all industries utilizing steel and iron with their normal supply, the board will, with its Priorities Division and other sections, operate a system of industrial hearings, in which committees representing entire industries may appear and present:

- A—Their normal requirements for iron and steel.
- B—Their reasonable requirements under war conditions.
- C—The stocks now on hand in each plant.
- D—The fuel consumed and all other pertinent facts.

The board emphasizes that there will be comparatively little iron and steel left to distribute to those industries engaged in non-war work and for consumers for application to non-war purposes. It states, however, that:

"A portion, at least, of the product of nearly every industry may be classed as a direct or indirect war requirement or essential to the civilian population, but in many the percentage of non-essentiality predominates. On the other hand, nearly every industry, including so-called war industries, has a percentage of non-essentiality in its production.

"It is the policy of the War Industries Board, through the hearings mentioned above, to take counsel with each industry, determine the extent to which it can and should, as a war measure, curtail its production, and particularly curtail its consumption of iron and steel, limiting its output to essential uses as far as practicable but without destroying or unnecessarily injuring an industry or legitimate business."

### Proposed Change in Pipe Thread

IN 1913 it was suggested to the American Society for Testing Materials that a committee on tubes investigate the question of a change in pipe thread standards. A sub-committee was appointed to collect data on pipe failures and to make tests showing the comparative strength of the Briggs (present American standard pipe threads) and Whitworth threads.

In January, 1915, the Executive Committee appointed a new technical committee on the Revision of Pipe Threads, and the following societies were asked to co-operate with this committee: American Gas Institute, American Society of Mechanical Engineers, Manufacturers' Association on Standardization of Fittings, Master Car Builders' Association, Railway Signal Association. Various forms of threads were proposed and a number of experiments were made by the committee to determine the strength of the threads, the tightness of the joint and the practicability of cutting the various forms of threads and of the interchangeability of the suggested types with the existing standard. These experiments were completed and the results were reported to the Society for Testing Materials.

This work, of course, is all preliminary, and the most difficult part of the work is still to be done. The tremendous manufacturing difficulties involved in any change in standard of pipe threads are fully realized. The type of pipe thread which may be employed is a matter of design and it has therefore been decided to transfer the work to the American Society of Mechanical Engineers.

# The De Haviland IV Biplane

Description of British Long-Distance Reconnaissance and Bomb-Dropping Machine, Which Also Is to Be Built in the United States, Fitted with the Liberty Engine—The Model Described Carries a Rolls-Royce Engine

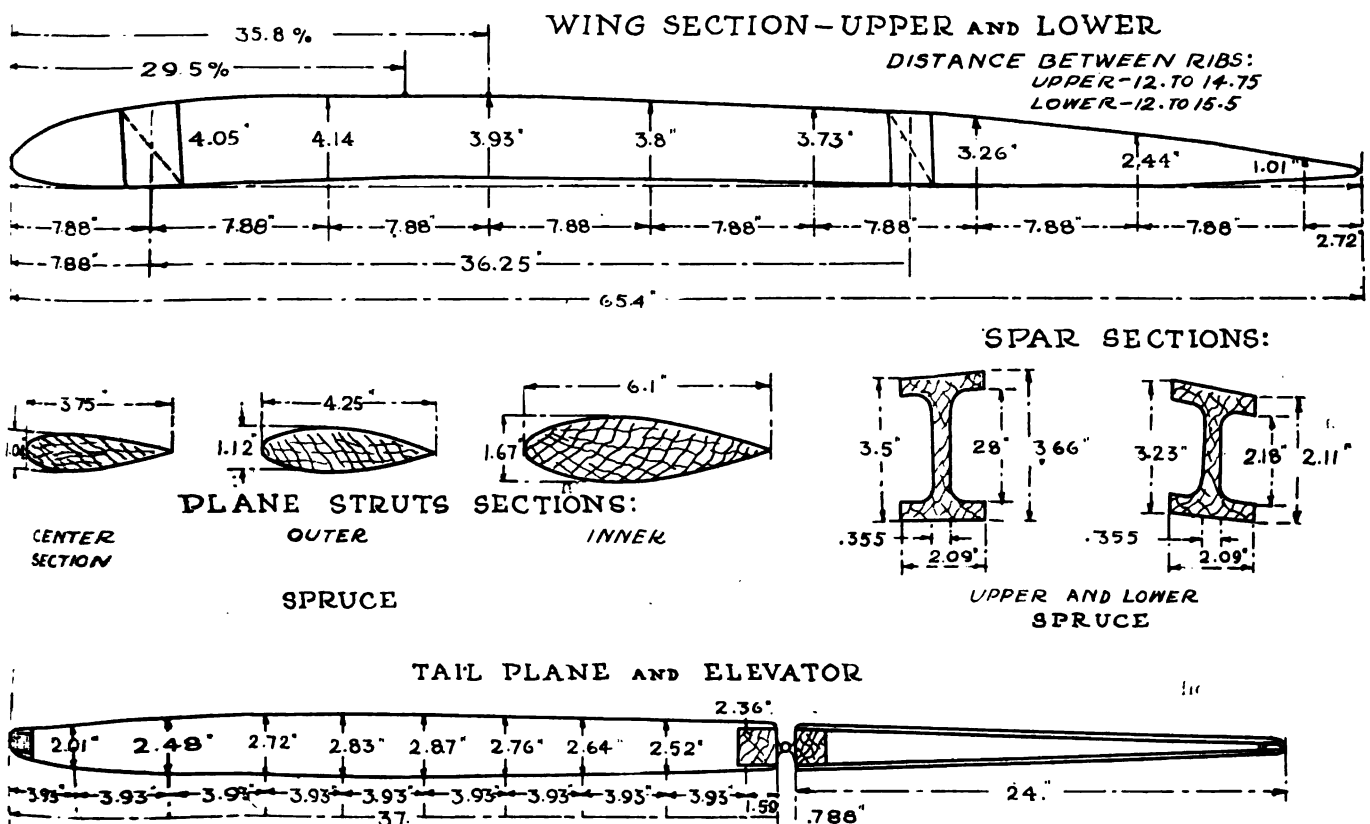
FOR the following description of the De Haviland biplane, one of the leading types of long-distance reconnaissance and bombing machines used by the Allied armies, we are indebted to our London contemporary *Flight*, which had it translated from the German aircraft periodical *Flugsport*. We have changed all dimensions both in the text and illustrations from millimeters to inches, having redrawn the illustrations.

This large airplane is chiefly built by the Aircraft Mfg. Co., Ltd. The different machines show minor differences in construction and outfitting according to the time of construction. Both wings of the two strutter biplane, which have distinctly rounded tips, have a span of 508½ in. (42½ ft.) and a chord of 66 in. The stagger is 12.5 in. There is no sweep-back, but the upper and lower planes are attached, respectively, to a center section 27.5 in. wide and direct to the body, at a dihedral angle of 174 deg. The pilot, whose seat is right under the top plane, center section, has a good view forward. The center section in the wings have their trailing portions cut away in the center to give a better view backward. The angle of incidence is 3 deg. at the body and at the top plane center section. Both main spars, which are of spruce, are of one section, left solid where the compression ribs are. At these points and where fittings are located the spars are not only left solid but are re-

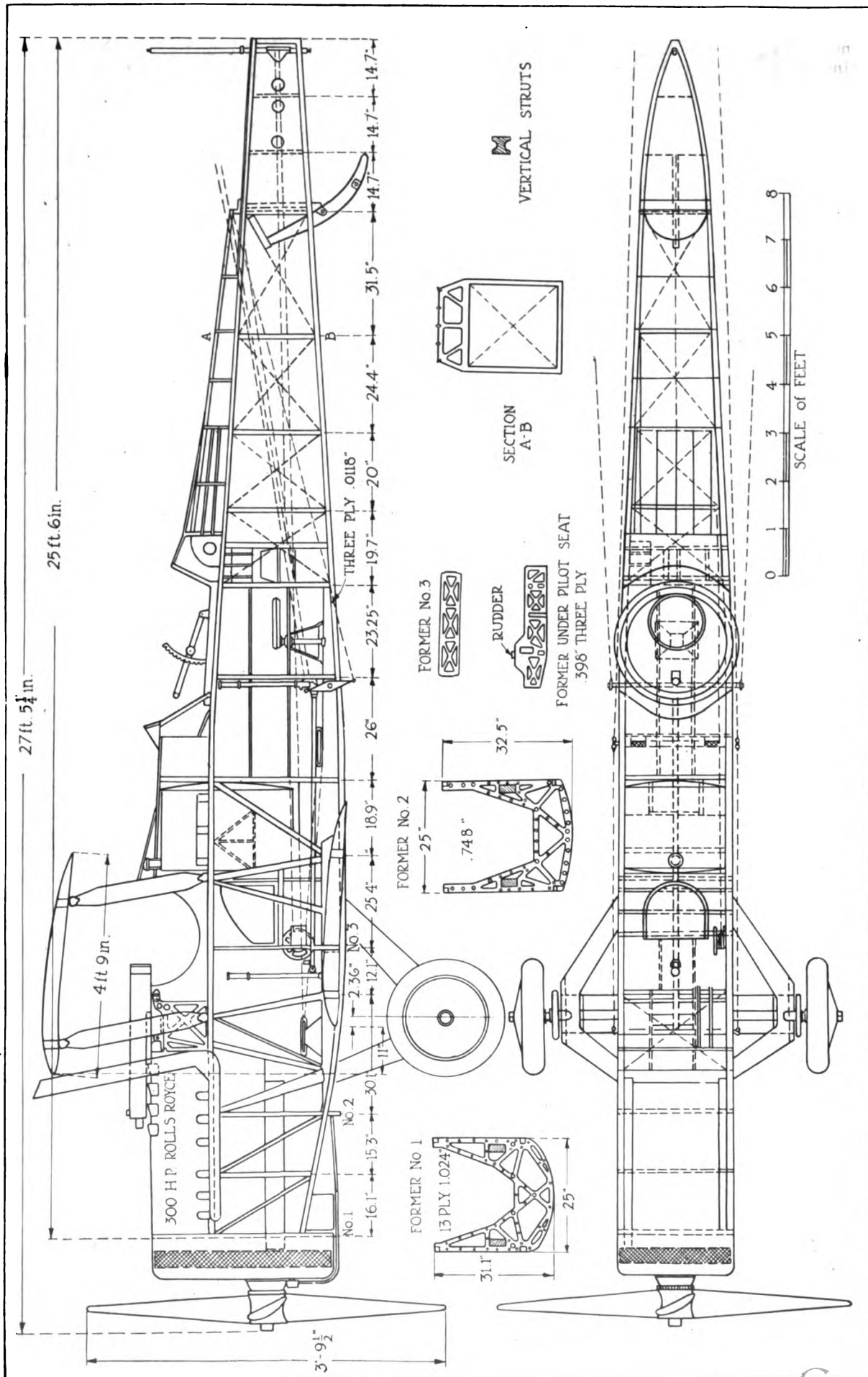
inforced by mahogany pieces glued and screwed on. At a point between the inner inter-plane struts and the commencement of the wing flaps the main wing spars are spliced and bound with fabric.

The wing ribs are only very slightly cambered on the under surface. Leading and trailing edges are slightly raised. Into grooves in the two flanges, which measure ½ in. in width and 0.175 in. in thickness, are glued and tacked with brass tacks the three-ply webs, which are provided with large lightening holes. The ribs at the struts and in the middle of each bay have flanges as wide as 1.45 in. and the web between them is solid spruce between the spars. Between every two ribs, which are spaced 12.2 to 15.7 in. apart, there is a false rib extending from the leading edge to the front spar. The internal wing bracing, which is of thick-ended wire, is in duplicate up to the middle of the outer bay. The wing covering is of a yellowish white color, and is sewn to the ribs in such a way that the stitches surround the whole rib. In front of the trailing edge, which is in the form of a strip of wood, eyelets are incorporated in the under surface, which serve to equalize pressure and to drain out moisture.

The crank levers of the wing flaps, which in all the planes are hinged direct to the rear spars, are made of 1/16-in. sheet aluminum which is reinforced on either







Assembly views and details of the body

side by facings of wood riveted on. The same construction is employed for the elevator and rudder cranks. At their outer end, where the control cables are attached, the aluminum cranks are doubled over. The very simply arranged wing bracing consists of stream line wire, while the external drift bracing takes the form of cables.

The wiring fittings are, as in so many other English machines, very simply carried out. Sheet steel plates 0.18 in. thick at the outer plane struts and 0.18 and 0.12 in. at the inner struts, having lugs bent to the angle of the bracing wires, are secured to the wing spars by two bolts. A large forked bolt passes through the center of the spar, while a second, smaller one, passes down the outside of the spar. The interplane struts, which are made of spruce, are of stream line section, and the inner struts are kept stronger than the outer ones. On the ends of the struts are short sheet steel shoes, into which are riveted aluminum packing pieces hollowed out in the center. Through these are passed 5/16-in. steel bolts, which rest in the forked end of the spar bolts, the bracing wires keeping the struts in place. The struts for the top plane center section are similarly attached.

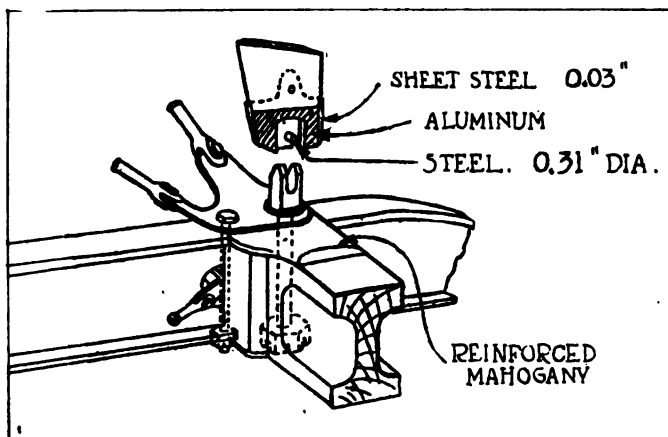
### Method of Building Up Body

The fuselage is covered with ply wood up to a point behind the gunner's cockpit, this part being built up without the use of diagonal bracing. The longerons are of spruce and the engine bearers of ash. The formers, as well as supports for controls and machine guns, are made of ply wood, some of which is 13-ply and as much as 1 in. thick. The fittings for the attachment of the lift wires are each connected with two 5/16-in. through-bolts. The after portion of the fuselage is carried out in the usual manner as a girder, and the longerons are spliced. This does not apply to the extreme rear part underneath the tail plane, which is covered with ply-wood  $\frac{1}{8}$  in. thick. In the front the fuselage has a rounded top. From the observer's seat vertical formers gradually carry the top into the rectangular section at the beginning of the tail plane.

The undercarriage is very light in proportion to the heavy machine. It weighs 119 lb. Each pair of struts is of solid wood and is not bound with fabric. Screwed to the struts are vertical strut-shoes of wood, which carry, in addition to the wheel axle, horizontal tubes for the attachment of the rubber shock absorbers. The axle rests between two cross-struts of wood, which are shaped to a fair shape and connected at the bottom by  $\frac{1}{8}$  in. three-ply. In order to cause no eddies during flight the axle is fitted into the stream line casing thus formed by covering its upper side with a layer of wood suitably hollowed out and secured to it with a wrapping of fabric. In order to better guide the axle in the slots in the struts this casing of wood is left square at this point and entirely surrounds the axle. It is covered with sheet metal. The diagonal bracing of the undercarriage is in the form of stream line wire, and is only placed in the bay of the front chassis struts. In addition there is a horizontal tension wire running in front of the stream line cross-strut.

### Attachment of Tail-plane

The tail-plane, which is of rectangular plan form with rounded corners, is so attached to the body that its angle of incidence can be carried from the pilot's seat, during flight, from +2 deg. to +5 deg., as in the Sopwith. For this purpose its front spar is so mounted as to be free to rotate, while the rear spar with its bracing is secured to a vertical tube placed in front of the stern post. This tube carries a thread engaging with an internally



Interplane strut attachment

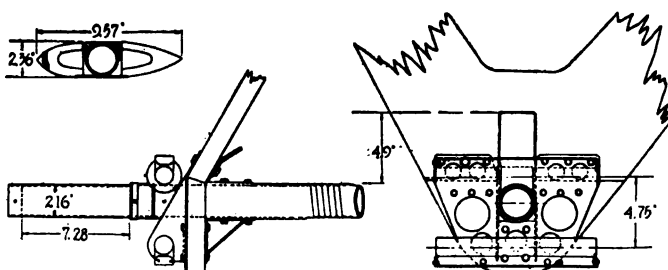
threaded bobbin, bolted to the stern post but free to rotate, operated by a hand wheel and cables, and forcing by its rotation the thread, and with it the vertical tube, up or down. The two elevator flaps, hinged to the tail plane, are not connected to one another. The rudder has a balanced portion as do many German machines.

The 12-cylinder Rolls-Royce motor develops, according to the firm's plate on it, 300 hp. at 1650 r.p.m., when the hourly consumption is 28 U. S. gal. of gasoline and 1.2 U. S. gal. of oil. The speed is not to exceed 1800 r.p.m. In general arrangement the engine is similar to older types of the same make, but it has four carbureters. The exhaust is either carried over the top plane or direct through short collectors slanting outward from the body. The nose of the fuselage is formed by a radiator fitted with shutters over its upper part. Through an opening in the center of the radiator projects the reduction gear of the engine, which reduces the speed of the airscrew to 900 r.p.m.

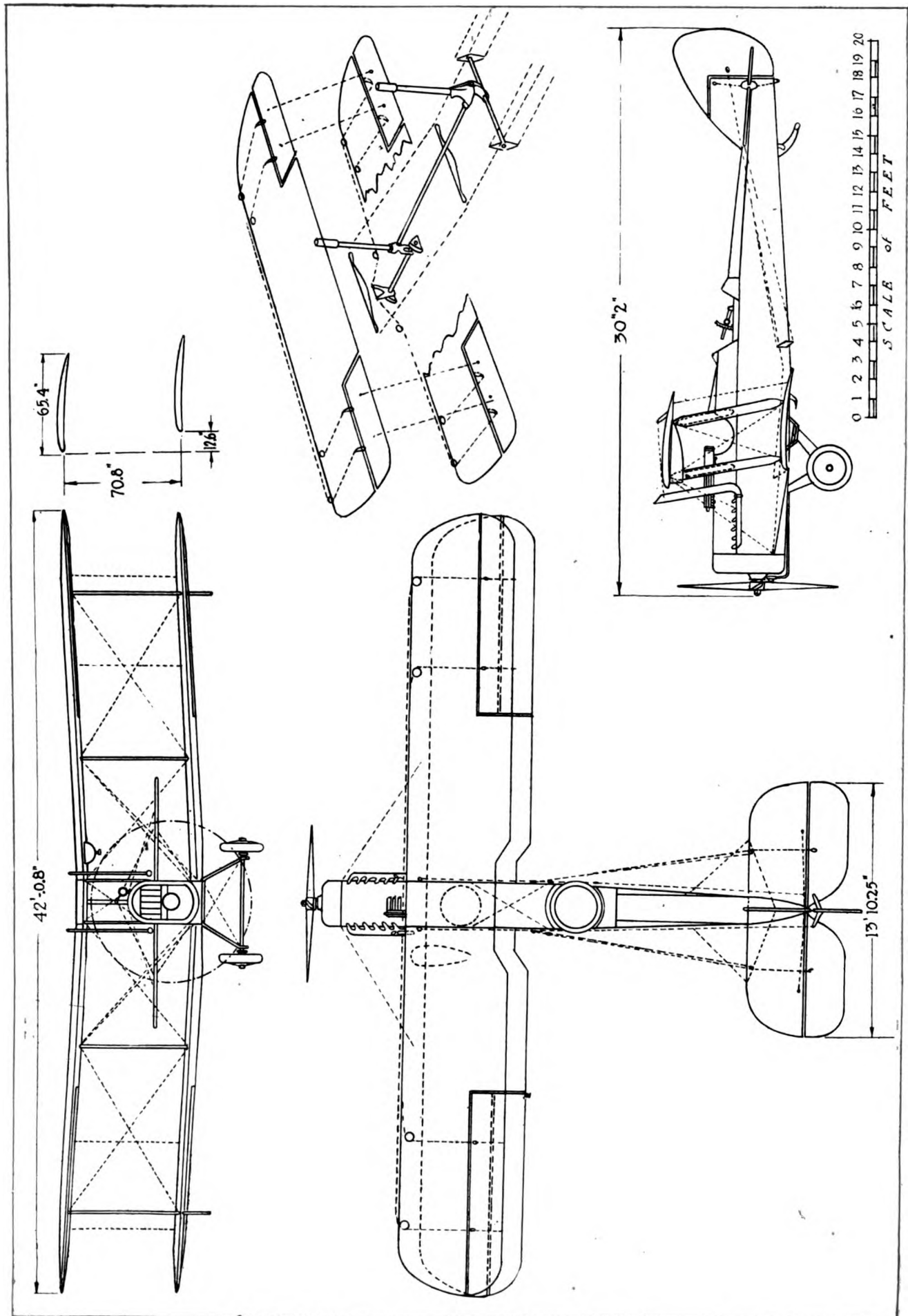
### Enough Fuel for 2¾ Hours' Flight

Under the front of the body is placed transversely the oil tank, which has a capacity of 5.5 gal. The main fuel tank, which is arranged for air pressure, has a capacity of 68 gal. and is placed behind the pilot's seat. A gravity tank holding 7.4 gal. is placed under the left top plane. Sufficient fuel is carried for a flight of about 2¾ hours' duration. In another there is an additional tank holding 20 gal., which brings the capacity up to about 3¾ hours.

More recent machines have, instead of the one pressure tank, and mounted in the same place, two tanks placed side by side, each of which is provided with a supply pump driven by a small propeller. With this arrangement a spring loaded valve is provided inside the tank which returns any surplus gasoline to the tank. The two leads from the main tanks and that of the gravity tank are joined at the engine to an omnibus tube, to which is attached a manometer for controlling the tanks.



Details of landing gear



*Elevations and plan of De Havilland biplane and sketch of its control connections*



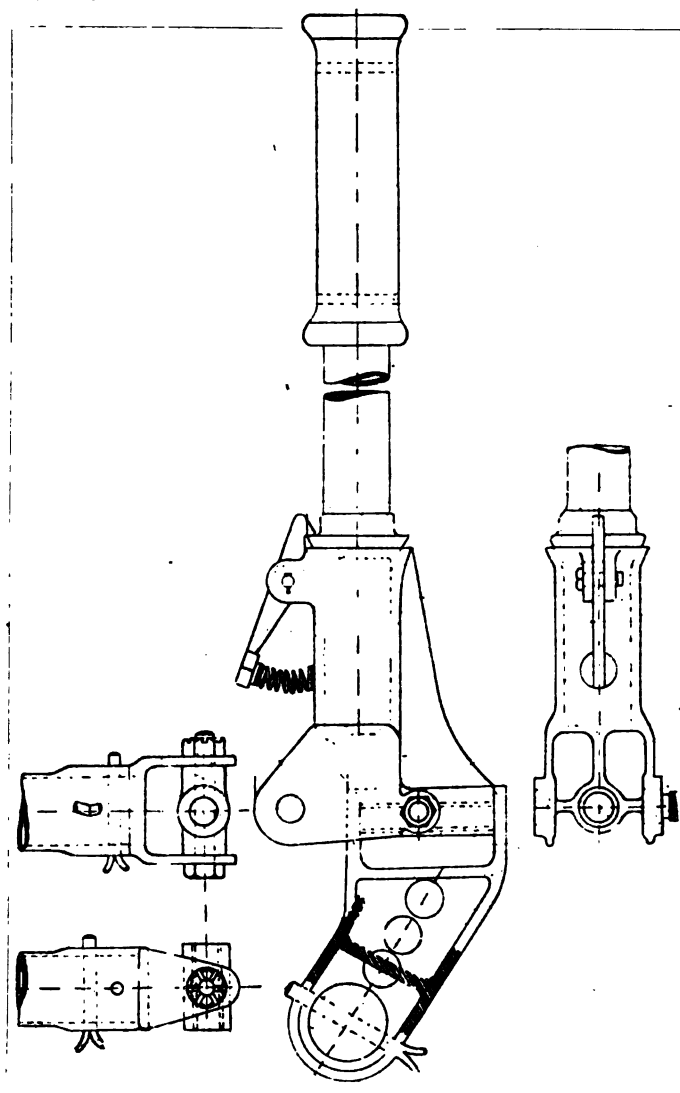
The machine is provided with complete dual control. The control lever of the observer is removable. The wing flaps are interconnected. Their cables run on the outside of the wings along the leading edge. Each wing flap has two crank levers. The upper and lower flaps are connected by two stream line wires. In the same manner the elevator and rudder cables run on the outside of the fuselage. The rudder cables are in duplicate, while each of the elevator flaps has single control cables.

The equipment of the pilot's and observer's cockpits differs in individual machines. On an instrument board in the former, provided with illumination for night flying, are the following instruments: Speed indicator, revolution counter, altimeter, thermometer, clock, hand pressure pump, inclinometer, map board and compass. To the left of the pilot the various fuel pipes are so arranged that the different cocks are within easy reach. On the same side are arranged oil and fuel pressure indicators, a pressure pump fed from the gravity tank, and also on a common axis the throttle, spark advance lever, and mixture regulator for altitude work.

On the throttle rods a catch lever is arranged, so that when the throttle is closed the lever for regulating the mixture at altitudes will return with it. To the right of the pilot are arranged the cables controlling the radiator shutters, the switch for night illumination and a shelf for signal cartridges. Fuel level indicators are not fitted.

In the observer's cockpit are placed a speed indicator, an altimeter, a throttle and a switch for night illumination. Observer's and pilot's cockpits are placed far apart, on account of the main fuel tanks being placed between them. For communication between the occupants there is a speaking tube on the right, and on the left an endless cable passing over rollers in the two cockpits. Behind the observer's seat is the mounting for the camera with adjoining shelves for the slides. The presence of a wireless outfit could not be ascertained in any of the machines. The armament consists of two interconnected machine guns mounted on a turntable in the observer's cockpit and of a fixed machine gun for the pilot mounted on the left of the top covering of the body. The control of the fixed machine gun is accomplished hydraulically by a control mechanism placed immediately behind the airscrew. This mechanism is driven off a pinion on the hub of the airscrew, and releases two shots for each revolution of the airscrew. Firing of the gun is accomplished from the control lever. A spring-controlled hand pump for filling the leads is mounted on the floor of the pilot's cockpit. For loading there is either a lever on the gun or a cable running over a roller, provided with a grip. A telescopic sight is placed to the right under the gun, in front of the rectangular wind screen. As the observer's seat is placed rather far aft a good field of fire is also obtained from here in an outward and forward direction.

The bomb gear, judging from the makeshift way in which the release gear is built, appears to have been added as an afterthought. Bomb racks, either arranged for four smaller or for one large bomb, are placed under the lower wings and under the body. The release is accomplished from the pilot's seat by means of Bowden cable. The cables are either joined at the right of the seat or arranged separately on the outside of the body. A sighting arrangement is built into the body immediately behind the rudder bar. It consists of a square plano-concave glass plate, 13/16 in. thick at the edges and 0.2 in. thick in the center. Underneath this are three wire rods soldered at right angles to a fourth rod lying in the direction of flight. Further down about 6 1/4 in. is another longitudinal rod, and a transverse rod working



Control lever and universal support

in longitudinal slots, and which can be locked in place by screws.

The weight of the machine empty, but including cooling water, was ascertained to be 2440 lb. If the maximum useful load is assumed to be 1300 lb. we obtain a total weight of 3740 lb. As the area is 434 sq. ft., the loading is  $3740 \div 434 = 8.6$  lb. per sq. ft. The load per hp.,  $3740:300 = 12.45$  lb. per hp.

<i>Weights</i>			
	Lb.	Lb.	
Motor . . . . .	858	Body accessories—	
Exhaust pipes . . . . .	33	Seats, etc. . . . .	17.6
Radiator and water..	169	Undercarriage . . . . .	119
Airscrew . . . . .	92.4	Tail skid . . . . .	11
Petrol tanks . . . . .	61.6	Controls . . . . .	20.9
Oil tank . . . . .	9.9	Wings . . . . .	460
Engine accessories, leads, etc. . . . .	43.2	Bracing . . . . .	68.1
Body and cowl. . . . .	385	Armament supports	88
Tail plane—			<hr/>
Incidence gear . . . . .	5.5		2440.0

<i>Loads</i>			
	Lb.		Lb.
Crew .....	330	Photographic outfit...	22
Armament .....	162	Wireless arrangement..	11
12 bombs, about.....	317	Fuel .....	452
Estimated useful load .....			1300 lb.
Weight of wings .....			1.06 lb. per sq. ft.

# Grease vs. Oil for Chassis Lubrication

Manufacturers Vary Widely in Opinion and Changes Are Frequent—Some Have Changed Back and Forth—Grease Under Pressure Desirable

**D**URING the winter of 1917 and the spring of 1918 a rising demand for oil chassis lubrication was noted. The idea of using oil lubrication from a central source of supply so that the individual bearing points would not require attention has always been attractive. The interest of every engineer in the industry was aroused by the system used on the Fergus car, in which the springs, shackles and other important bearing points throughout the chassis were lubricated from a central supply system. This system immediately reopened the controversy as to the comparative merits of oil and grease for lubrication, with the result that a considerable impetus was given to the adoption of oil for chassis lubrication. This demand for oil lubrication, particularly on the spring or shackle bolts and other points about the chassis customarily lubricated by grease cups, led to the use of oil cups in a great many instances. Now there has been a reaction, and a few of the manufacturers are considering whether it is not advantageous to use grease under conditions which eliminate the obvious disadvantages.

## Pressure Impossible with Oil

One of the fundamental difficulties with oil lubrication is that it is impossible to maintain pressure on the bearing surfaces; that is, the oil cannot be fed under pressure unless there is some sort of circulating system such as is used in the engine. If the oil were to be fed by pressure to bearings such as those of the shackle bolts the whole supply would soon be lost unless there was some means of trapping the oil working through the bearing and recirculating it. As this is impossible, or

at least impracticable, the feed had to be by gravity or by capillary attraction or some other means which, to say the least, is not positive.

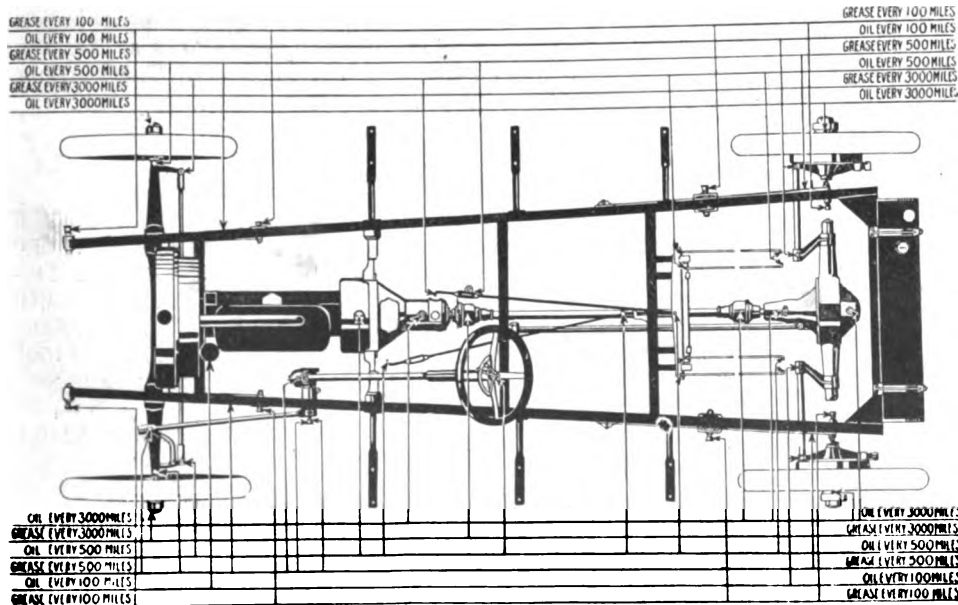
It is doubtful whether a feed of this kind is capable of maintaining the desired film, particularly with the rather heavy body oil necessary to take care of the conditions at certain points.

Grease has been used in bearings of this kind in preference to oil because of its ability to withstand pressure. Thin oil is useless if it is subjected to a very high pressure owing to its tendency to be squeezed out, or at least concentrated into the depressions of the metal surface, leaving the high spots exposed to wear.

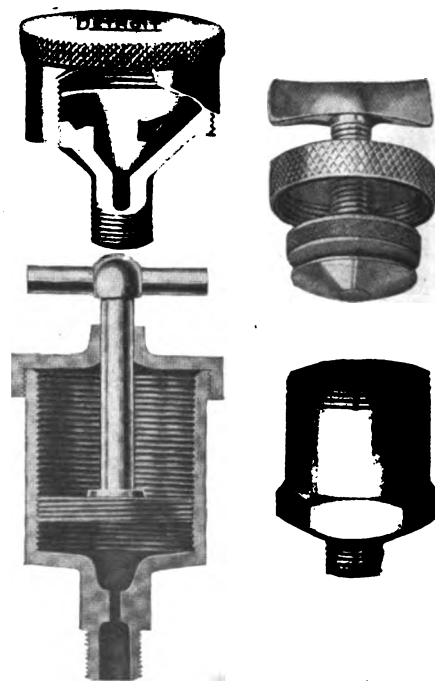
## Grease Better if Film Is Maintained

The chief advantage of oil as a lubricant is its fluidity. Because it flows so easily, oil can, of course, reach all parts of the bearing, but it is not this ability to flow which prevents friction. It is the greasiness, or what may be termed "oiliness" of the oil which prevents friction. With this in mind, it is obvious that where it is possible to feed or use grease for lubricating purposes and to positively maintain the film it is best to use grease.

Were it not for the fact that lubricating systems for trucks, passenger cars and tractors had to be so arranged that a temperature variation of possibly 100 deg. will be taken care of, the difficulties would not be so great. An oil of



Lubrication chart of average passenger car chassis, showing points where oil is used and where grease is used



Left, above—Patent type of grease cup in which grease is fed from a paper cartridge. Below—Section through ordinary type of grease cup. Right—Screw compression grease cup for feeding grease under pressure

the correct body for the particular job should be selected and used continuously. This cannot be done, however, in the case of a vehicle which operates outdoors. It is, therefore, necessary to combine the qualities of fluidity with those of greasiness or oiliness, as it may be called, in order to secure the correct kind of a lubricant to flow into the bearing and to lubricate it after it gets there.

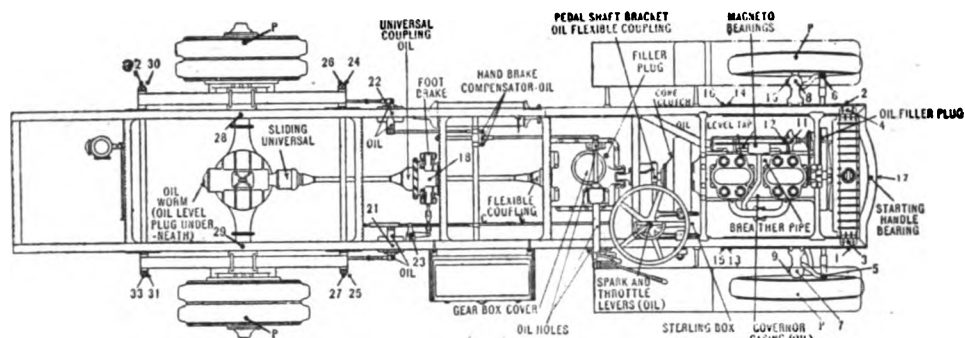
It must be remembered that fluidity, the property which causes oil to move into or through a bearing, also causes it to run out of it. Therefore, a lubricant such as grease, which stays wherever it is put, or at least tends to stay where it is put, has a marked advantage if it is possible to put the grease at that particular point. For this reason the use of grease cups in which the lubricant is introduced under pressure is attracting attention from engineers at the present time. The Packard company has recently introduced a number of pressure grease cups over its chassis to take care of conditions of this nature.

A perfect bearing, perfectly lubricated, would last forever. Perfect lubrication means the spreading of an unbroken film of lubricant between the bearing surfaces. When this film is broken the bearings come into metallic contact, and when bearings come into metallic contact wear takes place. The reason for a lubricated bearing wearing out is that the plane of the bearing surface does not coincide with the plane of the moving surface. In other words, the planes are not parallel. This break in the condition of parallelism, due to depressions in the bearing line surface or to projections from that surface, establishes a condition where it is impossible to protect the two surfaces by an oil film, and the result is that wear takes place. In other words, wherever the oil film is unbroken there is no wear.

### Difference in Films

The film established by oil lubrication and that established by grease lubrication are different. A microscopic view of a bearing lubricated by oil shows that there are two coats or films, one on each bearing surface. The friction is not between metal and oil, but between these two films of oil. On the other hand, the microscopic view of a grease lubricated bearing shows that there are three such films. One on each bearing surface and one between the two. The result is that a grease lubricated bearing has a third, extra cushion, which is one of the factors in securing more perfect lubrication.

It has been frequently asserted that a grease-lubricated bearing in winter time simply cuts a path for itself through the grease and lubrication ceases. This is a condition which may exist; but when it does, it means that the choice of lubricant has been faulty and compensation for winter temperature should have been made in the choice of the lubricant. To advantageously use grease on a bearing which has a heavy load to sustain it is necessary that the grease be put in under pressure. The only way that the grease can be put in under pressure is by means of a pressure cup or gun, which seals the grease against leakage of the plunger used to force it in. Some ingenious methods have been devised to accomplish this result; it is not the purpose of this article to mention these, but rather to give an outline of conditions which must be met in handling the lubrication question.



*Lubrication chart of a truck using oil lubrication throughout with no grease cups*

At the present time there are two main kinds of grease. One is produced straight from a crude petroleum, the other is a manufactured product, being a combination of mineral oils and tallow soap. The first kind are natural greases, which are nothing more or less than crude petroleum products and have been found to be quite satisfactory for most purposes, but are not always capable of withstanding large ranges of temperature. That is, they are either too soft to start with or under conditions of low temperature they are apt to harden excessively.

The manufactured greases vary in consistency from a heavy oil to practically a solid. The soap merely acts as a flux to bind the material together. That is, the soap is used as a binder for the mineral oil products. These two schools of grease manufacture have various arguments, and the question is one which is too large to come within the scope of this item.

### Manufacturers in Doubt

That the entire subject is one which has opened up a wide difference of opinion is quite evident from the number of times which certain manufacturers have changed from grease to oil and back to grease again for chassis lubrication. It is admitted that grease, when applied by the usual paddle method, is a dirt catcher, and unless the person greasing the car is very careful he is apt to introduce a considerable amount of dirt into the bearing along with the grease. On the other hand, grease, when squeezed into place, is a natural protector of the metal and tends to hold its film against heavy pressure. Oil is not always suitable except for very fine or delicate bearings, and the heavy oil which must be used as a substitute for grease is subject to limitations of flow, as well as to differences in its consistency due to variations in temperature. Undoubtedly, if a central lubricating system could be worked out either for oil or grease, a big accomplishment would have been made.

### Regenerated Rubber

**O**BJECTS made of a new regenerated rubber product, called agatit, were shown by Professor M. Le Blanc at the April meeting of the Bunsen Gesellschaft. This product has been worked out in the institute for physical chemistry of the University of Leipzig, by Le Blanc and Lüttke, in conjunction with industrials. It is supplied either in a fine emulsion or colloidal solution, which is convenient for many applications, or as a solid. The latter is much used, it was stated, in packing for condensers and on U-boats. It also serves as a substitute for leather, and is in one respect superior to rubber for this purpose, because it can be nailed and sewn, which is important for sole leather. Rubber gloves for medical men and feeders are also made entirely or largely of agatit. It was mentioned that rubber gloves were hardly obtainable at all in Germany now, while these new gloves only cost 2.50 marks; it is doubtful, however, whether this figure meant the estimated cost of manufacture or the sale price.



# Electric Heating and Heat Treating\*

The Advantages of the Electric Furnace for Forge Shop Use—Uniformity of Heating—Minimum Production of Scale—A Reduction in the Percentage of Imperfect Forgings

By T. F. Bailly

IT is only at a comparatively recent date that the heating and heat-treating operations incident to the manufacture of forgings have been considered with the seriousness which they require. A careful investigation of defective work and trouble with materials generally, has prompted the manufacturer to give more attention, not only to heat-treating furnaces and their shortcomings, but heating furnaces as well.

It is a well known fact among steel forgers that if steel is heated to too high a temperature, a so-called "burning" takes place, which is essentially an overheating of the steel, so that the occluded gases expanding in the plastic metal make the steel very porous, and in such a condition that no amount of forging or subsequent heat treating will correct this defect.

In addition to this, a great deal of trouble has been experienced by overheating the steel on the outside, due to too rapid heating. This is a common fault with particularly fuel-fired furnaces, and it is not an uncommon thing to see billets taken out of the furnace, whose exteriors are dripping, and whose interiors are still hard and difficult to handle in the dies.

The ideal conditions, of course, in heating a billet for forging, is that the metal is uniformly heated throughout, and have a minimum scale or oxide on the exterior. This is difficult to do in a fuel-fired furnace, owing to the fact that all fuel-fired furnaces, in order to obtain rapid heating, must run with a sharply oxidizing flame, and the oxidation or scaling caused by this flame may amount to as much as five per cent of the metal, in extreme cases.

The electric furnace offers an ideal heating medium for steel, as it is not necessary to carry such high ruling temperatures for a given heat desired in the metal, and the furnaces themselves operate normally with a reducing atmosphere at all times. There is, consequently, a saving in metal due to the lack of oxidation, which, in extreme cases of say 5 per cent loss on steel worth \$80 per ton, would amount to \$4 per ton of metal heated.

In addition to this, the steel being in a much better condition when it goes to hammer or press, due to the absence of scale, there is less wear on the dies and less danger of the dies being filled up with scale from the forging itself, as it is sometimes difficult, even with air blast or steam jet to keep the dies entirely free.

\*Paper read before the American Drop Forge Association.

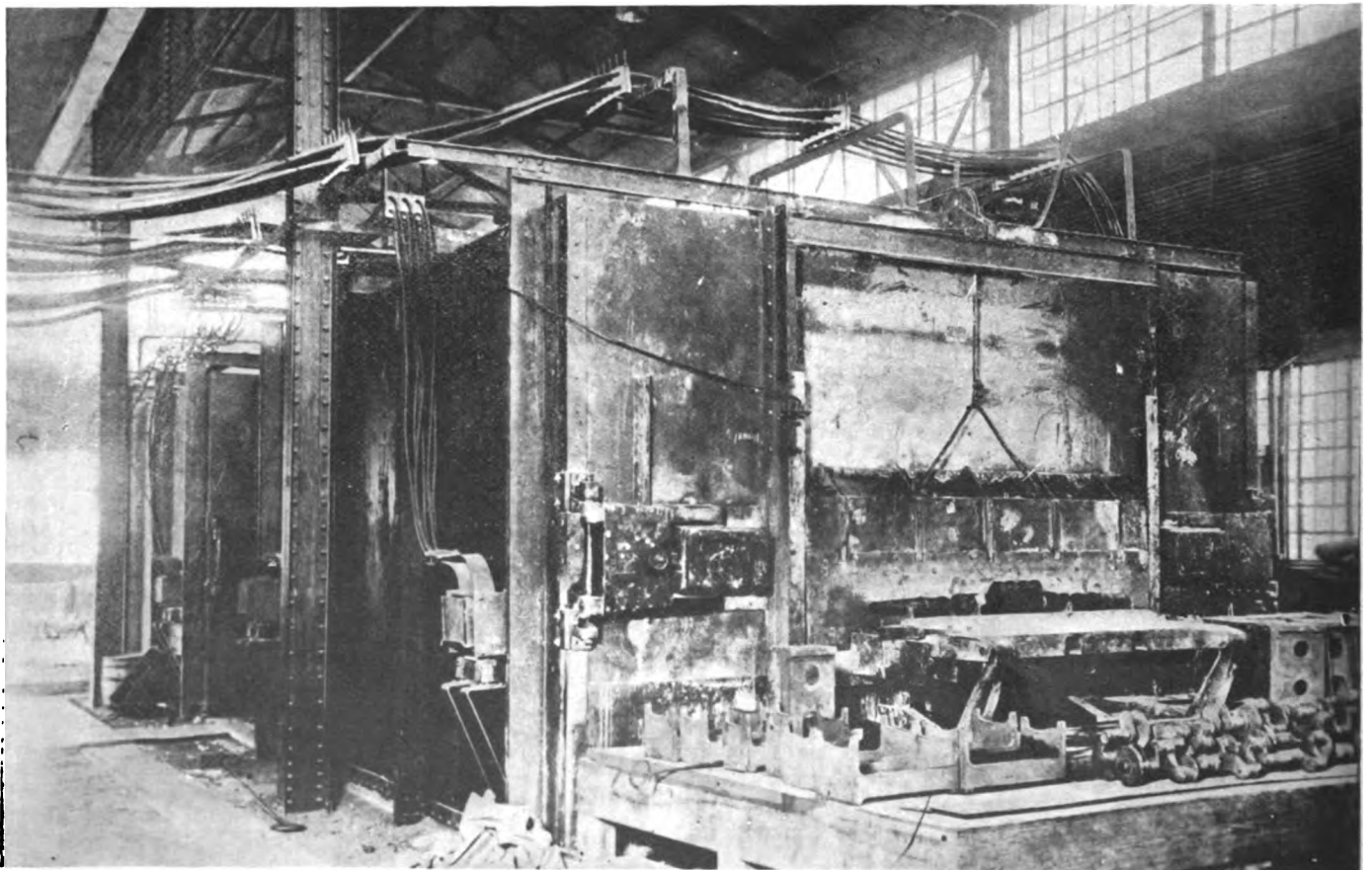


Fig. 1—A 900-kw. electric furnace for heat treating crankshaft forgings. Operating at full capacity it will heat 3 tons to 1650° Fahr., and draw at 1000° Fahr. after quenching in one hour

In addition the electric furnace is bound to reduce the number of defective forgings, some of which are always caused by improper heating, either from the wasting away of the steel if left too long in a fuel-fired furnace, or to a hard center, so that the steel does not flow well in the dies.

The question of the adoption of electric furnaces for the heating operations resolves itself then largely into a matter of cost, and this may be summarized as follows: Table 1 is a typical running sheet on an electric furnace of 600 kw. capacity heating 3¼-in. round billets for forging into 3-in. naval shells.

It is to be noted that the average current consumption per ton is a little less than 260 kw.-h.; but, taking as a basis, a figure of 300 kw.-h. per ton to cover delays and starting up this type of furnace, and with current at one cent per kilowatt-hour, the cost of heating for electricity would be \$3 per ton. The renewals and repairs should, in no case, exceed that of the fuel-fired furnace; and, due to the non-oxidizing atmosphere of the furnace, and the elimination of the sharp cutting flames, these repairs should average, in practice, much less.

Against this charge of \$3 per ton for electric furnace operation should be taken the fuel oil for a similar furnace, which, when operating on substantially 2 tons per hour, would approximate, in the average plant, at least 50 gal. per ton; and in direct-fired non-continuous furnaces this figure would be considerably increased. But even at a fuel consumption of 40 gal. per ton, and with oil at 5 cents per gallon, this charge would be at least \$2 per ton. Thus, if the metal loss on \$80 steel should be over 1½ per cent, or \$1 per ton of steel heated, the cost of electric furnace and fuel-fired furnace operation would be the same, with the exception of the better class of work done by the electric furnace, which would make a greater saving, due to the production of a higher percentage of good forgings put through the furnace and press.

On the 600-kw. furnace the difference in metal loss is some-

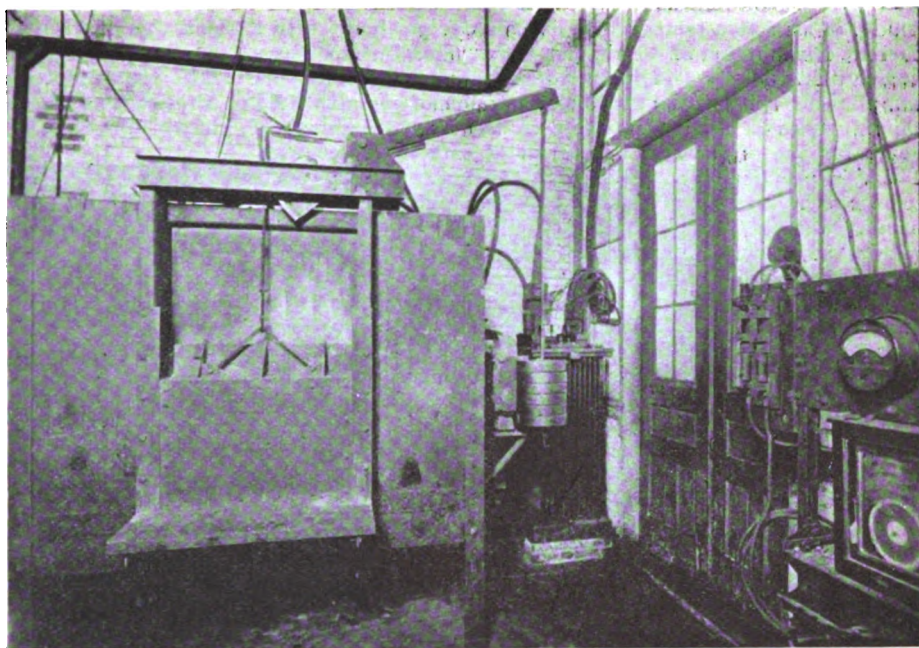


Fig. 2—A small electric furnace used in heating gear blanks, capacity 200 lbs. per hour to 1650° Fahr. using 40 kw. per hour

what over 5 per cent, and the reduction in the number of pierced billets rejected, due to eccentricity is such that in this item alone there would be at least 5 per cent more forgings by the electric furnace heating, due to the more perfect heating of the billets.

The heat-treating of forgings is a matter that has already been given a great deal more attention in the production of forged material than the heating just discussed, as the limitations in temperature and furnace conditions are more thoroughly known, and a variation of even 25 deg. in the heating, or more especially in the drawing temperature, makes a very noticeable and decided change in the physical characteristics of the piece.

There are perhaps no more exacting requirements in forging than those of gears for automobiles, and in this connection the furnace shown in Fig. 2 will be of interest. This furnace is the smallest type built and has a capacity for heating

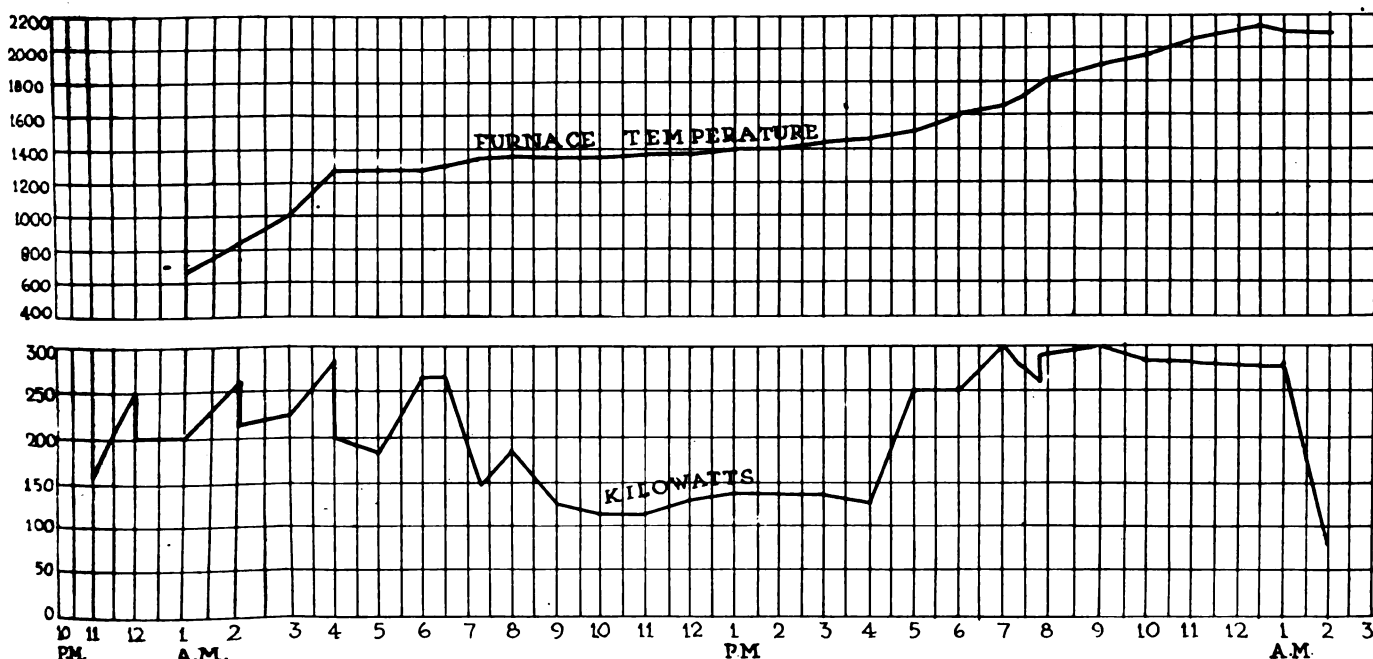


Fig. 3—Relative variations in furnace temperature and kilowatts used in run of furnace recorded in table on page 190

200 lb. of steel to a temperature of 1650 deg per hour, with a current consumption of 40 kw. per hour. This furnace has a hearth 2 ft. wide by 3 ft. long and a guaranteed current consumption of not to exceed 400 kw. per ton of metal heated. This furnace is used exclusively in the heat treatment of gears for one of the best known motor cars in the country. There is practically no scale in the furnace, and the gears come out in very much better shape than in fuel-fired furnaces, as it is possible to maintain the temperature well within the range of 15 deg. Fahr. above or below a desired point.

A larger size furnace, of the continuous type is used extensively for the heat treatment of small parts for airplanes—parts so small that it is necessary to place the material in pans in order to facilitate handling through the furnace. This furnace has a hearth substantially 10 ft. long and 2 ft. wide and a capacity for heating 1000 lb. of steel per hour to a temperature of 1650 deg. Fahr. with an electrical consumption of 150 kw. per hour and a current consumption of 260 kw.-hr. per ton.

#### A Furnace with Automatic Control

A larger size furnace has automatic control equipment by means of which the human element is very largely eliminated. This equipment is entirely automatic in operation, the only human labor involved being the placing of the material to be heated on the charging platform of the first furnace. All subsequent operations, including the removal of the material from the first furnace, the quenching in the quenching medium, the charging in front of the second furnace, the pushing through that furnace and discharging thence, all are controlled by a special motor-operated valve pulpit, and dominated by the pyrometers in the discharge end of each furnace.

The first equipment of this type was installed four years ago for the heat treatment of cast-steel draw-bar knuckles,

and was duplicated the next year by the same concern. Both of these equipments have attracted wide attention among men who are interested in the heat treatment of steel and continuous runs of over 5000 consecutive hours have been made, in which over 14,000 tons of steel were heat treated.

#### For Heat Treating Crankshafts

What is substantially a duplicate of these furnaces, except that it is adapted to the heat treatment of crankshaft forgings is shown in Fig. 1. The electrical capacity of this equipment is 900 kw. When operating at full capacity, it will heat treat 3 tons of steel per hour, consisting of heating to 1650 deg. Fahr., quenching and drawing at 1000 deg. Fahr. All of the operations of the furnace are hydraulic, the material being pushed through in cast chairs, supporting the material. This is necessary in this particular furnace, owing to the fact that all the forgings lack uniformity of section; while, as in the case of the draw-bar knuckles treating equipment there were two parallel surfaces which enabled the material to be put through without supporters or containers. The current consumption when heating to approximately the temperature mentioned above, and when operating at full capacity, is not to exceed 300 kw.-hr. per ton of metal heat treated, and it is possible to maintain a maximum temperature variation, when operating continuously and at full capacity, of not to exceed 10 deg. Fahr.

With an equipment of the character described, and with sufficient quantity of material to keep it operating at a constant rate, it is possible to substantially duplicate in the plant the conditions obtained in the laboratory and bring the heat treating operation to one of very high precision so that no parts should be rejected owing to defective treatment.

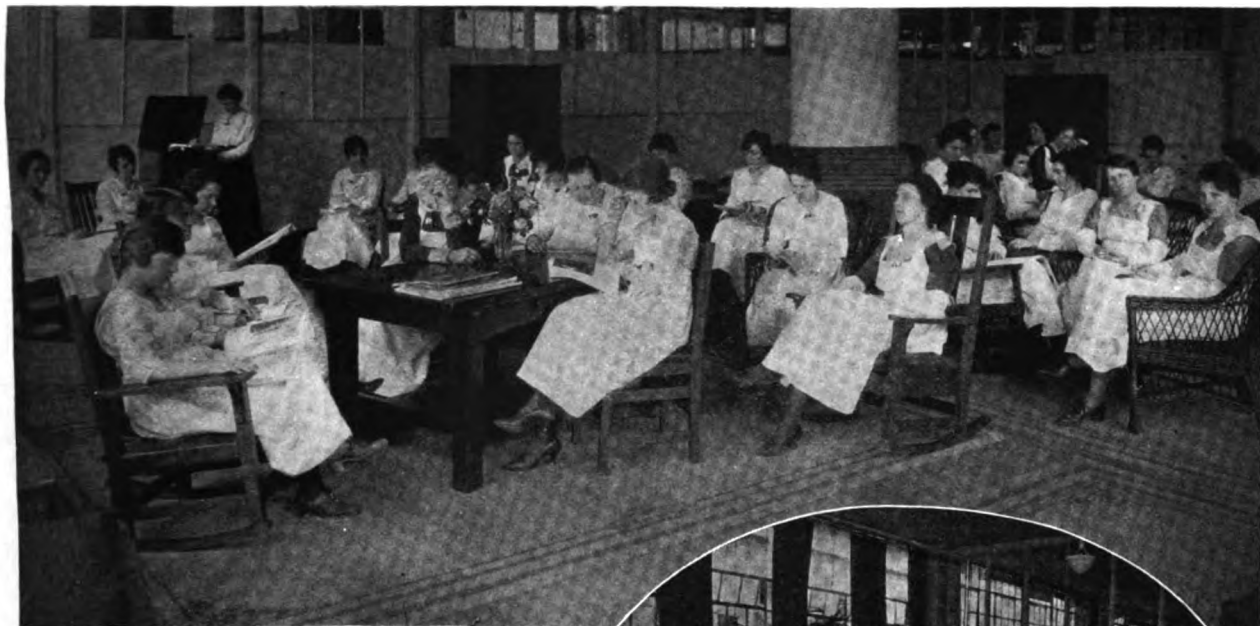
*In the discussion of the above paper by members of the American Drop Forge Association the consensus of opinion expressed was that for heating steel for forging electric heat was too expensive.*

### Heating Up Furnace No. 315 American Car & Foundry Co., Berwick, Pa., April 28, 29 and 30, 1918 Transformer No. 1

Time	Switch Points	Kw.	Watt-Hr. Meter	Kw.-H.	Trans. Furnace		Switch Points	Kw.	Watt-Hr. Meter	Kw.-H.	Trans. Temp. deg. C.	Remarks
					Temp. deg. C.	Temp. deg. F.						
9:20 P.M.	1-10	160	26,300	.....	30	.....	11-0	150	28,880	.....	32	Getting door in charging end.
9:45 P.M.	1-10	290	.....	.....	.....	.....	1-10	200	.....	.....	.....	
9:45 P.M.	1-10	290	.....	.....	.....	.....	1-10	215	.....	.....	.....	
10:00 P.M.	1-9	240	.....	.....	.....	.....	1-9	250	20,040	160	32	
10:00 P.M.	1-8	235	.....	.....	.....	.....	1-8	205	.....	.....	.....	
10:20 P.M.	1-8	245	.....	.....	.....	.....	1-8	215	.....	.....	.....	
10:21 P.M.	Cut power off.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
10:50 P.M.	1-8	155	.....	.....	.....	.....	1-8	125	.....	.....	.....	
12:00 P.M.	1-8	250	26,600	400	35	.....	1-8	250	29,400	360	38	
12:00 P.M.	1-7	200	.....	.....	.....	.....	1-7	200	.....	.....	.....	
1:00 A.M.	1-7	200	26,760	160	37	650	1-7	215	29,460	240	42	Air blast started on Trans.
2:00 A.M.	1-7	260	26,960	200	39	820	1-7	310	29,920	280	45	
2:00 A.M.	3-7	220	.....	.....	.....	.....	1-6	237	.....	.....	.....	
3:00 A.M.	3-7	230	27,280	240	39	1,000	1-6	240	30,200	280	49	
4:00 A.M.	3-7	240	27,520	320	43	1,275	1-6	280	30,600	460	56	
4:00 A.M.	3-6	200	.....	.....	.....	.....	1-5	200	.....	.....	.....	
5:00 A.M.	3-6	185	27,680	160	42	1,275	1-5	185	30,800	200	56	
5:00 A.M.	1-6	225	.....	.....	.....	.....	2-6	230	.....	.....	.....	
6:00 A.M.	1-6	260	27,880	200	44	1,275	2-6	245	31,040	240	58	
6:30 A.M.	1-6	260	28,040	160	.....	1,300	2-6	235	31,200	160	.....	
7:15 A.M.	3-5	150	28,100	60	40	1,340	3-5	150	31,200	.....	51	Pyrometer off; changed couple.
8:00 A.M.	3-5	125	28,200	100	37	1,350	3-5	130	31,400	200	45	
9:00 A.M.	2-5	130	28,400	200	40	1,350	2-5	145	31,600	200	42	
10:00 A.M.	3-5	110	28,400	80	83	1,350	2-5	145	31,800	200	40	
11:00 A.M.	3-5	110	28,600	120	36	1,375	2-5	145	32,000	200	40	
12:00 A.M.	2-5	130	.....	.....	.....	1,350	3-5	130	.....	.....	.....	
1:00 P.M.	2-6	140	28,800	200	38	1,400	2-6	130	32,200	200	38	
2:00 P.M.	2-6	140	29,000	200	38	1,400	3-6	140	32,400	200	38	
3:00 P.M.	2-6	140	29,200	200	37	1,420	3-6	140	32,600	200	38	
4:00 P.M.	3-6	130	29,270	70	36	1,450	3-6	140	32,680	80	37	
5:00 P.M.	3-7	250	29,400	130	35	1,500	3-7	250	32,800	120	36	Started to charge billets. Gland of pusher cylinder broke.
6:00 P.M.	3-6	250	29,700	300	36	1,600	3-6	250	33,200	400	32	
7:00 P.M.	2-6	300	30,000	300	40	1,650	2-6	285	33,600	80	42	
7:20 P.M.	3-6	270	30,120	120	42	1,700	3-6	310	33,520	320	42	
7:45 P.M.	3-6	265	.....	.....	42	1,800	3-6	285	.....	.....	46	
7:45 P.M.	2-6	295	.....	.....	.....	.....	.....	.....	.....	.....	.....	
9:00 P.M.	2-6	300	30,480	360	45	1,900	3-6	275	34,080	380	48	
9:00 P.M.	3-6	285	.....	.....	.....	.....	.....	.....	.....	.....	.....	
10:00 P.M.	3-6	280	30,800	320	46	1,975	3-6	285	34,480	400	50	
11:00 P.M.	3-6	280	31,120	320	46	2,025	3-6	290	34,840	360	50	
12:30 A.M.	3-6	270	31,520	400	46	2,125	3-6	290	35,560	720	50	Billets extracted by 4:30 A.M. Gland broke again 4:45 A.M.
1:00 A.M.	3-6	270	31,640	120	46	2,100	3-6	275	35,360	40	50	
1:00 A.M.	3-4	115	.....	.....	.....	.....	3-4	130	.....	.....	.....	
2:00 A.M.	3-4	80	31,760	120	46	2,100	3-4	90	35,640	40	50	
2:30 A.M.	Cut power off.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	



# Rest Rooms in a Large Ignition Plant



**T**HESE photographs show the interior of three of the rest rooms for women in a large plant devoted to the manufacture of ignition, starting and lighting apparatus. The welfare work of this plant is in charge of a committee composed of the forewomen of the different departments in which girls are employed. In each rest room there is a matron whose duties are to attend to the needs of the girls, to give out aprons, and to see that the privileges of the room are not abused. It is considered, in this plant, that a room approximately 30 x 65 ft. is necessary for 150 girls



# The Patent and Trade Mark Laws of the Argentine\*

Three Kinds of Patents Obtainable for Terms of from 5 to 15 Years—Novelty a First Essential—Priority of Trade Mark Registration in Most Cases the Only Requisite

By R. W. Huntington

A LARGE amount of misinformation regarding patent and trade-mark conditions in the Argentine Republic has been published or otherwise disseminated in the United States. The principal cause, however, of false impressions regarding patent and trade mark conditions in that country lies in the fact that many persons fairly well versed in similar matters in their own country jump to the conclusion that they must be the same everywhere. In patent matters in the Argentine the value of international jurisprudence is modified to a considerable extent by local legislation.

Another cause of confusion is the fact that Argentine patent and trade-mark laws are based on entirely different principles.

In the United States up to the present date about 1,300,000 patents have been issued for inventions and designs, and about 120,000 trade-marks have been registered. In Argentina on the other hand, since patent No. 1 was issued on Dec. 1, 1866, up to the present time, approximately 14,500 patents have been issued, and, since Dec. 27, 1876, when trade-mark No. 1 was registered, something over 52,000 trade-mark registrations have been made. That is to say, in the United States the ratio between the number of patents and trade-marks is more than ten to one in favor of patents, while in the Argentine Republic the proportion is about  $3\frac{1}{2}$  to 1 in favor of the trade-mark.

There is a reason for this inversed proportion in the two countries. In the United States as in Argentina, inventors' rights are based on priority of invention; whereas in the matter of trade marks, the laws of the two countries are diametrically opposed in principle. In the United States the mere fact of priority of registration does not hold against priority of use of a trade mark, so that registration is not necessary, although advisable, in order to protect the rights of the user of a brand. In Argentina, on the other hand, previous registration does prevail as against previous use, and for this reason it is absolutely imperative to register every trade mark used, and to do it before offering to the public the goods on which it is to be used.

## Argentine Patents

According to the Argentine Patent Law (No. 111 passed by Congress on Sept. 28, 1864 and signed by President Mitre on Oct. 11 of the same year) there are three kinds of patents, i.e.,

- 1—Patents of Invention;
- 2—Additional Patents;
- 3—Precautional Patents.

Patents of Invention are issued for 5, 10 or 15 years, the first two terms at applicant's option, and the latter or maximum term only to very important inventions originating in Argentina. The limit of time given to a patent for a foreign invention is 10 years, which can usually be obtained, always provided the foreign patent does not expire before the expiration of that term. The patent is not renewable on expiration of the term for which it is originally granted unless for reasons of force majeure the patentee is prevented from working the invention. Even in such cases the extension is

not provided for by law, but must be petitioned for administratively, and it has been granted in a very small number of cases. It is quite within the bounds of probability that some interesting cases of this nature may arise from conditions produced by the present world war.

Additional Patents are granted for improvements on an invention, already patented. They expire with the original patent unless granted after more than one-half of the term has expired, or if the improvement gives a reduction of more than one-half of cost or time of production, personal or property risks, or analogous results, in which case the Commissioner of Patents may decide what extension of the term may reasonably be granted. An additional patent may be taken out either by original patentee or by others, but in the latter case a royalty must be paid to the owner of the original patent, the amount of which is fixed either by mutual agreement or by the decision of the Commissioner of Patents.

Precautional Patents are popularly supposed to protect a partially developed invention until such time as it may be perfected when it may be converted into a regular patent. If this were really so, it would be similar to the United States "Caveat"; but the fact is that the law provides that if a second applicant applies for the same invention while it is covered merely by a "precautional patent," the two applicants are brought together and unless they come to an agreement no patent is granted to either of them; hence, this class of patent is only applied for by inventors who do not avail themselves of expert counsel.

In general, however, the Argentine Patent Law is good, and the protection afforded by a patent properly drawn up and based on real priority of invention, is ample. The punishment for infringement is sufficiently severe, including both fine and imprisonment besides the suit for damages which may arise out of the case; so that usually a simple admonition is enough to stop the repetition of the infringement.

## Novelty an Essential

A very general misapprehension exists arising from confusion of the patent with the trade mark laws, to the effect that a valid patent may be obtained by anyone, on an invention known and even patented in another country. Such a patent can only be obtained by false declaration as to novelty, and if an attempt were made to sue for infringement on it, a petition for annulment based on the production of published proof of previous public knowledge of the invention in any other country, would be successful.

The only valid patent based on a foreign invention is one which is applied for by the foreign patentee or his heirs or assigns, before the invention is worked in this country.

Many of the principal manufacturers of the United States are now aware of the importance of patenting their rights in Argentina before offering the patented article for sale here; since, if the article has already been manufactured here, or even sold either by the foreign patentee or any other person, such manufacture or sale constitutes previous public knowledge, and the foreign patentee would be barred from preventing such manufacture or importation, both of which might have been successfully avoided by applying for the confirmation of the foreign patent in time.

\*Abstract of a paper read before the American Commercial Club of Buenos Aires.

A small annual fee is due on each patent granted, excepting additional patents, and in order to keep the patent valid, besides the payment of these annuities, the invention must be "worked," i.e., either manufactured or offered for sale in this country, within two years from date of grant, and such working must not be suspended during any subsequent period of 2 years.

### Argentine Trade Marks

We now come to a phase of my subject which is of more general interest to merchants.

As previously stated, the Argentine Trade Mark Registration law is not based on the same principles as the Patent law. The fact that priority of registration is in most cases the only requisite to hold a trade-mark, and the additional fact that the law does not require the registrant to prove the fact that he is using the mark in order to register it, (as is the case in the United States) nor even to use the mark once registered, give the law a scope which in all probability was far from the intention of its legislators. While the object of such laws in all countries is to give protection to manufacturers and merchants in the use of their distinctive brands or emblems, the interest of the public in general is paramount in all legislation, and there is no doubt, not only that the public is not properly protected against imitations, when any person may register a well-known foreign brand and not only prevent the originator of the same from using it but also sell an inferior article under its name, but it is also a well-known fact that the law lends itself to a traffic in trade marks, thus making an article of commerce of what should be a protection to commerce.

Aside from this defect, the law is good, but in this particular it cries to heaven for amendment.

In the meantime, we must take the law as we find it, and like the patent law, it is a satisfaction to know that it is fairly administered by the authorities of the Argentine Patent and Trade Marks office, who nevertheless, like ourselves, must abide by it so long as it stands unamended or unrepealed.

There is only one alternative in view of the existing circumstances, and that is to apply for the registration of a trade mark before offering for sale any goods bearing it. This is so generally recognized by merchants here, that it is the usual custom to register all marks of any new goods received, not to defraud the manufacturers, but to prevent unscrupulous parties from defrauding them as well as the merchant. I could tell you of numberless cases in which reputable Buenos Aires houses have so done, advising the foreign manufacturer of their action and of its reason; but in the majority of cases the reason appears so absurd to the manufacturer that it is disregarded, and in some cases it even brings the merchant under suspicion, so that many have discontinued the custom of advising the home manufacturer for this reason. Now this may be all very well so long as the registration remains in honest hands, but an arrangement should in all cases be made between the manufacturer and the agent or merchant, to protect the former in case of the possible death or bankruptcy of the latter, in which case all trade marks registered in his name would be considered as an asset of the business, and might even be sold at auction, as has been done in several cases.

A notable exception to the general rule of the predominant value of previous registration, is the fact that according to the Argentine Law, personal surnames and portraits are protected. This rule is very strictly carried out by the Trade Mark Office, and when such names or portraits have been registered, it has always been by misrepresenting them as arbitrary or fictitious. When you hear of a foreign firm having been able to obtain redress in the Argentine courts for the improper registration of their names by unauthorized persons, you will find on investigation that it has been for this reason. But even in such cases, subterfuge has in some cases been resorted to by producing an individual of the desired name, making the petition in his name and assigning it afterward. This phase of the question is hard to avoid, as are legal subterfuges everywhere.

### The Things That Are Registrable

The Argentine Trade Mark Law (No. 3975, enacted Nov. 23, 1900, and which revoked all previous legislation) is now

what we must abide by in the registration of trade marks. By its enactments, the subject of a trade mark in general is similar to requirements in the United States, with the notable exceptions that proper names and geographical words are registrable, under a special form. Combinations of numerals are also registrable. The form given to the product itself is not registrable, but any novel form given to a container, if only for the purposes of identification and not of utility, may be registered to cover the class of goods sold in the container.

The registration is for the term of ten years, and is renewable indefinitely for like periods. The entire amount for the registration must be paid on filing the application, so that no subsequent payments are required until the time for renewal, when the matter is treated in all respects like a new application. If the registration is rejected, applicant may either substitute another mark by paying the additional expenses of publication, etc., or petition for the return of the payment made, except that portion of it which has been disbursed for reglementary public notices.

About ten days after filing, the application and facsimile of the mark is published in the *Boletín Oficial* for five consecutive days, and within thirty days from the last day of publication anyone deeming his rights to be aggrieved may file a protest. Unless in cases of evident fraud, however, this protest is useless unless based on a previous registration or the fact that the mark applied for contains the name or portrait of the person so protesting.

Afterward, the office makes a search, and if no objection is found, the mark is granted, at present about five months after application, varying according to the volume of applications presented at the office.

### Infringement Penalties

The penalty for imitation or infringement of a registered trade mark, like the case of the patent law, includes a fine and imprisonment, and the latter may not be commuted to a fine. For this reason, suits of this nature are very much dreaded, and it is not pleasant to become the defendant in such a case. The articles constituting the infringement are subject to seizure and sale in benefit of the Public Education Fund, and the defendant, if condemned, may be liable to a further civil suit for damages.

The names of firms, companies, merchants and manufacturers engaged in business in this country and duly registered or licensed as such, are protected by law without the necessity of registration as trade marks; nevertheless, they may be so registered, and since in the former case opposition must be made within one year from the time when a rival house with a similar name begins to do business under such name, while in the case of a trade mark the term for prescription of action is three years, or one year from the time when the facts came to plaintiff's knowledge, the advantage is evident and such registration is quite usual, even by local houses. In the case of foreign houses it is very necessary, since they do not enjoy the common law protections above mentioned.

Quite recently a new registry has been inaugurated within the Trade Mark Office, for such firm or company names, and for other designations applied to business houses rather than to their goods. This is available, however, to houses established here only, or to foreign houses with established agencies in this country.

Quite a general impression seems to exist that a radical change has taken place in Argentine trade mark legislation. This is not true. The law remains unchanged. It is true that in 1912 a new classification was adopted and the ruling made that each class must be registered separately, since previously it was possible to register a mark for all classes of goods for a single fee; while more recently another ruling has added the cost of advertising to the expenses of registration, and still more recently the new stamp law has even further increased the cost, especially in the matter of the legalization of the power of attorney. Furthermore, a few isolated decisions of the Chamber of Appeals have appeared almost to reverse its former sentences in the sense of being more favorable to foreign interests; but one swallow does not make a summer, nor does one sentence make jurisprudence, especially when in opposition to the great mass of decisions; and it will be safer to view the law from the standpoint of the prevailing mass of jurisprudence.



# Doman Tractor Engines

Made in Three 4-Cylinder Models to Suit Practically All Power Requirements—  
All Cylinders Are T-Head and Those of the Smallest  
Model Are Cast in Pairs

**T**HREE models of tractor engine are being manufactured by the H. C. Doman Co., Oshkosh, Wis. They are all of the slow-speed, heavy-duty type and were specially designed for tractor work. Each of the important features of design was given an exhaustive study before it was decided upon. Thus, for instance, although the T-head type of cylinder is somewhat more expensive to manufacture, the company has held to this type because it affords the opportunity to secure perfect water circulation all around the valves and to use valves of larger diameter, thus insuring the highest volumetric efficiency. As regards the grouping of the cylinders, the unusual wear of cylinder walls in tractor engines has been the deciding factor. If all four cylinders were cast in a block, any damage to one of the cylinders would prove exceedingly expensive. Therefore in the two larger sizes of Doman engines all cylinders are cast separately, whereas in the smaller size the cylinders are cast in pairs.

It is undisputable that a low-speed engine will outlast a high-speed engine, and in view of the fact that in tractor work engines are required to work under considerable load all the time, the Doman company has designed its engines to operate at comparatively low speeds of revolution. These engines are designed to develop their best efficiency at from 600 to 900 r.p.m., and it is the belief of the Doman company that a tractor engine should not operate at more than 900 r.p.m.

The illustrations herewith are of the small size, a four-cylinder engine of 4½ in. bore by 6-in. stroke, rated at 25-35 hp. This engine is designed for use on a three- to four-plow tractor. The piston displacement is 425 cu-in. and the weight complete of the engine is 800 lb. The cylinders are cast in pairs, of close-grained semi-steel and are of the T-head type with an unusually large water jacket around the valves. The cylinders are ground to size and are tested for leaks under hydraulic pressure. It will be noted from the sectional view that the cylinder heads are cast integral with

the cylinders, and there are large openings in the water jacket heads which are closed by plates to which the water return pipe is bolted. Pistons are made of semi-steel and are turned down to size. The wristpins are made of low-carbon steel, case hardened. They are hollow, are ground to size on the outside and are secured to the connecting-rod by a clamping bolt which passes slightly beneath the surface of the pin so as to prevent longitudinal movement of same.

The connecting-rods are drop forgings, of I-section, and are heat treated. The caps are secured by means of four bolts.

All crankshaft bearings are 2½ in. in diameter. The crankpin bearings are 2¼ in. long and the main bearings of the crankshaft are of the following lengths: Front and center, 4 in. each; flywheel end, 4½ in. This gives a total main bearing length of 12¼ in. The crankshaft is made from 35-45 point carbon steel, double heat treated and annealed. All bearings are ground to size. The crankshaft and crankpin bearings are die cast of high-duty babbitt, and are backed by bronze. The camshaft is supported in three bearings, of which the forward and center bearings measure 1½ in. in diameter by 1½ in. in length, while the flywheel end bearing measures ¾ in. in diameter by 2¼ in. in length. Hence the camshaft can be withdrawn from the engine through the forward end.

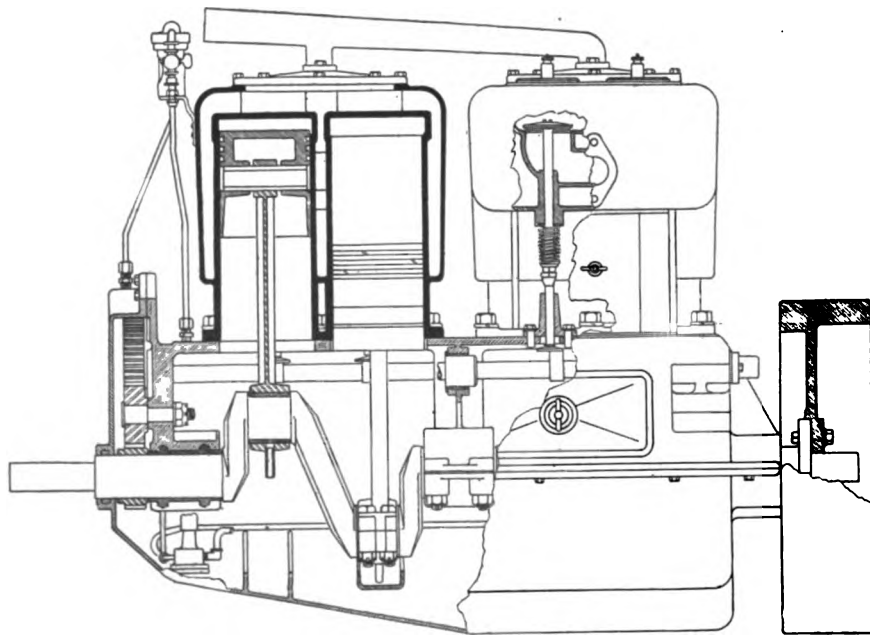
## Mushroom Type Cam Followers

The valves have a clear diameter of 2½ in. Their heads are of nickel steel and are electrically welded to the carbon steel stems. Valve operation is by push-rods with mushroom type cam followers. These are offset from the centers of the cams lengthwise so as to prevent the wearing of a groove. The timing gears are of 1½ in. face and cut with 10 pitch teeth.

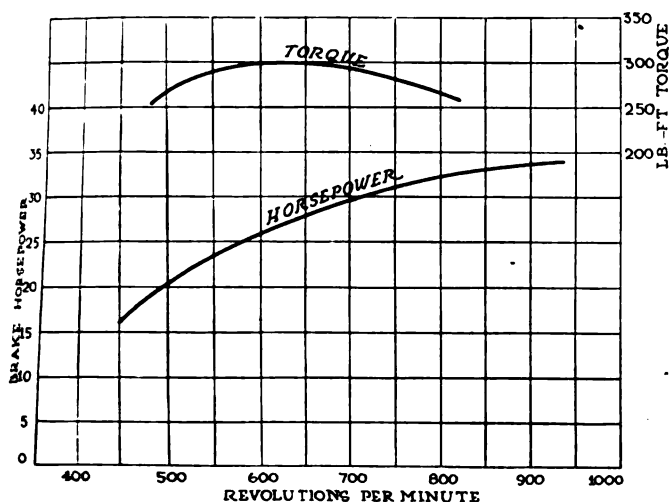
The crankshaft and idler gear are made of 35-45 carbon steel, while the camshaft and accessory drive gears are made of semi-steel. A centrifugal water circulating pump is fitted to the engine, of sufficient capacity to cool it under the hardest working conditions.

The Doman engines are regularly designed for the use of gasoline, but the company has evolved a special exhaust and jacketed intake manifold which can be attached to the engine at a small extra expense. This manifold, it is stated, permits of the use of kerosene with any good make of carbureter. A horizontal fly ball type of governor is fitted, which controls the amount of mixture entering the intake manifold. The governor is inclosed in a dust proof case and is claimed to be non-racing. Ignition is by a high-tension tractor type magneto equipped with impulse starter. No batteries are used.

The crankcase is cast of semi-steel in two sections. All of the crankshaft bearings are supported by the upper half and the lower half contains only the oil troughs and the oil reservoir. There are four large hand holes with cover plates in the upper half of the crankcase, and as there is also a removable cover plate over



Part-sectional view of Doman Type HT engine



*Torque and horsepower curves of Type HT engine*

the gearcase, all of the working parts are readily accessible. Lubrication is by the circulating-splash system. There is an oil trough under each connecting-rod head, and the oil is circulated by means of a gear pump located under the forward bearing and distributed by means of a distribution pipe with openings opposite each trough. A branch from the distribution pipe feeds oil through a sight feed to the cam gear housing. The valve mechanism is inclosed by removable housings and the whole engine is of neat and trim appearance.

The radiator fan is driven by means of a flat belt off the crankshaft. The spark plugs are located in the caps over the inlet valves and the high tension cables from the magnetos are carried to them through a tube.

The second size of engine made by the Doman company has four 5 x 6 in. cylinders and is rated at 35-40 hp. It is also designed for use in three to four plow tractors. The construction features are much the same as in the smaller engines, except that the cylinders are cast separately and the valve springs are inclosed in tubular housings. The largest size of Doman engine has four 6 x 7 in. cylinders and is rated at 40-60 hp. It is designed for use in 4-6 plow tractors. This type also has individually cast cylinders and sleeve covers for the valve springs.

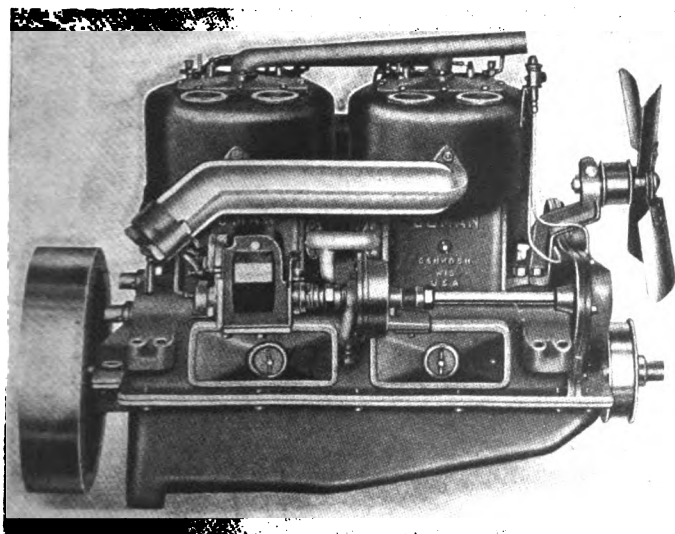
Special emphasis is laid by the Doman company on the finish of their engines. They are first given a heavy coat of filler and are allowed to dry thoroughly. They are then carefully sanded, after which they get a coat of sealer and are again allowed to dry. They are once more sanded before the final coat of enamel is put on. This gives the engines a glossy finish which will withstand heat and oil.

## Standardization of Milling Cutters and Small Tools

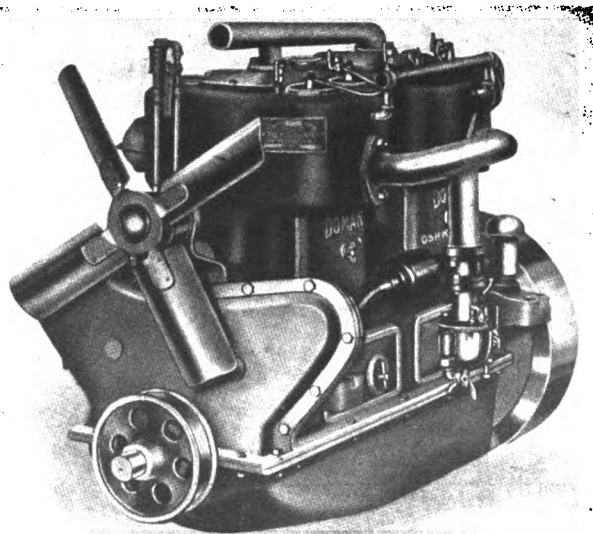
THE British Engineering Standards Association (by which name the Engineering Standards Committee will, in future, be known), at the request of a large number of manufacturers, who have felt that lack of standardization has hampered production and retarded progress, has recently formed a representative sub-committee to deal with the standardization of milling cutters and small tools. The work coming properly within the scope of Colonel Crompton's Sectional Committee on Machine Parts, he presided at a conference, at which the principal firms and associations interested, both makers and users, were present. Representatives were also present from the Ministry of Munitions Small Tools Department and Woolwich Arsenal. The subject was fully discussed, with the result that the meeting was unanimously in favor of standardization being undertaken. The sub-committee is under the chairmanship of R. Dumas, of the British Thomson-Houston Company, and a number of panel committees have been nominated to undertake the detailed study of the subject, as follows: Panel I, Form relieved cutters; Panel II, Non-relieved cutters; Panel III, End mills; Panel IV, Reamers.

On account of the pressure under which the industry is working at the present time, the committee have decided, in order to save the time of the members, that the work shall be carried out by these panels at convenient centers, those selected being Birmingham, Leicester, Manchester and Sheffield. The detailed reports of the various panels will be considered by the sub-committee sitting as a whole. In view also of the large amount of American machinery in England, it is hoped to establish close and direct co-operation with American engineers and manufacturers through the American Society of Mechanical Engineers; Continental practice will, doubtless, also be taken account of. It is quite realized that the work being undertaken, important as it is, will be largely in the nature of reconstruction work, and that the standards arrived at can only be introduced gradually on account of the amount of machinery already installed; yet, on all sides, expression has been given to the desire for such standards to be formulated without further delay, in order that gradually the present unsatisfactory position may be effectually ameliorated.

THE aluminum industry of all countries has been considerably developed since the war started. The annual report of the Swiss company at Neuhausen shows greatly increased output and large profits during the past year. A sum of some \$1,000,000 has been set aside from the gross profits of the year to provide further hydraulic power to extend operations.



*Right side view of Type HT*



*Three-quarter left side view of Type HT*

# New Axle for Four-Wheel Steer Trailer

Standard Parts Co. Has Standardized Unit for 3½-Ton Design of Trailer with and Without Brakes

THE growing use of four-wheel steer trailers for both military and commercial purposes has led to some ingenious designs of axles for this purpose. By means of suitable axle arrangement it is possible to use trains of trailers of considerable length. One of the recent designs of axle brought out by the Standard Parts Co. is illustrated herewith and shows some novel developments in brake and steering layout.

The meritorious feature of this type of axle is that it is absolutely interchangeable for front and rear, and the axle can be used either with or without brakes and still have a large number of the parts interchangeable. The axle is intended for a four-wheel steer trailer such as is in quite general use at this time. It is intended to have one or two men riding on the trailer, and these men can operate the brakes on the trailer when necessary, thus enabling the train to stop much more quickly than if there were brakes on the rear wheels of the leading truck only.

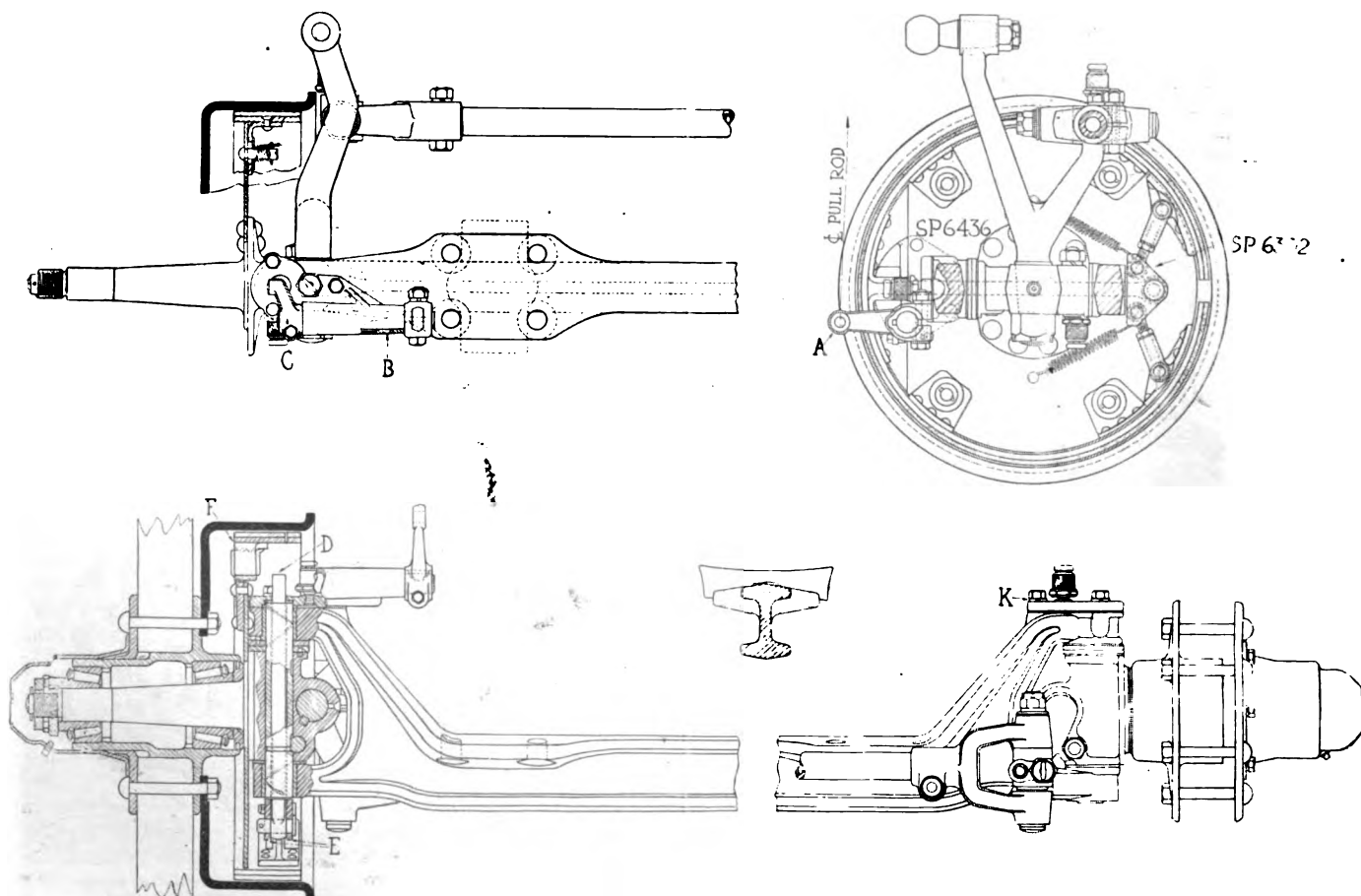
## Layout of Brakes

The layout and operation of the brakes is probably the most interesting part of the axle, as it is a matter which is often approached with a great amount of diffidence by designers who fear the unusual combinations of linkage necessary for the operation of front wheel brakes. In the layout shown in the illustration herewith the pull rod operates on the lever *A*, which is attached to the shaft *B*. Pulling on the

rod through the brake lever causes the lever *C* to push down on the pin *D*. This pin is connected to the two equalizing plates *E*, which are in turn connected to the toggle links which expand the brakes. The brake is anchored by a U-shaped bracket *F*. It is apparent that the turning of the knuckle will affect the operation of the brake. It is also to be noted that the steering knuckles can be used on either end of the axle by turning them end-for-end and upside down.

If one of the two axles used on the trailer does not have brakes—and it is the usual practice to put brakes on one axle only—this is taken care of by simply omitting the brake drum and the brake operating parts, but using the same hub, thimble, king bolt, I-beam, etc. This gives a standardized type of axle which makes a good production proposition because of the fact that so many of the parts are duplicated regardless of whether braking is required or not.

WE have received from the Erie Specialty Co., 8 West Fortieth Street, New York City, a copy of the concern's catalog on standard aircraft metal parts. The Erie Specialty Co. was specially organized for the purpose of manufacturing aircraft metal parts, and has built up an efficient organization. The catalog lists the various aircraft bolts, nuts and clevis pins standardized by the S. A. E. A telegram code is given for ordering parts in a hurry.



Interchangeable front and rear axle for trailers



# Tractor Operating Cost in the Corn Belt

## An Analysis and Tabulation of Data Obtained from More Than 600 Farmers in Illinois—Relative Figures for 2-, 3- and 4-Plow Machines

**A**N increase in the number of farmers securing profits from the use of tractors is reported in a pamphlet on tractor experience in Illinois issued by the U. S. Department of Agriculture. Tractors do not increase the crop yields, but their advantages lie in labor saving, speed and adaptability for night work, states the report. The tractor has not reduced the number of horses used on farms but is replacing them in much of the work which they formerly performed. Ninety per cent of the tractor owners in Illinois reported profits from their tractors as compared with 80 per cent in the year preceding. Preference for 3-plow tractors was expressed by 76 per cent of the farmers, while more than three times as many 2-plow machines were found in use as 4-plow.

The present report is based on detailed reports from 359 tractor owners in Illinois made during the summer of 1917 and 284 reports made during the spring of 1918.

Inquiring for the principal advantages of the tractor for farm work the Department of Agriculture found that the ability of the tractor to do heavy work quickly is considered the principal advantage. The saving of man labor is next. The ability to plow to a good depth, especially in hot weather, is also emphasized. The availability of the tractor for night work is mentioned.

Under the leading disadvantages, the difficulty of efficient operation is the principal point named. Packing of damp ground is mentioned, as are also expensiveness, delays and inability to use the tractor for some work still performed by horses. That disadvantages are not emphasized to so great an extent as formerly is noted by the Department.

Small farms do not warrant tractors, says the report, but experience shows that where a tractor is purchased for a small farm, the farmer usually increases his farm to meet the capacity of the machine. One-third of the Illinois farmers reported increase of acreage farmed after they purchased a tractor. This is considered especially significant as there has not been a tendency to increase the farms recently excepting where tractors are used.

### Three-Plow Type Predominates

The 3-plow tractor outfit predominates, due, according to the Department of Agriculture, to experiences which show that large outfits are not economical for ordinary farm conditions and that the 3-plow outfit meets the requirements in acreage plowed per day and maintenance costs. It recommends the 3-plow tractor even on farms of comparatively small size, preferring it to the 2-plow tractor because the latter does not increase sufficiently the amount of work one man can do and does not, therefore, possess the great advantage of tractors over horses, namely, speed. Moreover the 2-plow tractor does not develop enough power for operating grain separators, ensilage cutters, etc. The average sizes of farms on which the 2-, 3- and 4-plow tractors operate satisfactorily are 180, 250 and 300 acres respectively. The 3-plow and 4-plow sizes seem to meet the best tractor requirements of the average Illinois farm since they enable speedy plowing, reduce man labor and are powerful enough to operate the various machines found on the average farm.

### Average Prices

The average prices paid for the three sizes most commonly purchased during 1917, in Illinois, were:

The 2-plow tractor .....	\$800
The 3-plow tractor .....	1,100

The 4-plow tractor .....	\$1,400
The 2-plow plow .....	115
The 3-plow plow .....	165
The 4-plow plow .....	235

Prices at the beginning of 1918, adds the report, were substantially higher than the above.

The life of a modern tractor, an important factor in determining its value for farm work, is uncertain as yet. The average use of the tractor is 45 days per year and replies to inquiries received show that 40 per cent of the tractors used required no expense for repairs in the first year. Those tractors between 2 and 3 years old averaged \$79 for repairs. The conditions under which tractors are operated, the rough and uneven ground and severe shocks to which they are subjected and their exposure to constant showers of dust and dirt are pointed out as causes for the excessive wear. This is being rapidly overcome, however, by the protection which the modern machines are given in construction.

Of 140 tractor owners in Illinois who had used their outfits one season or less, 48 reported that they spent nothing for repairs, the others had repair bills varying from a few cents to \$100 or more, the average being \$22, making the average repairs for the entire group about \$15. The figures obtained indicate that repairs are less among the 4-plow machines, but this may be due to the fact that the smaller outfits are more cheaply constructed. The report estimates an annual repair charge during the first 3 years of the tractor's life of about 3 per cent of the first costs.

### Work Done by 2-, 3- and 4-Plow Outfits

Figures provided by the Illinois tractor owners for days of 10 net working hours show that the 2-plow outfit plows  $6\frac{1}{2}$  acres per day, the 3-plow outfit 8 $\frac{1}{2}$  acres per day and the 4-plow outfit 10 acres per day. This, it is pointed out, does not coincide with the theoretical provision by which a 14-in. plow drawn by a tractor should cover 3 acres in a 10-hr. day, thus giving the figures of 6 acres per day for a 2-plow machine and 30 acres by a 10-plow outfit. The difference between the actual and theoretical figures is accounted for by the loss of time occupied by repairs and by possible unfavorable plowing conditions. A delay is frequently caused, it is pointed out, by a necessary repair on one plow which will naturally prevent the operation of the other 9 plows on a 10-plow outfit. Farmers are warned in the report against trying to make their outfits pull one more plow than they are rated to handle, as this tends to slow down the tractor and create mechanical difficulties according to the reports from those who are overloading their machines as compared with the farmers requiring their machines to pull only their normal loads.

The acreage covered per day at field operations other than plowing depends upon the relative draft varying with the width of the implement pulled. This makes it impossible to secure average figures which would be of value. In harrowing or disking for example the width of the implement pulled depends on the adjustment of the disks or harrow teeth and the depth of the ground worked. The nature of the soil also has an influence. The largest proportion of work done by tractors was found to be plowing and repairing the seed bed and in belt work. Hauling by tractor has been found less satisfactory and more expensive than by horses. Less than 20 per cent of the tractor owners reported doing hauling with their outfits.

The cost of operating, including fuel, oil and grease, re-

pairs, depreciation and cost of man labor, interest on investment, cost of housing, time spent caring for the outfit other than for repair work, etc., was found to be as shown in the following table:

Approximate Cost of Plowing an Acre with 2-, 3- and 4-Plow Tractors, Based on Average Cost of \$800, \$1,100 and \$1,400 Respectively, and a Life of 7½ Years of 45 Working Days Per Year

Size of Tractor	TOTAL*		FUEL		Oil	Grease	Repairs	Depreciation	Man Labor	Interest
	Gasoline Tractor	Kerosene Tractor	Gasoline	Kerosene						
2-plow...	\$1.58¼	\$1.33¼	\$ .50	\$ .25	\$ .05¼	\$ .02	\$ .11	\$ .36	\$ .46	\$ .08
3-plow...	1.47¼	1.22¼	.50	.25	.05¼	.02	.11	.37	.34	.08
4-plow...	1.80¼	1.25¼	.50	.25	.05¼	.02	.12	.42	.30	.09

\*The cost of housing the outfit and other minor overhead charges, such as taxes, insurance etc., are not included.

These costs are arrived at by allowing for a consumption of 2½ gal. of fuel per acre plowed, which is the average reported by the Illinois farmer. The replies indicated less difficulty from kerosene tractor owners than they encountered in 1916. Slightly more than 50 per cent of the Illinois tractors are operated on kerosene. The average price paid for gasoline in 1917 was 20 cents per gallon and for kerosene slightly less than 10 cents per gallon. In figuring the fuel costs extra allowance was made for warming up the kerosene engines with gasoline, estimating it at less than one gallon per day at a daily cost of 10 cents or one cent per acre plowed.

#### Lubricating Oil Quantities

The average quantity of lubricating oil was three-fifths of one quart per acre for all tractors reporting from Illinois. Some reported the use of nearly a gallon per acre while others used less than one pint per acre. With oil at 35 cents per gallon the average price paid, the cost per acre amounts to 5¼ cents.

Grease consumption averaged slightly less than one pound per day at a cost of 10 cents per pound, an average of 2 cents per acre. Based on these figures the average cost per acre for fuel, oil and grease is 57¼ cents where gasoline is used and 32¼ cents when kerosene is used.

The average annual repair charge was 45 cents per day used plus an estimate of 4 per cent of the first cost which the Department allowed against the original cost of the machine, making a total average repair charge per day of 71 cents for the 2-plow tractor, 11 cents per acre, 98 cents for the 3-plow tractor, 11 cents per acre, and \$1.24 for the 4-plow tractor, 12 cents per acre.

#### Annual Depreciation

Assuming the average life of a tractor to be 7½ years the average annual depreciation, based on the average costs is:

Two-plow outfit .....	\$106.67
Three-plow outfit .....	146.67
Four-plow outfit .....	186.67

The daily charge based on 45 working days per year is:

Two-plow outfit .....	\$2.37
Three-plow outfit .....	3.26
Four-plow outfit .....	4.15

The depreciation cost per acre based on the average acreage is:

Two-plow .....	36 cents
Three-plow .....	37 cents
Four-plow .....	42 cents

The cause of the high depreciation costs for the 4-plow machine is due to its higher relative price.

The average cost of man labor, estimated at \$3 per day, gives the cost per acre for man labor of 46 cents for the 2-plow, 34 cents for the 3-plow, and 30 cents for the 4-plow outfit.

Figuring interest at a fixed annual charge of 6 per cent on the average investment which is one-half the first cost, for the different sized tractors and using the basis of 45 working days per year the average interest charge per day is: 53 cents for the 2-plow outfit, 73 cents for the 3-plow outfit, and 93 cents for the 4-plow outfit. The interest cost per acre based on the average acreage covered by the different sizes is, therefore, 7, 8 and 9 cents respectively. Because the 4-plow outfit daily acreage does not increase in proportion to its cost, its interest charge is higher than for the 2-plow or 3-plow tractor. The increased acreage plowed daily by the 3-plow machine as compared with the 2-plow offsets the increased charge due to higher prices.

In addition to including the above figures for estimating the costs there are also such items as fuel and oil used for stationary work, but the Department of Agriculture considers these relatively small and unimportant. It points out that all of the above cost figures can be used as a basis for arriving at relative costs for other operations with the tractor.

#### Tractors vs. Horses

The cost figures, it is said, are approximately the same as with horses excepting for the item of man labor, which is lower with the tractor than where horses are used. This emphasizes that the advantage of the tractor lies not so much in the reduction of the cost as in the fact that it permits one man to do considerably more work in a given period of time. It is also stated that horse and tractor costs cannot be compared, since on farms where tractors are used a number of horses are also retained and comparisons must be made between the cost of operating horses alone and the cost of operating the tractor and a certain number of horses. Frequently horses stand idle while the tractor is being used and in such cases the cost of their maintenance must be considered in the farm operations costs, as they are as much a part of the farm power plant as the tractor.

A number of farmers according to the report hesitate to purchase tractors fearing that they will not work as satisfactorily as horses, especially in plowing. Fifty per cent of the tractor owners reported that the plowing work is better by tractor than by horse while less than 3 per cent say it is poorer. The quality of the plowing depends more upon the plow and its adjustment than upon the tractor. The selection of a good gang plow is important. It is quite possible that an inferior tractor pulling a good gang plow well adjusted will do better work than a good tractor pulling a poor plow or one out of adjustment. The average depth of tractor plowing in Illinois is slightly less than 7 in. as compared with 5½ in. previously plowed by horses. Eighty-six per cent of the Illinois tractor owners reported their tractors satisfactory for use on plowed land. The general use of automobiles is educating the farmer in the operation of the gas tractor and eliminating many of the operating difficulties farmers experienced in the earlier days. The department points out, however, that some farmers are making a mistake in assuming that boys can operate tractors efficiently whereas only a proficient operator can handle the tractor properly. It urges farmers to take advantage of tractor instructions offered by some tractor manufacturers.

#### Tractor Reliability

The reliability of the tractor depends largely on the ability of the operator. Fifty-four per cent of 300 tractor owners reported their outfits not disabled a single day during the past year. Of the remaining 46 per cent the tractors were out of commission 5 days on an average not including one man who stated his machine was out of commission about half of the time. Ninety per cent of the tractors owned in Illinois were reported operated by some member of the farmer's family, the best results being obtained by this class of operators. Thirty-six per cent reported no time lost in the field because of trouble with the outfit. The average time lost per day by the 64 per cent reporting trouble was a little over three-quarters of an hour.

Farmers purchasing tractors to displace horses are likely to be disappointed, according to the replies from the Illinois tractor owners. The tractor does displace the horse to some

extent, but only in about three-fourths of the cases where it is used on the same number of acres as were previously farmed, in which instances the horses displaced averaged about four and represent about three-fifths the cost of the tractor outfit. There is considerable work on the farm which the tractor cannot perform and which must be done by horses.

About 45 per cent of the tractor owners used their tractors to some extent for custom work. Some purchased their tractors with custom work in mind, while others procured them for their own farms only and undertook custom work at the request of neighbors. The Department of Agriculture states that the use of a tractor at custom work seems a reliable indication that the home farm is not large enough to utilize the tractor economically. One-third of the tractor owners reported that custom work was unprofitable. In view of the fact that the average farmer ignores depreciation charges and many other proper expenses, it is likely that considerably

more custom work was performed at a loss. The 47 per cent of tractor owners reporting custom work in 1917 averaged 17 days in the year at this work.

Despite the greater depth of plowing with the tractor, crop yields do not seem to have increased materially. The greatest percentage of owners report no noticeable effect either in increase or decrease of the crop yield, which might be attributed to the tractor.

That the farm tractor has developed more rapidly in the past few years than any of the field equipment for use with it, excepting the gang plow, is a point developed in the report. It is urged that maximum results with a tractor can only be achieved when it is combined with implements designed for it. A minimum of results is obtained when implements designed for use with horses are used. As the implements improve in design and are constructed especially for tractors it is expected a higher percentage of profits will result from tractors.

## Types of Small Electric Hoists and How They May Be Used

**I**N many places, and for many different kinds of work, the most economical means of lifting and hauling loads is provided by small electric hoists. Such hoists as those shown in the cuts herewith are capable of handling from one-half to five tons, and can lift at from five to ten times the speed of hand operated chain hoists. They have the further advantage of low cost, which is usually but a fraction of that of an electric travelling crane. Furthermore, they can be suspended at almost any point in the shop or can be used with shear pole, jib crane, a trolley running along an overhead track, or a small travelling crane. When used with a trolley or crane they can be moved about either by hand power or by means of a second electric motor.

One of the photographs reproduced herewith shows a large type electric hoist used in connection with an overhead track on which is fitted a travelling carriage driven by an electric motor. The other illustration shows one of the smaller type electric hoists, which in this case is attached to a trolley.

These hoists are controlled from the floor by means of pendant ropes. A brake, which is automatically applied when the controller is returned to the off position, holds the load suspended, and a safety switch automatically cuts off the current when the hook is hoisting to its safe limits of travel.

Special mechanical and electrical features are used in the construction of the motors to suit the service, which is equipped with the Westinghouse electric apparatus. The

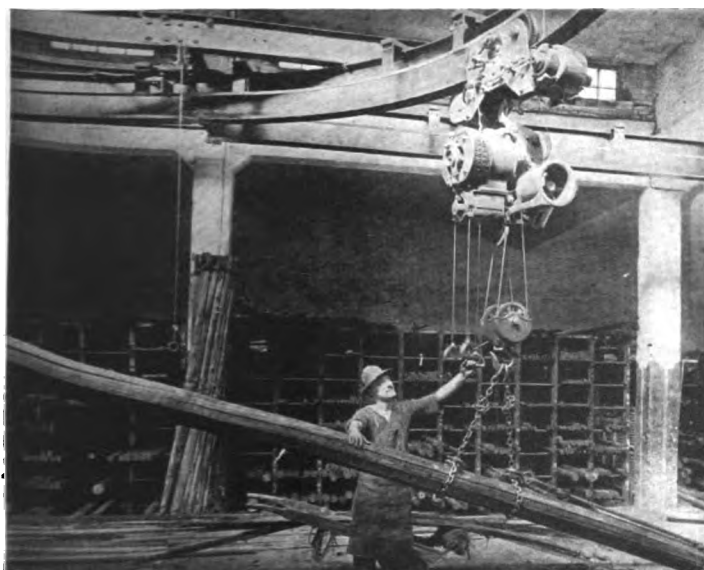
direct-current motors are modifications of the series-wound crane type. The alternating-current motors are of the poly-phase squirrel-cage type with high torque, rotor windings. Three-quarter horsepower motors are used for  $\frac{1}{2}$ -ton hoists and 7-horsepower motors for 5-ton hoists, the ratings being figured on a 30-minute basis.

The controllers of the drum type are designed to break heavy currents without burning the contacts. When the tension on the control ropes is released, a spring returns the controller to the off position.

The hoists illustrated are built by the Yale & Towne Manufacturing Co. and are equipped with the Westinghouse electric apparatus.

### New Spring Wheel Design

**I**SAAC HAYMAN of Los Angeles, Cal., has designed a driving wheel for motor vehicles in which there is a series of coiled springs between an inner and an outer hub intended to absorb shocks and jolts. Spring holders screwed into the outer hub from the inside are provided with extensions moving in radial slots in flanges on the inner hub, so there is a positive drive from the inner to the outer hub. To insure smooth action between the inner and the outer hub flanges a circular row of balls is inserted between the two flanges on each side of the hub.



*Two types of small hoists operated by electric motors and controlled by pendant ropes. They are built by the Yale & Towne Mfg. Co. and equipped with Westinghouse electric apparatus*





## Getting Employees to a Distant Plant

Ford Company Uses Trucks and Trailers Between End of Street Car Lines at Eagle Boat Plant and Blast Furnaces More Than Two Miles Away—A Regular Schedule Maintained

**A**T almost any hour of the day, should you happen to be in the western outskirts of Detroit—out Michigan Avenue or Fort Street—you may see a crowd of workmen lined up along the curb of the street and wonder why they are there. Your curiosity will soon be partly satisfied by the arrival of a khaki-colored bus pulling a like-colored trailer of about the same size.

You will see the men step into the vehicles in orderly fashion and seat themselves on the long seats at each side. About a minute later you will see another conveyance arrive and take some more men away. You will see a procession of vehicles—one after another arrive and depart quickly with capacity loads of human freight. You might ask where all these men were going, and the answer would come: "To Henry Ford's big shipbuilding plant and blast furnaces at River Rouge."

### Transportation Needed Quickly

Almost as soon as ground was broken for these mammoth plants, a means of transporting the workers to and from the site became a problem—but not one of difficult solution. The nearest car line was 2 miles distant; men could not be asked to walk so far back and forth every day. Such a walk, after a hard day's work, is not taken with relish nor with profit by the majority of men.

A transporting scheme had to be devised—and quickly. There was nothing else to do. So to be assured of workers, Henry Ford suggested the bus idea. But where were the trucks to come from? No such conveyances as could be used for this service were immediately available. But a manufacturer who has a record of building a car a minute and executing other tasks on a similar scale can be counted on to solve such a comparatively simple problem quickly.

Twenty-four hours after the plan was decided upon, three trucks with trailers were in operation carrying workers to the plants. All the material was at hand, it simply remained for someone to assemble it and build up the trucks. The regular Ford ambulance chassis was used and upon it was mounted a specially built body with leather upholstered seats at the sides.

The first vehicles were put in commission on March 1,

and to-day there are twenty-one in the service with three more to be added very shortly. The service was built up to 17 trucks within its first 2 weeks. As many as 7800 men are carried during the course of a day. Not all these men work for Ford directly, however. A number are engaged in construction work for outside interests, such as contractors and builders, as the erection of all the buildings is not yet completed. The men of five different companies are served by the bus line. Of the total, about 50 per cent are Ford employees.

On July 2, between the hours of 5.45 a. m. to 8.15 a. m., a total of 3720 men were carried—1545 from Fort Street and 2175 from Addison switch. From the Fort Street car line it is a distance of 2 miles and takes 6 minutes to make the trip. Addison switch is 2½ miles from the plant, but this route takes almost twice as long because of the bad brick road traveled part of the distance, and because of frequent delays at railroad crossings of which there are eight. Thirty-four hundred and forty passengers were carried during the same morning period on July 1 and 3655 on July 5, when 70 trips were made. The biggest rush is manifested between 6.10 a. m. and 7.30



Busses waiting at the Ford shipbuilding yards

[illegible]

*Each driver keeps a record of the number of trips he has made and details of the trip. A card for this purpose, as well as a repair card, is given him*

*pair card, is given*

Form No. 1948

### MOTOR TRUCK REPAIR

Date \_\_\_\_\_

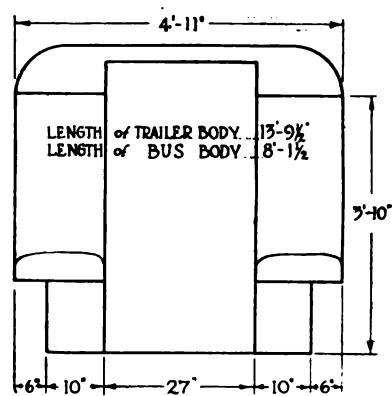
Driver No. \_\_\_\_\_ Shift \_\_\_\_\_

Vehicle and No. \_\_\_\_\_

Remarks \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

NAME .....

NO .....



*Diagram of the dimensions of  
the bus and trailer*

a m., at which time capacity loads are always carried.

After this morning shift men start coming in again for the afternoon shift at 1.30 p. m. Bus service is maintained from this time uninterruptedly until 11.30 p. m. The afternoon shift starts at 3.30 p. m., and by the time all the men have arrived those who are quitting are ready to use the busses to take them back again to one of the car lines or termini of the bus line. This departing service which starts at 3.15 p. m. and ends at 11.30 p. m. overlaps the previously mentioned schedule, namely: 1.30 p. m. to 6.30 p. m. All these schedules utilize the entire number of busses.

For the night schedule which starts at 11.30 p. m. and ends at 8.15 a. m. only seven cars are operated. This also overlaps another schedule—the first one which begins at 5.45 a. m. The commencing of this latter schedule brings into service the other fourteen cars, making the total twenty-one again. To put it in other words, the service is almost unceasing. There is a lapse of only 5 hours and 15 minutes—from 8.15 a. m. to 1.30 p. m.—when the busses are not needed on the road because there are no changes in shifts at this period. During this period, however, the trucks are not idle, but are utilized in conveying materials from one part of the plant to another.

There are 3600 Ford employees benefited by the bus service. Within 30 days it is estimated that 10,000 names will be on Ford's payrolls of these two plants and more vehicles will be pressed into service.

It takes 110 men, including the repair men and garage

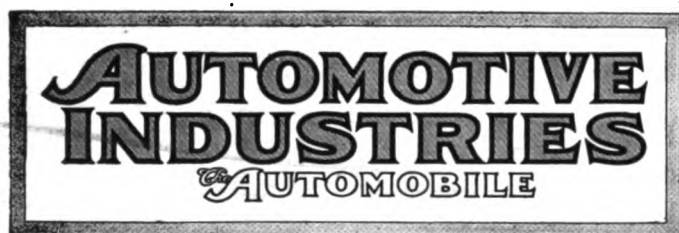
clerks, to operate the bus line. Each bus has two men—a driver and conductor who work in 8-hour shifts. While on the road the conductor travels on the rear step of the trailer and when a railroad crossing is approached the bus is brought to a dead stop. Here it is his duty to jump off and cross the tracks and signal the driver if it is safe for the vehicles to proceed.

A report of all passengers carried is made out by the conductor each shift. At both termini of the bus line are men—usually the foremen of the shifts—who check all cars as they leave. The reports that they make out include the bus number, the total number of passengers of each and the time the vehicle leaves. This report proves valuable evidence when frequently workmen arrive late for work and attribute their tardiness to a delay of a bus. A glance at the report will instantly reveal whether or not the bus service is to blame.

At the garage is a bus register which gives the badge number of the driver, his name, his destination, the bus number, time he left and the time he came in. This serves to show at all times just who is driving each car and on what route he has been assigned.

The cost of operating these vehicles has not yet been definitely determined, but estimating the cost on a basis of a capacity load it equals 2 cents to 3 cents a mile per man for gas, oil and repairs. This is not taking into consideration the cost of labor. When the service was first established the cost was estimated at 4 cents, but when it became systematized it was brought down about 50 per cent.





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## The Proposed Transatlantic Flight

ONE of the most daring proposals to which the war has given rise is that to fly aeroplanes built in the United States across the Atlantic Ocean to the battlefields of France. Large numbers of planes of all kinds are wanted on the battlefield, and are wanted quickly, too. The production of planes and of engines for them is rapidly rising, and if one asks the engineers connected with aircraft production as to the possibilities in the way of output during the next several months, the usual answer is that they can make all that can be transported across to France. Hence, the shipping situation has become the limiting factor in the aircraft program, and though ship construction is being pushed with the utmost vigor, there is little chance of this situation being materially changed for months to come. That is, our capacity for producing planes will continue to run ahead of our ability to transport them across the ocean.

If the planes could be flown across this would solve a most perplexing problem. Of course, only planes of the type of large long-distance bombers could be expected to make the flight successfully, for it would be necessary to carry not only a fuel supply sufficient for some 2000 miles flight, but reserve pilots as well. The plan of plane drive-aways, we believe, originated in England, in connection with a large bomber type plane of British design which is to be manufactured in this country.

It is easy to foresee numerous difficulties and dangers besetting an undertaking of this sort, and it is almost a certainty that a fraction of the departing machines would be lost on the way. This, of course, does not disprove the practicability of the scheme, as some machines would be lost even if they were sent abroad on board ship. The proportion which can be gotten to their destination safely is the all-important factor, and this can be determined only by actual trial. If it is decided that the chances of success are sufficient to warrant a trial, we may be sure that the greatest precautions will be taken to prevent loss at sea, by distributing station ships along the proposed route of travel, and in various other ways.

If planes of well tested construction are selected, the most experienced and capable drivers picked and station or signal ships are placed at reasonable distances apart all along the line of flight, the scheme would seem to have a reasonable chance of success. Non-stop flights of nearly the distance required to be traversed in this case were made several years ago with much smaller machines than are now available. Undying fame awaits the pilot who first succeeds in completing the aerial journey from the New World to the Old, and volunteers will not be wanting to guide the machines across the big expanse of water.

In this connection it may be said that the offer of large cash prizes, which under ordinary conditions might have been a strong incentive, will have little effect on the materialization of the scheme. If it can be carried out successfully, its consequences from a military standpoint are so enormous that the prizes offered pale into insignificance in comparison.

## Value of the Notch Bar Test Questioned

IN Europe the notched bar test or impact test has come into extensive use of late years for detecting brittleness in steels, but some engineers of high standing are far from being convinced of its practical value. This test consists essentially in letting a heavy hammer arranged as a pendulum drop from a certain height, break a notched test bar of specified dimensions when in its lowest position and noting the height to which the pendulum rises after having broken the test piece. The difference in height at the beginning and end of the swing multiplied by the weight of the hammer gives the energy in foot-pounds absorbed in breaking the test piece. The theory is that the tougher the steel the more energy will be required to break the specimen and



that a steel which absorbs little energy in the impact test must necessarily be brittle.

The test has been applied mainly as a check on heat treatment, and it appears that there has been a great deal of difference of opinion as to its suitability for the purpose. One argument made against the test is that it subjects the steel to strains unlike any to which it is subjected in regular work. This does not apply to the tensile, transverse and similar tests. The notch in the test bar concentrates the strains at one point, and a similarity of conditions might be claimed for more or less sharp shoulders on shafts, etc., but these in practice are never subjected to such extreme shocks that a single shock suffices to cause the part to fail. A test which subjects the material to exactly the same sort of strains as those it has to bear in regular work certainly meets with the greatest amount of confidence on the part of engineers and properly so.

One thing that has served to shake faith in the

impact test is its absolute lack of correlation to the micrographic test. This was brought out in the discussion of a paper on Round Test Specimens for the Impact Test, read before the Institution of Automobile Engineers some time ago. One of the speakers mentioned that a piece of nickel chrome steel, oil-hardened at 1830 deg. Fahr., reheated to 1150 deg. Fahr., and quenched in water would show a most objectionable looking structure, yet would test about 50 ft.-lb. on the Izod impact machine, whereas the same steel oil-hardened at 1475 deg. Fahr., reheated to 1150 deg. Fahr. and cooled slowly, though showing a beautifully fine grain structure, will only show about 15 ft.-lb. on the impact machine. From the micrographs most every engineer would pick the last-mentioned specimen as the better one.

It would thus appear that the long established practice of determining the elastic limit, breaking strength, contraction of area and extension is more reliable than the use of the impact machine.

## The Case of the Truck and the Case of the Passenger Car

EVERYONE connected in any manner with the industry can, and probably does, find much justifiable satisfaction in the way the case of the motor truck was presented before the Priorities Committee of the War Industries Board. It was a good job, well done.

When those of us who are in the industry read the statement which the representatives of the truck manufacturers presented to the committee, we are filled with a feeling of gratification at the thought that we are devoting our energies to something so well worth while. Not only that, but we are pleased that the facts substantiating the essential character of the motor truck have been so clearly presented that they cannot possibly escape comprehension, with the resulting benefit that the country, at this time when it needs so badly just what the motor truck can give, will not be denied its help, as it might have been, through a failure to realize how great that help can really be.

It was a simple, direct, dignified, convincing statement. In the most sincere manner it indicated a

desire on the part of the makers to co-operate with the Government. It expressed an honest conviction which it backed up with logical evidence "that trucks used in this country are necessary to a swift winning of the war," and asked for the committee's careful consideration of the request for steel and fuel priorities "on this basis alone."

The case of the motor truck is clean cut. It seems to many of us to be almost obvious. The utilitarian value of the truck is very close to 100 per cent. A few incontrovertible and almost self-evident facts logically presented form a conclusive argument establishing its practical worth. In the case of the passenger car, on the other hand, the facts may not be so apparent. They are, nevertheless, just as real and just as capable of being demonstrated even if some different method must be employed. In its case volume of testimony must be relied upon. And there are large volumes of it to be had. Some day, perhaps, it may be compiled and the real case of the passenger car presented. For the good of the country as a whole that day cannot come too soon.

## Recognition from Abroad

WHATEVER efforts have been made to belittle the engineering achievement represented by the Liberty aircraft engine have by this time been pretty well nullified, but it is interesting, nevertheless, to observe that the head of the British Air Service, Sir William Weir, speaks of the engine in most appreciative terms. It was on the occasion of the Sixth Wilbur Wright lecture, recently delivered to the Aeronautical Society by an American scientist, Dr. W. F. Durand, at which Sir William Weir presided. At the conclusion of the lecture, referring to the aircraft situation in general and the materials question in particular, Sir William stated that thorough and searching tests recently applied in France and England to the Liberty engine had justified the prediction that it would prove a most

valuable contribution to the Allied resources, and that the United States could go ahead and push these productions with every confidence. The results so far obtained placed the engine in the very first line of high powered aeromotors.

This testimonial to the qualities of the Liberty engine is the more acceptable for the reason that much of the criticism which has been passed upon it originated with interests connected with foreign-designed engines. It is no longer necessary to accept the word of those responsible for the Liberty engine that it has made good in every respect; we now have the word of the highest authority on aircraft matters in England, supported by thorough and searching tests, that the Liberty engine ranks in the very first line among engines of its class.

# □ Latest News of the

## Tax Cars and Trucks On Cost

Federal License in Addition to  
Impost on New Vehicles—  
2 Cents per Gallon on Gas

WASHINGTON, Aug. 1—A heavy excise tax, a tax of 10 per cent on new cars and 5 per cent on new trucks, and a tax on gasoline were written into the new Revenue Bill by the Ways and Means Committee yesterday. The excise tax includes cars, trucks and motorcycles and will be in the form of a Federal license tax, and in the case of cars and trucks is graduated according to the original cost of the machine. The tax on motorcycles is \$5 regardless of the original cost.

The graduated tax which will yield about \$125,000,000 annually, will operate under the following schedule:

Not over \$500, annual license.....	\$10
Above \$500, not over \$750.....	15
Above \$750, not over \$1,000.....	20
Above \$1,000, not over \$1,500.....	20
Above \$1,500, not over \$2,000.....	40
Above \$2,000, not over \$2,500.....	50
Above \$2,500, not over \$3,000.....	60
Above \$3,000, not over \$3,500.....	80
Above \$3,500, not over \$4,000.....	100
Above \$4,000, not over \$4,500.....	120
Above \$4,500, not over \$5,000.....	140
An additional \$40 for each \$1,000 of original cost above \$5,000.	

The tax on gasoline of 2 cents per gal. is expected to raise \$45,000,000. The Committee believes a gasoline tax will lead to a considerable conservation of gasoline reducing its needless use in passenger cars. This is the sole purpose of placing this gasoline tax.

A tax on used cars through a tax on dealers is also contemplated by the Ways and Means Committee. Chairman Kitchen thinks that some method of taxing used cars will be found as they would escape taxation under the methods already agreed upon.

The graduated tax on cars and trucks undoubtedly will encounter a struggle in the Senate where the Finance Committee has stated where it will never agree to a tax of this sort which is unfair because of the reduction in prices of cars affected during the last few years by better production methods and lower cost of materials. They state that the plan is unfair to the motorist who owns a car several years old to have to pay a higher tax than the motorist who owns a car two or three years old. This should be reversed, states the Finance Committee.

The graduated tax on trucks is tentative. There will probably be a lower graduated scale arranged, to apply to trucks only, as the committee has displayed some understanding of the utility

of the motor truck, having applied but 50 per cent of the car tax through the manufacturer to the motor truck.

The tax on gasoline is to be paid by the manufacturer or producer but it is expected that it will be passed on to the consumer by them.

DETROIT, MICH., Aug. 1—Manufacturers expect that a general increase in the price of cars and trucks will follow the passage of the proposed taxation measure, but they hold out hope that the \$70,000,000 which the tax is expected to raise is an indication that the government will permit them to get sufficient steel to enable a production somewhat better than had been hoped for. It is freely predicted that the burden will fall upon the purchaser and fear is felt that this will have a marked effect on sales.

### Define War Work

WASHINGTON, Aug. 1—The Department of Labor defines war work as follows:

1—The manufacturer of products or erection of structures directly or indirectly supplied to some department of the government for use in connection with the war. Indirectly supplied includes goods delivered under sub-contract to government contractors.

2—Coal mining is wholly war work.

3—Railroads and farms are engaged in war work and will be protected from all recruiting by other industries.

### Daniels Opposes Air Ministry

WASHINGTON, Aug. 1—Any effort by Congress to create an air ministry to control the production of aircraft will be opposed by Secretary of the Navy Josephus Daniels. He said yesterday there would be no more single reason for establishing control over aircraft by means of a ministry than there would be for establishing a ministry control of submarines in the War Department.

### Winningham Named Oil Chief

WASHINGTON, Aug. 1—C. C. Winningham one of the principal stockholders of the Hudson Motor Car Co., who has had charge of the Hudson product for the last 8 years and of its advertising has been appointed chief of the Gasoline Section and Director of Publicity of the Oil Division of the Fuel Administration under W. C. Robinson, who is director of the Bureau of Oil Conservation. The work of Mr. Winningham will include the elimination of gasoline waste by distributors and users, the conservation of lubricating oils, and the inauguration of methods for reclamation of oil that has been used.

## 40,000 See Tractor Demonstration

112 Machines Started at Once—  
Need for Better Engineer-  
ing Is Voiced

SALINA, KAN., July 31—The annual National Tractor Demonstrations being held here are proving to be the greatest demonstrations by far that have ever been held.

To-day over 40,000 witnessed 112 different tractors working in one huge field a mile in width and nearly half a mile long. Promptly at 1.30 all of the 112 started across the field, some pulling ten plows and others pulling different numbers, down to the smallest sizes that pull but two.

No sooner had these 112 started turning over the fertile winter wheat acres of the State than 27 other tractors, drawing every other conceivable form of farm machinery came on the plowed soil and demonstrated the all-conquering aspect of the tire. The mile of tractors waiting for the starting signal called to mind a veritable tank attack, the industrial tanks of the army at home that are doing their part to produce the food and other necessities for our army, on the other side of the ocean.

The spirit of co-operation among all of the tractor makers has never been so generally apparent as this year. There is on every hand nothing but the best of team work. This spirit was well displayed at the dinner of the Society of Automotive Engineers to-night when F. P. Mount of the Advance-Rumely declared that the bringing out of better tractors is the best thing for the industry no matter whether those tractors come from old line concerns or from newer firms in the automobile or allied industries. Better tractors are needed and due recognition must be given them no matter where they come from.

J. A. Everson of the International Harvester Co. told of the great educational work his concern is doing in educating farmers to the more intelligent use of tractors. His company has conducted upward of 600 different schools of instruction, and in these farmers using different makes of tractors attend; in fact, 30 per cent of the farmers own tractors of other makes.

J. B. Davidson of the University of California, who has been conducting the drawbar and belt tests at the demonstrations, declared that more engineering is needed in several tractors, and that the engineer must take a stronger place in

(Continued on page 210D)

# Automotive Industries □

## To Cut Tire and Tube Production 50% During August and September

War Industries Board "Requests" Restriction and Would Curtail  
Use of Cars—Allocation Rate Little Changed—  
Rubber Section of War Board

NEW YORK, Aug. 1.—The War Industries Board has requested the rubber industry to cut down the production of pneumatic tires and tubes during the months of August and September to 50 per cent of its production during the same months of 1917, and has placed itself on record as expecting that the use of tires will be restricted to war and essential business purposes. It has further let it be known that steps are now being taken to restrict the use of tires to such purposes, but no inkling of the steps to be taken has been permitted to become public.

The request to cut tire production during this two-month period really amounts to an order, and follows a recommendation made to the War Industries Board by the War Service Committee of the Rubber Association of America, that such a step be taken. The War Service Committee also suggested that the use of tires be restricted to essential war and business purposes and as a means to this end has proposed a Federal licensing system for cars and trucks so that every one may be checked up and the essential or non-essential character of its purposes definitely known.

### 600 Representatives Present

More than 600 representatives of the rubber industry gathered at the Waldorf here today to go over with the War Service Committee of the Rubber Industry its recommendations for the importation, allocation and use of rubber, following the closing of the first quarter of the year during which Government restrictions on imports were to be effective.

Last April, the Government ruled that during the three-month period commencing May 6 and ending July 31, only 25,000 tons of rubber might be imported, and that during the year, May to May, the total importation might be only 100,000 tons. The expiration of the period was the occasion for the gathering.

In consequence of recommendations made by the War Service Committee, the next period is to be of only two months' duration, the understanding being that in that period the rubber industry is to furnish the Government with additional data upon which to decide what quantities may be imported during the remainder of the year.

The War Trade Board has ruled that

during the months of August and September, rubber may be imported at the same rate as for the initial quarter of the year, i. e., at the rate of 100,000 tons a year. The rate of allocation by the Rubber Association of America, however, has been slightly altered. During these two months, consumers will have rubber allocated on the following basis:

(a) Government requirements are to be supplied in full;

(b) The remainder to be allocated to consumers at the rate of three-eighths of their consumption during the same period last year. (In the first quarter the rate was one-quarter of seven-sixteenths.)

(c) New consumers will have rubber allocated in proportion to their mill or churn capacity.

### No Hardship Anticipated

Although the production of tires and tubes is to be cut down 50 per cent during August and September, it is not anticipated that this will cause any great hardship on dealers. The restriction applies only to manufacture, and inasmuch as many tire companies carry fairly extensive stocks on hand, it will be possible for them to supply current demand from these stocks.

The burden apparently will fall most heavily on small manufacturers, and particularly on those who have either started since August, 1917, or who had very small production at that time. At the request of a majority of those present, the War Trade Board is to be asked for a ruling which would permit all manufacturers to base production during August and September on 50 per cent of their average production during the first 6 months of 1918, though small hope is held out that such a ruling will be obtained.

### Textile and Rubber Division

So that there may be closer co-operation between the War Industries Board and the rubber industry, a new section of the War Industries Board has been created. This will be known as the Textile and Rubber Division and is headed by John W. Scott, who will have supervision over textile matters. Henry T. Dunn, president of the Fisk Rubber Co., Chicopee Falls, is head of the rubber section.

In presenting its case before the War Industries Board, the War Service Com-

mittee reviewed at length the various uses to which rubber is put. It pointed out that the entire importation of rubber during 1917 only occupied 3.6 per cent of the total shipping tonnage entering Pacific ports, though it represented 28 per cent in the value of all imports. Now, due to improved packing methods, the same quantity of rubber can be carried in 2.7 per cent of the shipping tonnage.

The committee completed its presentation with an urgent plea for more rubber, stating that unless more is permitted to come in the Government will find itself seriously handicapped for lack of it. Following is practically the complete report of the committee:

The War Trade Board, pending the further ascertainment of facts, limited the amount of crude rubber which might be imported, and has, for the months of May, June and July, 1918, specified the amount of such importation to which each manufacturer is entitled as evidenced by allocation certificates issued by the War Trade Board, each manufacturer being permitted to receive for three months (exclusive of rubber for Government contracts) one-quarter of seven-sixteenths of the amount of crude rubber which it received throughout the year 1917. In this the War Service Committee fully acquiesced as an emergency measure. But operation under these restrictions for approximately three months has shown conclusively that, if the same restrictions are continued for any prolonged period, a serious situation will arise which will handicap the Government in securing some of its most important supplies to meet the urgent war demands. The situation is such that there must be either an extremely radical reduction in production or an increase in importation of crude rubber—or both.

The greater part of the crude rubber imported comes from the British and Dutch possessions in the Far East, and most of this arrives at Pacific ports. The amount so imported in 1917 occupied 3.6 per cent of the total shipping tonnage and constituted, in value, 28 per cent of the importations to the Pacific Coast ports. Under a new method of packing, this quantity of rubber will occupy only 2.7 per cent of the shipping tonnage. The details of this are set forth in Exhibit B in the Pamphlet of Exhibits accompanying this memorandum.

The amount of rubber used in 1917 in the production of various classes of goods, as compiled from 448 replies to 503 questionnaires sent to the trade, is set forth in Exhibit C. From this it appears that the crude rubber consumption in 1917 was nearly 160,000 tons, whereas the Government is working on the basis of allowing only 100,000 tons per annum.

Coincident with this decrease in the permitted supply of crude rubber, the demands for manufactured articles has increased; for instance, the increase in the demand for truck tires, which are essential to war activity and transportation, is fourfold, and the increased demands for such essential articles as footwear, surgical materials, etc., are also very substantial. In 1917 the tonnage

(Continued on page 210a)



## Economy Records Attained by Airplane Mail Service

WASHINGTON, July 27—Reports of the comparative cost of operation and maintenance of the air mail service shows records attained for economy for gasoline consumption. The total operating expenses of 9 airplanes aggregating 7234 miles of flight was \$2,682. Total gas consumption for 113 hours and 8 minutes of flying was 1377 gallons, which is \$32.50 per hour, approximately 50 cents a mile.

The average consumption of gasoline for the 9 planes was 12 gallons per hour.

A Curtiss JN 4 machine flying 26 hours and 40 minutes at a cost of \$28.01 per hour covered 1719 miles at a cost of 43½ cents per mile. A Hispano-Suiza 150 hp. engine equipped plane used 8 gallons of gas per hour. A plane equipped with a 400 hp. Liberty engine used 17 gallons of gas per hour. This figure is about 40 per cent less than is generally required for airplane engines of these sizes.

The total operating cost mentioned above includes departmental overhead charges, interest on investment, parts replacement, mechanic's time, gasoline and lubricating oils, motorcycles and trucks, rent, fuel, light, telephone, pilots' salaries and salaries of hangar attendants.

### Detroit Aircraft Bureau Moves

DETROIT, July 29—The Bureau of Aircraft Production has been moved from 870 Woodward Avenue to the fourth floor of the Ford Motor Co. branch, and the entire working force of more than 200 people is now at work in the new quarters.

### Rapid Growth of Aeronautics Department

WASHINGTON, July 29—The Department of Military Aeronautics, recently organized, has grown to include more than 1000 civilian employees in addition to the officers and enlisted men. Thirty stenographers and 50 typists are needed by this department, particularly those who are qualified to take dictation and

make transcription in both French and English. Applicants should call upon or address the Civilian Personnel Office, Department of Military Aeronautics, Building B, Sixth and B Streets, N.W., Washington, D. C.

### 624 Men Called for Aircraft Board

WASHINGTON, July 24—Provost Marshal General Crowder to-day issued a call for 624 limited service men for duty with the Aircraft Production Board. The majority of them will report for work at various mechanical trades at Kelly Field, San Antonio, Texas. Twenty-four of the men will perform clerical work here in Washington.

### Aircraft Investigation in the East

WASHINGTON, July 24—Attorney-General Gregory, Charles E. Hughes and W. L. Frierson will make their headquarters in New Jersey for the time being to resume hearings in the aircraft investigation they are making.

### Three Deaths at Aviation Field

WASHINGTON, July 27—Three deaths occurred at aviation fields in the week ending July 20, representing one fatality for every 7926 hours flown or 634,080 miles of air travel. Following is the summary:

Brooks Field, San Antonio, Texas.....	1
Kelly Field, San Antonio, Texas.....	2
Total .....	3

### Bosch-Owned Bicycle Plant Taken

READING, PA., July 28—The Reading Standard Motorcycle and Bicycle Co., which operates a plant employing 300 workmen, has been taken over by the Government on the direction of A. Mitchell Palmer, alien enemy property custodian. The Bosch Magneto Co., of New York, already taken over by the Government, is said to be the owner of the controlling interest in the Reading Standard Company. A. T. Murray and A. E. McGavin, Government agents, have been made president and general manager, and the company is now filling Federal orders.

## Philadelphia Aircraft Plant Completes 50 Flying Boats

WASHINGTON, July 27—The first order for 50 naval flying boats placed with the new navy aircraft factory at Philadelphia has been filled and the greater part of the machines are now flying over British waters. This was revealed to-day in a statement by Secretary of the Navy Daniels. The first flying boat had a successful trial flight on March 27.

The forms for the first boats were laid October 12, 1917, despite the fact that the factory building itself was not completed until November 28. These facts prompted Secretary Daniels's letter containing these statements and felicitating Naval Constructor F. G. Curn, who is in charge of the naval aircraft factory.

The contract for the aircraft factory was awarded August 6, 1917, and work began the same day. The original factory had 160,000 sq. ft. of floor space. An extension adding 55,400 sq. ft. was begun February 26, 1918, and is now completed.

### Chevrolet Price Increased

FLINT, July 29—The Chevrolet Motor Co. will increase the prices of its models on Aug. 1 as follows:

Model	Old Price	New Price	Increase
Baby Grand.....	\$995	\$1,095	\$100
4-90 .....	685	735	50

### No Gasoline Restrictive Measures

WASHINGTON, July 27—Due to considerable uncertainty among users of gasoline, the Oil Division of the United States Fuel Administration announced that there are no restrictive measures in force. A campaign will be launched shortly to eliminate the great waste of gasoline and lubricating oils which occurs in garages, repair shops, service stations, etc. The campaign will be headed by the slogan "Stop the leaks and save the drops."

### Loco-Tractor Invented by Ford

DEARBORN, MICH., July 29—A tractor locomotive has been invented by Henry Ford and is now being experimented with at the tractor plant at Dearborn. It is a regular tractor fitted with flange wheels which are connected with a driving rod, and is capable of developing enough power to draw eleven loaded trucks. The device is only in an experimental stage but is very likely to be produced on a large scale.

The Loco-Tractor, as it is styled at the plant, could be used at a great saving in large manufacturing plants, rice fields and copper and coal mines where it could do the work of scores of horses and mules. In tropical countries it is believed the Loco-Tractor could be used to draw passenger trains. Ford is experimenting with it at his tractor plant in drawing sand to fill in a small lake which borders the property.



*Ford's Loco-Tractor is capable of developing enough power to draw eleven loaded trucks*

## De Palma Victor at Chicago

Breaks Two World's Records  
in Races—Wins 20-Mile at  
Rate of 110 M.P.H.

### TWO-MILE

Driver and Car	Time	M.P.H.
Resta	1:18.0	92.3
Chevrolet, Frontenac	1:18.4	91.7
De Palma, Packard	1:19.0	91.1
Mulford	1:20.0	90.0
Vail	1:42.0	74.2

### TEN MILE

Driver and Car	Time	M.P.H.
De Palma, Packard	5:24.8	110.8
Chevrolet, Frontenac	5:25.0	110.7
Resta	5:26.0	110.4
Mulford	5:26.2	110.3

### TWENTY MILE

Driver and Car	Time	M.P.H.
De Palma, Packard	10:50.2	110.7
Resta	10:51.6	110.4
Mulford	10:52.0	110.04
Chevrolet, Frontenac	10:52.2	110.03

### THIRTY-MILE

Driver and Car	Time	M.P.H.
De Palma, Packard	16:54.8	106.42
Chevrolet, Frontenac	16:55.8	106.30

CHICAGO SPEEDWAY, July 28—Ralph De Palma in a series of spectacular races here to-day took first place, incidentally breaking two world's records. All the races were hotly contested, with the lead usually alternating between De Palma and Chevrolet, who drove the Frontenac with its usual steady gait.

Resta got his car going well in the first race and took the 2-mile event in 1:18, or at 92 m.p.h., the slow time being accounted for by the standing start. Duray broke the rear axle shaft of his Frontenac a few seconds after the field got under way, scarcely having moved 100 ft. from the starting line.

The 50-mile race was abandoned after three laps had been run on account of rain.

When the smoke of battle had finally cleared De Palma had 22 points safely tucked away, Chevrolet 18, Resta 15, Mulford 10 and Vail 2.

All the races except the 2-mile were from flying starts. In the first race Resta was followed closely by Chevrolet, De Palma, Mulford and Vail in the rear and suffering from ignition trouble.

In the 10-mile race Vail had the pole, and after the field had got under way Resta came trailing around with plug trouble before he had crossed the tape and the field was again started.

It was a duel between Chevrolet and De Palma, the latter winning at the speed of 111 m.p.h. in the 20-mile. The four cars, Vail having retired with ignition trouble, were bunched most of the time, with the lead held principally by De Palma. Chevrolet, Resta and Mulford were serious contenders, but on the last lap the big Packard was shot over the tape with another record to its credit.

Under a threatening sky the four cars lined up for the 30-mile race, with Resta

at the pole. De Palma set such a terrific pace that Resta was forced to his pit, where diagnosis of his trouble indicated a burned out connecting rod bearing.

This left De Palma and Chevrolet sole contenders. So closely were they matched that when Starter Wagner finally waved the checkered flag De Palma crossed the tape but one second ahead of Chevrolet. Earlier in the race Mulford came to the pit with a plugged oil line.

Just before the race started De Palma's car got afire at the pits, but quick work put it out. There was no more damage than a scorched plug. Resta's car was considerably improved over its appearance in the Derby last June. Fouled plugs were his chief offenders. Mulford drove his first Sunday race, and although he kept well bunched with the leaders, his Frontenac did not possess quite enough speed to capture any of the events.

Vail showed up for the 50-mile race after having done considerable adjusting, and ran well with the field up to the time the race was flagged.

Officials of the speedway estimated from 15,000 to 18,000 people scattered about the paddock, grandstand and bleachers, and what the crowd lacked in numbers it made up in enthusiasm, for the spirited close time kept everyone on the alert. The previous 10-mile record on the Chicago track was held by Resta, and was 8 sec. more than De Palma's time made to-day. In setting the record for 20 miles, De Palma beat his own time, 10:53.08, made at Sheepshead Bay last August.

### Bearing Company Insures Employees

BOUND BROOK, N. J., July 30—The Bound Brook Oil-less Bearing Co. has insured all employees who have been in the service of the company for 3 months for \$500. This amount increases with the length of service. The expense of the policies is paid by the company, and the insurance plan applies to employees at the Bound Brook plant and the two factories at Lincoln, N. J.

### C. A. Lawton Building Addition

DE PERE, WIS., July 29—The C. A. Lawton Co., manufacturer of gasoline engines, is completing work on a 2-story addition, 40 x 120 ft., to be used for the forge shop, pattern-making department and machine shop. A new boiler room, 36 x 40 ft., is also being erected. The structures will be ready shortly after Aug. 1.

### Standard Foundry Changes Hands

RACINE, WIS., July 29—The Standard Foundry Co. has been purchased by a syndicate headed by Arthur Janes, from Henry and Albert Kousek, who established the plant in 1907. The foundry has been idle for several weeks because of a labor dispute, but will be reopened at once in order to fill Government contracts. The new officers of the company are: President, Arthur R. Janes; vice-president, David G. Janes, secretary and treasurer, E. L. Mrkvicka.

## G.M.C. to Take Over United Motors

Negotiations Reach Stage of  
Definite Plan for Exchange  
of Stock

NEW YORK, July 30—Negotiations having as their object the taking over of the United Motors Corp. by the General Motors Corp., the first inkling of which was given in the issue of AUTOMOTIVE INDUSTRIES for Feb. 28, have now reached the stage where a definite plan for the exchange of stock has been laid down, and it appears likely that the deal will be completed within a few days.

It is proposed now that General Motors acquire United Motors through the exchange of three-tenths of a share of General Motors preferred and one-tenth of a share of General Motors common for each share of United Motors. At the present time General Motors common is selling around 145, with the preferred at 82. On this basis, it would mean that United Motors stockholders would receive \$39 worth of General Motors stock for each share of United, which at present prices is worth about \$32.

Although no definite action has been taken as yet toward the ratification of this plan, it is regarded as likely that it will go through substantially as outlined. The United Motors Corp. has let it be known that it looks favorably upon the amalgamation, and it is known that General Motors has for several months been planning such a course of action.

The acquisition of United Motors by Durant interests appears entirely logical, inasmuch as it would give General Motors control of a big parts-making company. Chevrolet already owns 106,000 shares of United stock, and this will assist in the consolidation.

The United Motors Corp. was formed in May, 1916, and was an amalgamation of the following companies engaged in the manufacture of accessories, which are controlled by stock companies:

Perlman Rim Corp.	New York
Hyatt Roller Bearing Co.	Newark
New Departure Mfg. Co.	Bristol
Dayton Engineering Lab. Co.	Dayton
Remy Electric Co.	Anderson
Harrison Radiator Corp.	Lockport
Klaxon Co.	Newark

The manufacturing departments of these various companies remain separate, but close co-operation is effected in the sales and service departments. Gross sales of the constituent companies for the nine months ended March 31, 1917, were \$23,500,000, as compared with \$17,200,000 for the corresponding time in the previous year. The authorized and outstanding stock of the company consists of 1,200,000 shares (no par value) of common.

The officers of the company are: President, Alfred P. Sloan; vice-president, A. Deeds; secretary and treasurer, Witt Page; chairman of the finance committee, L. G. Kaufman.

**Government Survey of Housing Facilities**

WASHINGTON, July 30—The organization of a Homes Registration Service, for the utilization of available housing facilities in war industry zones, is being completed by the Department of Labor. The work will be performed in co-operation with the Council of National Defense, state and local defense bodies, and the U. S. Employment Service.

A survey is under way of the available houses, flats and rooms in each community. Lists will be compiled from the survey results, which will be distributed to the various offices of the U. S. Employment Service so that workers seeking jobs may at the same time be able to learn of available lodgings. In compiling the lists, such factors as effect of locality on nationality, types of houses and rooms, and classes and sex of workers are considered.

**Ford Production Decreased**

DETROIT, July 30—Production of the Ford Motor Co. after Aug. 1 will be 350 passenger cars and 400 trucks a day which is in accord with government wishes. It is estimated that at the close

of business July 31, when the fiscal year ends, the year's production will be, in round figures, 677,000 cars. The estimate is based upon the fact that during the first 10 months and 24 days of the 1918 fiscal year the output of cars was 651,191. Since then production has been steadily decreasing. With an average daily production of 1000 during June and 750 during July the remainder of the fiscal year would total about 25,750 cars. This, added to the above figures would aggregate 676,940 cars. How many Ford cars could have been easily disposed of can be estimated also from the fact that on June 10 the company had on its books unfilled orders calling for 89,242 touring cars, 9824 runabouts, 3013 coupes, 1675 sedans, 5234 trucks and 1619 chassis. Subsequent reports state the company being 110,000 cars behind.

**Service for Regal Cars at Old Plant**

DETROIT, July 27—Maurice Rothschild having purchased the complete equipment of the defunct Regal Motor Car Co., including all the property, goodwill, patterns, etc., will operate the property here.

**Canadian Makers to Ask for Steel**

TORONTO, ONT., July 29—The directors of the Automobile Manufacturers' Assn. of Canada met in Toronto this afternoon to discuss what action should be taken to request the Government to secure for the industry a sufficient supply of steel. Fear was expressed that the decision reached by the United States Government to reduce the supply of steel to certain industries, including that of the automobile, might have a serious effect on automobile manufacture in this country.

Gordon M. McGregor, general manager of the Ford works at Ford City, who attended the meeting, remarked the shutting down of the plant had been due to the difficulty of obtaining material, especially steel, and also to the fact that the Ford company wished to take a careful inventory of its true position at the present time.

Unless some action is taken by the Government, it is feared other plants will also have to suspend operations. The Government will be approached shortly, with a request to give the matter most careful consideration and early attention.

**A German Tank Captured by the French**

Several German tanks like the one here shown with the French crew which repaired it and used it against the Germans, have been captured in the recent fighting near the Marne. They are 33 feet long, overall, weigh 40 tons and are driven by two 4-cylinder Daimler engines of 100 horsepower each. Their speed on top gear is about 8 m.p.h. In general design they are simply creeper-type tractors armored with 1½ in. plates in front and ¾ in. plates elsewhere. The armor is said to be comparatively soft. The gun equipment comprises a piece, the equivalent of the British 6-pounder, which has a bore of approximately 2¼ in. and 8 heavy type machine guns. The crew of each tank is made up of 12 men.

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## M. T. S. Divisions Defined

### New Organization Will Consist of Two Units Similar to Airplane Service

WASHINGTON, July 30—Further reorganization of the motor transport divisions of the Army in this country contemplates two divisions, similar to the airplane service, with one division purchasing and controlling production, and the other directing operation and training.

The purchasing, procurement and production will continue under the Motor Transport Service headed by Col. F. Glover. The operations and training is planned to come under a new separate army division to be known as the Motor Transport Corps and to be headed by Major Barrett Andrews, who, it is reported, will shortly be promoted to a colonelcy. Major Andrews has seen service for the past year with the American Expeditionary Forces under General Rogers, who controls the Motor Transport Corps of the A. E. F.

Further plans include division of the organization under Major Andrews into two sections, one headed by Lieut. Colonel W. D. Uhler and in charge of operations and convoys, the other to take charge of training. The chief of the training section has not yet been named, but this section will have the special attention of Major Andrews, who plans to inaugurate a system of training in this country that will give the personnel of the Motor Transport Corps experiences similar to those they will encounter in France.

Heretofore the operations section of the Motor Transport Service was combined with the maintenance and recently was under the direction of George Randles, who will remain in charge of maintenance.

Further standardization has been completed with the adoption of the Indian, Harley-Davidson and Solo motorcycles as the standard motorcycles in the general motor transport equipment. The Westfield bicycle has been taken as the standard bicycle.

The motorcycles will be known under type letters as follows:

Indian "I."  
Harley-Davidson "H."  
Solo "S."

Adoption of these motorcycles apparently marks the downfall of the original Liberty motorcycle which had been designed specially by motorcycle engineers for the U. S. Army and which was to have been the standard.

Type letters have also been announced to denote the passenger cars used in the army, as follows:

Ford "F."  
Dodge "D."  
Cadillac "C."

The Motor Transport Service is now giving attention to trailers and will

shortly announce the standardization and type names.

### Continued Scarcity of Common Labor

WASHINGTON, July 27—Reports for the week ended July 13 indicate a continued scarcity of common labor. Common labor conditions appear normal in Florida, Mississippi, Indiana, Michigan, Colorado and some sections of New England, but an acute shortage is reported throughout the balance of the nation, being especially serious in the Central and Southern States and in every Atlantic State from Connecticut to Georgia. Railroads and mines in the central states are losing their common labor because of the high wages offered in the harvest fields.

Shortage in the skilled trades division is also nation-wide and growing. There is hardly an industrial community where there are any unskilled workers, with the exception of automobile workers in factories. Machinists and boiler makers are in general demand. The greatest shortage for skilled workers lies along the Pacific and Atlantic coasts and in the states other than Indiana bordering on the Great Lakes. Out of 110 cities reporting skilled trade conditions, 26 show a shortage, 31 a surplus and 35 balanced conditions. The farm labor situation seems to be well in hand in the central wheat belt, but farm laborers are scarce in the East and in the Southern States.

A surplus of inexperienced women applying for clerical positions is noticeable. The demand for women in factory work is increasing and there is a great demand for their service in domestic and hotel work. Out of 133 cities reporting the female labor situation 42 show a shortage, 42 surplus and 49 normal conditions.

### Labor Situation Still Acute

WASHINGTON, July 26—A slight improvement in the common labor situation is indicated by a report for the week ended July 6, although the shortage is still nation wide and critical. One hundred and five cities reported shortage against 109 for the week previous. Cities with common labor surplus increased from 10 to 16, those with a balanced condition remain the same. There is a demand among employers of skilled labor for boiler makers, machinists, iron workers, lathe hands and tool makers. Mechanics other than machinists are needed in Connecticut, Delaware, Georgia and parts of Texas. There is a demand in the East for farm labor.

### Increased Demand for Women's Overalls

From every quarter comes evidence of the extent to which women are finding places in the industries of the country. According to reports from several manufacturers of them, women's overalls are selling in large quantities throughout the country. The largest markets are in the West and Middle West, but New England and the Eastern States are taking fairly large quantities. The chief call, say the makers, is for garments cut along lines which give ample freedom of movements.

## To Recruit Unskilled War Labor

### U. S. Employment Service Will Supply Workers to Many Manufacturers

WASHINGTON, July 29—On Aug. 1 the United States Employment Service will begin recruiting unskilled labor for employers engaged in war work who have filed orders for workers with the state directors of the service prior to July 30. The total demand, as shown by these orders, will be ascertained this week and divided among the states on a quota basis. State quotas will be announced Aug. 1. Orders received from employers after Aug. 1 will be compiled and quotas announced Aug. 15. Additional quotas will be made up on the same basis and announced from time to time as unskilled labor demands develop.

The prohibitions against private recruiting of unskilled labor by employers engaged in war work whose maximum force, including skilled and unskilled labor, exceeds 100, go into effect on Aug. 1.

In order that there may be no interruption in the labor supply of the more important war industries after Aug. 1 and before the program of the United States Employment Service for securing the men needed can be put into full operation, private field forces will be permitted to continue recruiting under regulations drawn up by the United States Employment Service which will provide, among other things, that labor thus secured shall be credited to the quota which is to be supplied by the community where such workers are obtained. No such recruiting may be done except with the permission of the State Director of the United States Employment Service where it is conducted. Full information concerning methods by which such private recruiting may be conducted can be secured from the Director General of the United States Employment Service at Washington.

### 25,000 Laborers Needed

WASHINGTON, July 27—The severe shortage of unskilled labor in war industries is indicated by the first 600 war plants to send in their requirements to the United States Employment Service asking for 25,000 common laborers now and 40,000 during August and September. The total of 25,000 men wanted now represents a direct shortage.

The Department of Labor expects to complete the State Advisory Boards of the United States Employment Service in the 28 states east of the Mississippi this week. These boards, which will administer the central labor recruiting program in each state, will act as court of appeal from decisions of the Community Labor Boards, and will be comprised of representatives of the states, employers, employees and the Government.

# Spruce and Fir Output Nears Requirements

Almost Enough Lumber Cut to Supply Allied Governments with Needed Material for Airplane Construction—350 Pieces of Spruce Used for Each Plane—11,000,000,000 Feet Standing

WASHINGTON, July 27—Production of spruce and fir for airplane construction is coming close to the requirements of this country and the Allies. The total spruce and fir shipped to June 15, including that delivered to the Allies, was: spruce, 52,000,000 feet; fir, 20,800,000 feet.

The frames of airplane wings, ailerons, fins, rudders, elevators, and stabilizers, the struts, landing gear, fuselage, flooring, engine bed, after-deck and seats are made of wood and preferably of spruce. This is because spruce is the toughest of soft woods for its weight, and possesses great shock absorbing qualities. Furthermore, it does not splinter when hit by a missile. Sitka spruce, white spruce and red spruce are used.

## Specifications for Parts

About 350 pieces of spruce are required in a single airplane, but not all of them are individually different; the wing beams are practically of similar dimensions, and the struts vary only in size according to the strains put upon them.

Roughly, the specifications for spruce parts are: Straight grain, clear from knots and defects so as to give maximum strength. The size of the rough pieces must be such as to insure a finished dimension after deducting losses for finishing, checking and shrinkage. Desirable pieces run from 1½ in. to 3 in. thick, 3 in. and upward in width, and from 5 ft. to 17 ft. in length. Practically all the available spruce is in the United States and along the western coast of British Columbia. In our country it grows close to the Pacific Coast on the western slopes of the Cascade range in the states of Washington and Oregon. The stand of Sitka spruce, which is the best airplane stock, in these two states is estimated at 11,000,000,000 feet. But less than half of it is near enough to transportation facilities or in dense enough stands to be commercialized. The total spruce shipped for the first three months of 1918 was over 20,000,000 feet, but the U. S. Government and the Allies required more than three times that quantity in that time, showing that we were not up to requirements in March.

## 11,000,000,000 Feet Standing

The vast total of eleven billion feet standing, however, is not all available for airplane construction, and never will be, because only a small per cent of the spruce is suitable for such use. It is stated that about 30 per cent of a good spruce log is available for airplane stock. At the outbreak of the war, very little spruce was being cut or shipped, and it remained for this country to supply the necessary amount.

On September 7, 1917, under the National

Defense Act, orders were placed in the name of the Secretary of War with the western spruce mills, which required them to give preference to Government orders. Col. Brice P. Disque, Signal Corps, was detailed to investigate the situation. He proceeded to Portland and reported to the Aircraft Board that the hostile attitude of labor and the shortage of labor in the vicinity had been responsible for the lack of production. The report was approved by the Aircraft Board and later, on November 6, 1917, Colonel Disque was placed in command of the Spruce Production Division of the Signal Corps, which had been organized a short time previously.

Colonel Disque organized a volunteer logging army of experienced men as part of the Signal Corps to supplement civilian labor in the logging camps, detaching them to camps producing Government aircraft lumber. All lumber-camp and mill conditions were supervised; food, housing and transportation of employees were regulated. A basic eight-hour day, with time and a half for overtime, was established at all camps, and a standard wage scale for each occupation was adopted for civilians and soldiers. There are now about 15,000 troops engaged in this work.

Colonel Disque was supplied with a fund of \$20,000,000 with which to aid responsible operators, who were in need of money, to the extent of 30 per cent of their contracts. In the end he quadrupled the output of spruce.

The felling of the trees and the transportation of the logs were not the only problems of production; the timber had to be cut up into airplane stock. The Government adopted a method employed in the woods, known as riving or splitting the logs longitudinally into cants. This made transportation easier and permitted the selection in the forest of the suitable stock which split straight and clear. Forty-nine saw-mills were available, but they did not operate well on Government contracts and had not the facilities required. Early in 1918 thirty-six of them closed, claiming a car shortage.

By erecting the largest saw mill in the world in 45 days, the Spruce Division made a distinct record. Work of erection was begun on December 24, 1917, and the mill was completed February 7, 1918. This huge cut-up mill is at Vancouver Barracks, Wash. It has twelve separate log carriages for conveying the spruce to twelve head saws, back of which are complete sets of edgers, cut-off saws and other machinery necessary to convert the rived or sawed cants into finished stock. This mill cost the Government in the neighborhood of \$200,000. There are 1,940 men in the second Provisional Regiment who operate this cut-up plant, working in three shifts of 8 hours each.

Before the war this sort of lumber was seasoned by air-drying, but the great demand for spruce necessitated a kiln-drying process. This was worked out by the Forest Products Laboratory, of the Forestry Service, and a plant costing \$350,000 was erected at Vancouver Barracks. A saving in shipping weight of 33½ per cent was effected by shipping dried wood to factories. Beam stock now requires twelve days and smaller parts about seven days for drying, a saving of considerable time as compared with the air-drying system.

When operations began in the neighbor-

hood of Vancouver Barracks there was a great scarcity of wire rope and other materials. Steps were immediately taken to secure control of the wire rope situation, sizes were standardized and distribution of wire rope was taken over by the Spruce Division, with the result that to date 6,000,000 feet of wire rope have been provided for the use of the loggers. After standardizing logging engines, the Logging Equipment Section secured 175 of these engines. Other equipment secured included 10 tons of wedge steel, innumerable jacks, steam engines, electric motors, saw-mill equipment and over 200 miles of rails.

Previous to the first week in February aircraft lumber shipments were handled individually.

Since February aircraft shipments have been consolidated with cars containing other Government lumber and handled in special through trains to Eastern points. The time of transit has been reduced by nearly 50 days. An average time of 15 days from the mill to Eastern factories is now being made.

It was first decided to use open freight cars for transporting this lumber, but on account of the character of the material it has been found necessary to ship aircraft lumber in closed cars. By thus protecting the lumber from the weather an increase in the number of cars required has resulted.

There is very little waste at the saw mills manufacturing airplane material, as all the stock unsuitable for aircraft requirements is still utilized as general commercial lumber. The percentage of split spruce logs now available is more than twice that before the war, due to the riving process. In July, 1917, new grading rules were established whereby the quantity of spruce necessary to be purchased for each plane was reduced practically a third.

Fir and Port Oxford cedar are used in aircraft manufacture when spruce is not available. The possibility of using laminated sections in the wooden construction of airplanes will tend to increase the amount of spruce available for this use.

A thorough canvass has been made of the entire spruce situation in the United States, detailed reports having been obtained from each section of the country. In the Northeast and New England States the Navy Department, in co-operation with the Bureau of Aircraft Production, is securing a maximum output of airplane spruce. In the South and Southeast a similar canvass has been made and plans are now under way for the production of spruce in this section.

## New England Spruce Lumber Prices Fixed

WASHINGTON, July 29—Prices for New England spruce lumber have been fixed by the Price Fixing Committee appointed by the President, after considering information submitted by the Federal Trade Commission on the cost of producing this lumber and information submitted by representatives thereof at hearings were considered. The prices have been set in agreement with the manufacturers and will be in effect from July 19 to November.

They will cover all purchases by the Allied governments, the railroads and other customers regularly purchasing lumber for mill shipment. The prices on all New England spruce lumber in the states of Maine, New Hampshire, Vermont and Massachusetts are not to exceed those given in the issued list. They

## To Cut Tire Production

(Continued from page 205)

of rubber consumed in pneumatic tires was about 65 per cent of the total; the present uses are now being ascertained through a questionnaire, the results of which will, we believe, show a decrease and that the increased consumption during the last three months has been due to essential uses.

A general working classification of the industry, in the order of approximate importance, is as follows (it always being assumed that Government orders take precedence):

- (a) Medical rubber goods.
- (b) Rubber footwear.
- (c) Waterproof clothing.
- (d) Solid tires and pneumatic tires for commercial use.
- (e) Mechanical rubber goods for the operation of industry.
- (f) Insulated wire.
- (g) Pneumatic tires for essential passenger use.
- (h) Bicycle tires.
- (i) Hard rubber goods other than medical.
- (j) Mechanical rubber goods for less essential use.
- (k) Rubber cement.
- (l) Pneumatic tires for pleasure use.

### The Problem and Suggestions for Meeting It

The problem which is confronting the Government and the rubber industry to-day is the conservation of crude material and the control of the consumption of the finished product, the end to have in mind being an assured supply of the products necessary for the war activities and sufficient importation of crude rubber to meet these requirements and to insure that they will be met in spite of any temporary interruption of ocean traffic. In this connection it must be borne in mind that it takes, on an average, about four months for rubber to come from the plantations to the manufacturer here, so the plans in connection with importation must be made far in advance.

The War Service Committee fully realizes the necessity for conserving shipping space across the Pacific (even though all of the rubber so imported in 1917 would occupy only 2.7 per cent of the total tonnage required for all imports) and for conserving manufacturing facilities and labor here and reducing the consumption of rubber to such an extent as may be consistent with the continued filling of the real needs of the war and of the public and preserving the national prosperity.

To this end the War Service Committee makes the following recommendations:

### 1. Recommendations as to Decreasing Production of Certain Articles

This committee believes that there should not, at the present time, be any restriction imposed as to the production of articles connected with athletics, which should be continued in order to develop and contribute to the public health.

Nor does the committee now make any recommendations as to those articles in which the uses of rubber are of an incidental character, forming only a small part of the article as a whole.

The War Industries Board might wish to consider eliminating the production of the following articles, or, pending the compilation of more detailed statistics, reducing their production during the two months of August and September, 1918, to such an extent as the War Industries Board thinks wise. This could be done under an order of the War Trade Board, a draft of which is presented as Exhibit E in the Pamphlet of Exhibits accompanying this memorandum, and would conserve rubber to some extent

## Letter of the War Industries Board Which Requests Cut in Tire Production

MY DEAR MR. WORK:

Your industry has operated during the months of May, June and July on the plan of allocation of crude rubber under a limited tonnage arrangement with the War Trade Board and, as additional information is necessary before finally determining upon the allocation for August, September and October (which information you are now compiling), it has been determined that for the months of August and September substantially the same arrangements and percentage of allocation will continue.

Your industry should understand that the need of conserving shipping space is as great, or perhaps greater than when this matter was first taken up last April. We understand that while approximately 25,000 tons were licensed for import during the months of May, June and July (although considerably more than this has been received), approximately 50,000 tons will have been consumed by the industry. It is obvious that something radical must be done at once to curtail the consumption of rubber and we feel sure we may rely upon the support of the industry in taking such immediate steps as may be necessary to conserve the present stocks of rubber now in the country and those due to arrive.

The Government departments are making every effort to determine requirements of crude rubber for essential war and business purposes, and as soon as this information is at hand steps will be taken to insure the import of sufficient rubber to meet those requirements.

As a means of conserving the stocks of crude rubber now in the country, your committee has suggested curtailment of the production of pneumatic automobile tires and tubes during the months of August and September, and we request you:

(a) To pledge the manufacturers of pneumatic tires and tubes to restrict the production in tonnage of rubber consumed and in numbers of casings and tubes to the extent of 50 per cent of the production for the corresponding months of August and September of last year. But in no event shall the manufacture of pneumatic casings and tubes during the month of August, 1918, or the month of September, 1918, exceed 50 per cent of the monthly average for the year 1917 both as to amount of rubber used and number of pieces produced. This restriction is exclusive of Government business.

(b) That you carefully consider restricting the manufacture of all other articles involving the use of rubber, as every possible saving should be made.

and conserve manufacturing facilities and labor to a greater extent:

Bathing Caps	Pitcher Mats
Mats and Matting	Poker Chips
(except for insulation purposes)	Umbrella Rings
Chair Tips	Toy Balloons
Tobacco Pouches	Flowers
Bath Mats	Bathing Garments
Bath Mitts	Advertising Specialties
Bath Pillows	Telephone Ear Pads
Beard Softeners	Cuspidors
Beauty Brushes	Goggles
Carriage Mats	Atomizers for Perfumery
Auto Mats	Bust Forms
Ching Mats	Camera Bulbs
Cuspidor Mats	Chin Bands
Door Mats	Cigar Holders
Drainboard Mats	Cigarette Holders
Flower Pot Mats	Complexion Bulbs
Rubber Toilet Sponges	Household Gloves
Toys	Tires for Horse Drawn Vehicles
Rubber Bands	
Glass Mats	

You are thoroughly familiar with the industry to which we look to patriotically and conscientiously cut out the consumption of crude rubber at every point where it can be done without injury to the nation's welfare.

A curtailment such as mentioned above, in the production of pneumatic tires and tubes and other articles, will not accomplish the desired result unless some plan is evolved for limiting and regulating the use of motor vehicles, and we expect the use of rubber tires will be restricted except for actual war and essential business purposes. We are not at liberty at this time to announce our plans for accomplishing this purpose, but will do so in the near future.

Every necessary step should be taken to discourage and prevent hoarding of the finished product by manufacturers, wholesalers, dealers and consumers, and we ask you—

(a) To evolve some plan, and put it into effect, which will accomplish this end, and to see to it that if any one of these factors are guilty of hoarding, that steps be taken to prevent their securing additional supplies.

(b) That advances in prices be prevented.

We look to you to see that this is accomplished.

Before arrangements are concluded for the importation of rubber after the month of September, with your co-operation we expect to evolve definite plans which will accomplish the purposes we are after, i.e., the conservation of every foot of shipping space possible by the conservation and restriction of the use of rubber.

We ask that you facilitate your final arrangements for co-operation with the Conservation Division in making such changes in the manufacture and distribution of your product as will result in the conservation of rubber during the period of the war.

We anticipate your complete co-operation in all of the above matters, and assure you of our desire to see that the industry is provided with the necessary raw materials to take care of the war and essential civilian needs as soon as they can be determined, and give you our further assurance that we desire to curtail the industry only in so far as it may become necessary to meet the war needs.

We understand that there will be a general meeting of the industry at an early date, at which time you will have an opportunity to lay all of these facts before the manufacturers.—Yours very truly, War Industries Board, by George N. Peek, Commissioner of Finished Products.

To Bertram G. Work, Chairman War Service Committee, care B. F. Goodrich Company, 1780 Broadway, New York City.

### 2. Recommendations as to Motor-Driven Vehicle Statistics

In order to obtain an accurate knowledge as to the classes of uses of motor-driven vehicles and the number employed in each class, the War Service Committee strongly urges that a Federal Licensing plan be at once put into effect along the lines set forth in detail in Exhibit F contained in the Pamphlet of Exhibits accompanying this memorandum. This is believed to be the only practical way of obtaining the information which should be had and of enforcing any regulations that may be adopted toward controlling the uses of motor-driven vehicles.

### 3. Recommendations as to Reducing Pneumatic Tire Production

As some time would necessarily elapse before the information could be compiled



through the Federal licensing plan; above suggested, this Committee recommends, to prevent the disastrous condition, which seems to be imminent, that immediate measures be taken to reduce the consumption of rubber in pneumatic tires suitable for pleasure vehicles, by requiring each manufacturer to reduce its production of pneumatic casings (and tubes therefor) of sizes up to 6 in. (6 in. and over being used entirely on trucks) and reduce its consumption of rubber in such casings and tubes to one-twelfth of its 1917 production and consumption—always excluding Government orders.

This may be done through an order to be issued by the War Trade Board, along the lines of Exhibit E, requiring each manufacturer to limit its consumption in August and September to one-twelfth of the total amount of crude rubber used by it during 1917 in the specified casings and tubes, and also requiring it to limit its production of those articles to one-twelfth of the total number of such articles produced by it during 1917.

It is obvious that the unnecessary use of motor-driven vehicles cannot equitably be controlled by a restriction in the importation of crude rubber; it can be limited by controlling the use made of the imported rubber, but that would not meet the situation existing because of the stocks in the hands of many users. It can completely and fairly be controlled only by regulation of the use of the vehicles themselves, based upon a licensing plan somewhat along the lines above proposed. The vehicles themselves should be controlled rather than any one element of them.

#### 4. Recommendations as to Notice of Restrictions

This Committee desires to point out that the restriction of production of pneumatic casings and tubes for limited periods will induce unwarranted buying and hoarding before the restrictions become effective unless notice of restriction is accompanied by an announcement of the proposed possible restriction of use under Federal control of license. The Committee strongly recommends that such announcement be made at the time when notice of restriction is given.

#### 5. Recommendation as to Importation

The increase in the demand for rubber articles, due to war activities and industries connected therewith, is such that the 100,000 tons which are now permitted to be imported are inadequate even on a very conservative estimate, as is shown in detail in Exhibit G forming a part of the Pamphlet of Exhibits presented with this memorandum. We recommend a tentative importation at the rate of 160,000 tons, as stated in Exhibit G.

These figures show the necessity of increasing the shipping of rubber to this country, to avoid serious consequences, even though the excess amount of rubber shipped here be held in this country for allocation at a later date. Any plans for such increase should be made now, as the time required for delivery from the source to the manufacturer is practically four months, and it would be far better to have an excess of rubber come in during the fall months, when advantage could be taken of shipping facilities and when transportation from the Coast to the manufacturer is much more prompt than in the winter months when everything possible should be done to lessen the congestion of traffic.

#### 6. Recommendation as to Principle Which Should Be Adopted

This Committee believes that the only safe and logical course to follow is to restrict the uses of crude rubber to any point that may be found necessary, no matter how drastic

such restriction may ultimately be, and provide for the importation of sufficient crude rubber surely to meet this requirement, which involves the accumulation of stocks adequate to tide over any temporary failure of transportation facilities.

The existing plan appears to be to permit importation to an amount based upon estimates of what should be required, but as the uses of the rubber are not controlled, the stocks are being dissipated and the country is approaching the danger point, as no provision has as yet been made for replenishing stocks and for insuring the use along essential lines in the future.

This committee, knowing that the rubber industry desires to work wholeheartedly to carry out any regulations put into effect by the governmental departments, and that it will do so particularly if all of the circumstances are fully explained and known, requests that, in the interest of the most complete understanding and co-operation, this committee be given an opportunity to call together and to explain to the whole industry whatever regulations may be decided upon, and to do this before those regulations have otherwise been announced. A complete understanding will furnish a basis for directing the efforts of the rubber industry most effectively along the lines of the needs of the Government and of the public as a whole.

In making the above presentation of facts and recommendations, the War Service Committee of the rubber industry has endeavored to place the War Industries Board in a position to view the situation in its true light, in order that the Government may fairly meet the responsibility which necessarily rests upon it in dealing with this industry. The responsibility of this committee has been met when it has presented the facts and its recommendations.

The War Service Committee of the rubber industry is ready, at any time, to meet the War Industries Board and other governmental departments to answer any questions that may be asked and further to discuss any suggestions that may be made. —Respectfully submitted, B. G. Work, chairman; H. S. Firestone, J. N. Gunn, G. B. Hodgman, P. W. Litchfield, H. T. Dunn, C. T. Wilson.

#### Exhibit B

A greater part of the crude rubber imported is of the plantation character, coming from British and Dutch possessions in the Far East. Roughly speaking, 70 per cent from British territory and 30 per cent from Dutch. It is mainly shipped to Pacific ports.

The following table is submitted:

Total tonnage in the Pacific in units of cargo tons of 100 cu. ft. during 1917 .....	2,333,140 tons
Total weight of crude rubber imported during 1917 at Pacific ports.....	113,846 long tons
Or in cargo tons of 100 cu. ft. ....	85,005 tons
Or 3.6 per cent of the total tonnage.	
Value of imports at the Pacific Coast during 1917.....	\$539,335,640
Value of crude rubber imports..	150,151,590
Reduced to percentages 3.6 per cent of the total Pacific tonnage was used in bringing in 28 per cent of the value of the importations at the Pacific Coast.	

Ordinarily Plantation rubber will average about 30 lb. to the cubic foot in packing. Due to the successful experiments on the part of a large manufacturer we have demonstrated that rubber can be packed under pressure and baled with a space economy of somewhat over 25 per cent.

The manufacturer placed at the disposal of the industry the result of his experiments, and they were quickly acted upon. A large number of presses were sent out, others were built locally, and rubber is reaching America packed on the average of 35 to 40 lb. per cubic foot.

On the basis of the same importations and the same amount of tonnage, under the new method of packing 2.7 per cent of the total Pacific shipping space will be used.

#### Exhibit C

Summary of 448 replies out of 503 questionnaires—Sent out March 5, 1918.

Amount of crude rubber used in the production of specified classes of goods.

	Tons used during calendar year ending Dec. 31, 1917
<b>Tires and Tubes—Class</b>	
Automobile pneumatic casings...	71,664
Automobile pneumatic tubes....	14,422
Motor and bicycle tires and tire sundries .....	2,815
Solid tires .....	11,685
Casings and tubes combined....	8,782
Casings, tires and tubes combined .....	902
Mechanical rubber goods.....	21,323
Boots and shoes .....	12,638
Insulated wire and insulating compounds .....	2,756
Druggists' and stationers' sundries and surgical rubber goods.....	3,732
Waterproof clothing, including carriage cloth and rubber sheeting	1,590
Waterproof cloth, including single and double texture .....	585
Hard rubber goods.....	1,165
Rubber cement .....	1,462
Miscellaneous, not included in any of the above schedules.....	1,798

#### Exhibit E

Draft of suggested notice to be sent to manufacturers by the War Trade Board, curtailing the production of certain articles.

In accordance with the second paragraph of clause 5 of the guaranty given us, under which deliveries of crude rubber are made to you, specifying that all sales of manufactured or partly manufactured goods be subject to the control and regulation of the War Trade Board and to comply with any rules or regulations concerning such sales providing methods, restrictions and limitations under which such sales may be made, you are advised as follows:

Under date of Aug. 1, and effective for two months thereafter, the manufacturer of pneumatic casings and tubes therefor shall not consume for the two months more than one-twelfth of his total amount consumed in each class of said articles during 1917, neither shall the number of pieces exceed one-twelfth of his output during 1917.

(Add here such restrictions on production of the articles listed in Recommendation No. 1 of our memorandum, as may be decided upon by the War Industries Board.)

#### Exhibit F

##### Federal Licenses for Motor Vehicles

It is suggested that the Government shall immediately require all motor (including motorcycles) vehicles to display thereon in conjunction with the regular state or city license plate a Federal license tag or plate.

The plan as outlined hereinafter contemplates the use, exclusively, of the existing state or city license boards and no staff of clerks would be required to be employed by any Federal department or by the War Industries Board.

It may possibly require in Washington the detailing to some one person with four clerks and stenographers, to conduct the correspondence with the highway commissioners or secretaries of state or other heads of licensing boards during the short period incidental to making clear to them the contemplated plan, but it is believed that the whole matter will involve but little work on the part of the Government other than that indicated.

The plan could be made immediately effective by first calling in conference the heads of the licensing boards of Massachusetts, New York, Connecticut, New Jersey, District of Columbia, Maryland and Illinois, placing on them the responsibility of formulating plans for immediate procedure. No delay should ensue, as there is at present close co-operation between all of the existing licensing boards, and it would not add to the expense of administration of these boards to any extent that would not be compensated by the charge of the proposed fees of \$2 per vehicle, which sum, if it is considered too large, could safely be reduced to \$1.

If the Federal Government does not care to take the formal initiative in this, a conference should be called in Washington of the heads of the licensing boards above referred to: they will then make plans to take the suggestion of the War Industries Board and make the plan effective on their own initiative.

The Federal license tag shall bear a letter indicating the character of the use of the vehicle.

For further identification, each tag shall be of a different color selected for each of the several classes.

It is recommended that the existing license board of each of the states (or in some few cases—cities) shall be utilized for the issuing and registration of the Federal licenses.

Each license board shall charge the owner of the vehicle, in payment for registration and tags, the sum of \$2 (or \$1) for each set of license tags for each vehicle.

Written applications for Federal licenses shall be filed with each license board.

The license board shall issue to the owner of the vehicle a Federal license and receipt for registration fee with the tags or plates.

It may be required that the applicant for the license shall state under oath the use made of each of the vehicles licensed.

Federal license tags shall be issued as follows for each of the classes of vehicles described after the corresponding letters:

- A (Green) Trucks or motor vehicles with solid rubber tires (except electric passenger cars).
- B (Blue) Trucks or motor vehicles (commercial bodies) using pneumatic tires or pneumatic and solid tires, for the conveyance of materials or merchandise.
- C (White) Motor vehicles (passenger) running for hire, including taxis, jitneys and busses.
- D (Red) Motor vehicles (passenger bodies) used by physicians and surgeons in professional work, hospitals, institutions, mercantile and manufacturing owners or companies or persons using vehicles in the conduct of their business.
- E (Brown) Motor vehicles (passenger or commercial bodies) used by farmers or owners in rural communities using their cars for passenger or merchandise transportation in connection with their work and living.
- F (Yellow) Privately owned passenger vehicles used for recreation, convenience or pleasure, whether driven by the owner or by paid chauffeur or driver.
- G (Black) All motor vehicles (passenger and commercial) in the service of Federal, State or Municipal Departments or Employees, or owned or used by Government Controlled Railroads or Government Controlled Express Companies.

The issuing of such licenses under the request or direction of the War Industries Board by the utilization of existing licensing

facilities of the various States or Cities—

- (a) Will afford accurate means of determining the number of vehicles in each class in any and all states and cities or communities;
- (b) Will provide a means for the regulation of the use of all vehicles;
- (c) Will provide means for the exclusion or limitation of the use of all vehicles in any class;
- (d) Will provide means, if and when it may be deemed necessary for the control of the consumption or distribution of fuel and oil;
- (e) And in case of Class F, will afford means for the restriction of the use of such vehicles unless driven by the owner (unless under special license).

The foregoing plan is submitted in the belief that it is essential to secure accurate information regarding the use of all cars before attempting to promulgate any rules for regulation or limitation, or even for specific direct Federal taxation or control of supply of fuel.

The plan insures securing this vital information promptly, as it is believed that all cars may be registered and provided with license plates within thirty days after such plates and the necessary application and receipt forms are supplied to each of the local license bodies.

It is further suggested that the license plates and tags first used shall, with the distinguishing letter and color, bear the year date, 1918, and that provision be made for stamping on a small space provided on the tag the corresponding State or City license number to provide against fraudulent use of Federal identification tags or plates.

#### Exhibit G

The consumption during the quarter ending June 30, 1918, was 52,000 tons. During that quarter there was no restriction in force regarding the use or consumption, so it may be stated that normal requirements for 1918 would be at least 200,000 tons as compared with about 160,000 tons during 1917.

The Government is working on a basis of allowing importation of 100,000 tons, or 220,000,000 lb.

Consumption 1917 for the U. S. was about 157,360 tons, or 352,000,000 lb.

We feel 220,000,000 lb. insufficient, even granting:

- A. Restriction of automobiles within reasonable limits.
- B. Elimination of all non-essentials.
- C. Whatever may be accomplished through the matter of standardization and simplification of varieties and kinds of the whole industry.

For example:

Total rubber consumption	
U. S., 1917.....	352,000,000 lbs.
Total rubber consumption tire industry U. S., 1917.....	247,000,000 lbs.
Total rubber consumed in solid tires in U. S., 1917—less...	26,000,000 lbs.
Total rubber consumed in pneumatic tires U. S., 1917.	221,000,000 lbs.
One-half of rubber consumed in pneumatic tires, 1917...	110,500,000 lbs.
To provide for solid tires and 6 in. and over pneumatic tires for trucks and Government purposes—present requirements for solid tires being three times the requirements of 1917, irrespective of increased demand for pneumatic truck tires of 6 in. and over—add.....	100,000,000 lbs.
Consumption of rubber for all other purposes 1917, all articles other than tires...	105,000,000 lbs.
Requirements as against.....	315,500,000 lbs.
Estimated by the Government .....	220,000,000 lbs.
Difference, or .....	95,500,000 lbs.

43,409 tons

We consider this example, which would require 143,409 tons to be imported as against the 100,000 tons estimated by the Government, to be ultra-conservative, for the following reasons:

- A. January 1, 1917, there were licensed, 3,400,000 automobiles.
- January 1, 1918, there were licensed, 5,200,000 automobiles.
- An increase of cars during 1917 of 1,800,000, or 53 per cent.
- Granting no automobiles produced in 1918, the nominal requirements for tires and consequent consumption of crude rubber would be greater in 1918 than 1917, and when we assume in the foregoing example the reduction of pneumatic tires and tubes by 50 per cent (for the purpose of illustration), we feel we are going further than the Government will eventually feel it wise to go in the reduction of tires for use on automobiles for essential purposes.
- B. The allowance of 100,000,000 lbs. for truck tires for the coming 12 months will probably be about right, based on the present demand for truck tires.
- C. We believe that the 105,000,000 lbs. provided for the manufacture of all other rubber goods, which is the amount consumed in 1917, is far too small, since:
  - (a) The speeding up of many of the industries for war purposes is calling for increased tonnage of mechanical goods.
  - (b) The demand for hospital supplies and electrical insulation is greatly in excess of a year ago.
  - (c) Sixty per cent of the total capacity of the country for certain heavy grades of rubber footwear is being taken by the Government, these being the grades that use the largest percentage of rubber in the footwear division.

We fear the Government expects a reduction in poundage consumption of crude, due to the work being done by the Conservation Division of the Government, with which the industry is working in close co-operation. For the next 6 months or year, while much will be accomplished in co-operation with the Conservation Division, which may mean more economy in labor, space, etc., we do not believe it will result in a reduction of poundage consumption of crude rubber.

For example:

- 1. If styles and kinds of hospital supplies were cut in two, it would not result in saving half the poundage of rubber, but only in doubling the amount of rubber consumed in the remaining styles and kinds. This would also be true as regards mechanical goods, footwear, etc.
- 2. Many styles and kinds will be eliminated altogether, and these in number may more than equal those retained, but those eliminated for the sake of economy and efficiency of operation would be styles and kinds of limited production in normal times, and consequently small tonnage of rubber consumed, which in our opinion would be for some time to come offset by the increased demand for the styles and kinds retained.

The total amount of tonnage involved in the proposed restrictions for August and September is small, with the exception of the curtailment of tire production. Figures are now being prepared to show the amount of rubber used in each class of articles during the last quarter, and these will be submitted to the War Industries Board as soon as they are available.

From the facts and figures already at hand, it is obvious that 100,000 tons is inadequate and that a minimum of 160,000 tons will be required under the most rigid restrictions of consumption.

We would, therefore, recommend that 160,000 tons per annum be taken as the tentative minimum, and that allocation for August and September be made upon this basis. Before a further allocation is necessary, the Board will have actual figures upon which to form a definite conclusion.

#### 40,000 See Tractor Demonstration

(Continued from page 204)

the tractor field in the future than he has in the past.

There are some tractors much in need of the professional engineer, and though the engineer is not the be-all and end-all of the tractor design, it is imperative that his work be incorporated in it.

He is of the opinion that tractors in too many cases are rated too high. Too often the ratings represent the maximum capacity of the machine, which means that they have not enough reserve power. This is a mistake. The farmer is deceived by these over ratings.

Professor Davidson made a plea for a standard method of tractor rating. He was certain that it is coming, and no obstruction should be placed in its path.

He gave a few valuable words of advice to tractor salesmen. The tractor cannot be sold on price alone. It cannot be sold on horsepower alone. The necessity in every tractor is sound engineering that will give reliability and performance. Incidentally he told of how California is one of the greatest tractor states. It has very rough land, as well as a wide variety of soils, some light and others very heavy. The State has been a pioneer in the tractor field, and the farmers in California are not looking for the cheapest tractor but for the one that will give best results in the long run.

J. B. Bartholomew told of how the Salina demonstrations are the best that have ever been held. No better place in the country could be selected, as the tractors are plowing very hard soil in weather that is too hot for horses to work to advantage.

This year Kansas will produce 100,000,000 bushels of winter wheat, or one-ninth of all the winter wheat in the country.

E. J. Gittins of the Case company, and a member of the tractor committee handling the demonstrations, spoke very favorably of standardization and declared that gradually different tractors are coming closer and closer together to the eventual goal. While many may declare that many improvements have not been made during the past year, Mr. Gittins believes that very great progress has been made, not in a few but in a very large percentage of the machines.

#### Hardman Tire Reorganized

BELLEVILLE, N. J., July 31—The Hardman Tire & Rubber Corp. was reorganized on July 1, and the business will be continued under the style Hardman Rubber Corp. The present plant will be operated, and in addition a new plant will be built shortly. The present production is 125 tires a day, but the addition will increase this to 450.

The new officers are: President, Lorne A. Scott; vice-president and manager of production, Albert A. Pashek; treasurer, Walter Haefeli; secretary, Arthur C. Bang. Clayton C. Dobbs has been named sales manager and John D. Reynolds manager of sales for the southern territory, with headquarters in Baltimore.

The tire has been placed on the 5000-mile adjustable basis and will operate on the standard guarantee. Direct sales have been discontinued, and tires will be distributed by dealers.

#### N. A. D. A. Members Rolling In

ST. LOUIS, July 30—If the present rate of speed is maintained the National Automobile Dealers' Association will have its wanted 5000 members by September. There are about 3000 in now. At a big meeting in Boston last week Friday there ended a two weeks' campaign that brought the New England total to 445 and more are coming.

Last Wednesday in Newark, N. J., the New Jersey dealers endorsed the project, as did the Buffalo dealers the evening before. A big meeting is scheduled for Chicago to-night.

President F. W. A. Vesper and Executive Secretary E. E. Peake are traveling rapidly in their speech-making tours from city to city.

#### Paige Price Increased

DETROIT, July 31—The Paige-Detroit Motor Car Co. will increase the prices of its cars on Aug. 1, as follows:

Model	Old Price	New Price	Increase
6-39 .....	\$1,395	\$1,515	\$120
Essex, 6-55 .....	1,830	1,985	155
Larchmont, 6-55 .....	1,950	2,090	140

#### Goodrich Purchases Resort for Employees

AKRON, July 30—The B. F. Goodrich Rubber Co. has purchased a large tract of land near the city, including Rex Lake, for a recreation center in addition to the athletic field maintained by the company. A large summer cottage has been erected on the grounds where employees may spend week-ends and their vacations. A bathing pier and beaches have been provided; also boats for fishing, basketball and tennis courts. Free transportation between Akron and the lake, a distance of 9 miles, is arranged for.

#### Develop New "Liberty Aero Oil"

WASHINGTON, July 31—Development of a new aircraft engine oil to be known as the "Liberty Aero Oil," to be used in the Liberty engine and all stationary cylinder aircraft engines, by the Army and Navy, was announced to-day by the Department of Military Aeronautics. The new oil is a mineral oil, the result of experiments lasting 12 months, carried on by a staff of men who worked uninterruptedly on the problem. One officer worked so intensively that he became ill and died. This was Captain O. J. May. Captain May personally supervised the running of 37 engine tests in 25 days in a laboratory where 5 engine tests a week would ordinarily be a complete program. To determine lubrication and fuel at high levels Captain May

went to the altitude testing laboratories, an airtight building capable of having the air within it partly reduced and kept constant by means of exhaust air pumps.

It is stated that the new oil will be available in quantities sufficient to meet our airplane needs and that it will cost about 75 cents per gal.

Plans have also been completed and placed in operation for the reclamation of used oil, and at least 50 per cent can be used again under the scheme devised.

It is estimated that our airplane program will call for at least 5,000,000 gal. of lubricating oil and that since castor oil costs \$3 per gal. Captain May's experiments will save the Government at least \$11,000,000.

#### Michigan Plants Listed for War Work

DETROIT, July 30—Samples of the questionnaires to be sent out to all Michigan manufacturers by the Survey and Conversion Section of the War Industries Board in an effort to determine the possibility of converting their plants to war work have been made. At the meeting of the heads of the thirteen districts of Michigan plans were formulated for each district head to get in touch with every manufacturer in his district. Sub-chairmen for each industry within the district will be appointed by the district heads.

The war resources committee will act as a go-between in supplying Washington with plants that can do war work and that the government will get in touch with such plants as they are needed. The district representatives were told at the meeting to discourage building of all kinds of industrial work but to use buildings that were already standing or converted for war work.

#### Only One More Show for Canada

TORONTO, ONT., July 29—Other than the National Automobile Show of Canada, held in conjunction with the Canadian National Exhibition in Toronto, there will be no more automobile shows in Canada until after the war. This decision was reached at the board meeting of the recently organized Automotive Industries of Canada, and announced by its president, G. M. McGregor, of the Ford Motor Co. of Canada. The organization includes in its membership all Canadian car manufacturers (Briscoe, Chalmers, Chevrolet, Ford, Gray-Dort, Maxwell, McLaughlin, Studebaker and Willys-Overland), as well as many tire, parts and accessory manufacturers.

#### Plan Kansas City Tractor Show

KANSAS, MO., July 29—The fourth annual Kansas City Tractor Show will be held Feb. 10 to 15, 1919, in a special building to be erected on the plaza facing the Union Depot. The building will be approximately double the size of the one used last February. The tractor manufacturers have already practically signed up for space double the area used at the last show. The show, as formerly, will be conducted by the Kansas City Tractor Club, with Guy H. Hall as secretary and manager.



## Castor Bean Industry Being Revived

108,000 Acres in Southern States and California—Growers Expect a Supply of 2,000,000 Gallons of Oil the First Year—Oil Essential for Rotary Motors

delivery at Boston but do not incur tax on freight bills. The usual practice, including 1 per cent cash in 15 days or 30 days net, is to be. The War Industries Board gave priority on all available supply and will allocate supplies to Government departments and other essential departments as required. Any balance not used will be released for sale to retail buyers, but at prices no higher than determined upon. Foreign supply except to Allied Governments, is controlled by the ruling.

Prices set for rough lumber range from 8 to \$60 for specified lengths of 10 to 20 ft. and from \$36.50 to \$59 for planing one side. For planing one side and two sides, \$1; for planing two sides and matching or grooving, \$1.50; for planing four sides, \$1.50.

### Standard and Maxwell Dealers Retain Lines

ST. LOUIS, July 25—Contrary to reports, the Standard Motor Sales Corp. is maintaining a general practice of combining Standard and Chalmers agencies. In instances the company has found it better to combine the field forces of the two lines and it has become a general opinion that the company has been successful all over the country. This has been decided by the company. A statement has been made that the dealers are not disturbed and that each agency is maintaining its respective line as heretofore.

### Online Profiteering in Bay State

BOSTON, July 27—There will be no increase in gasoline in Massachusetts as a result of the increase of 1/2 cent permitted by the United States War Relocation Authority. Fuel Administrator James M. Cowley, who has direct charge of all matters throughout the State, reported that some of the retailers had raised the price a few cents following the increase by the oil companies. Thereupon he issued a statement requesting persons who come across retailers to have advanced the price more than a cent to notify him at once, and stop the practice.

Under the powers granted him by the War Relocation Authority, Fuel Administrator Storow may revoke the license of any such dealer to do business in Massachusetts, either for a few weeks or for the period of the war. Examples have been made of other profiteers in sugar, flour, etc., and gasoline profiteers will meet the same fate.

### Continue Price-Fixing for Scrap Steel

WASHINGTON, July 27—The Price Fixing Committee of the War Industries Board announces that rumors circulated in publishing companies that price-fixing for scrap steel would be discontinued are untrue. It states that conservation of scrap steel and stimulation of the steel industry are matters of first importance in the emergency.

WASHINGTON, July 27—The planting of 108,000 acres with castor oil beans in 8 Southern States and California, Cuba, Haiti and Santo Domingo is proving successful, according to a statement from the Bureau of Aircraft Production. The supply of oil from this territory will be available this fall, some of it as early as August. It is estimated that the average acre will produce 20 gallons of oil of No. 1 grade, making 2,000,000 gallons for the first year.

The necessity of obtaining millions of gallons of castor oil for lubricating rotary aviation engines during the first two years of the war, when the available supply was only 700,000 gallons, was one of the several anticipated problems encountered in 1917 in the operation of the American air problems. In its solution—namely, the growing of castor oil beans in the above mentioned states and countries—the industry has been revived. Although castor beans are not native to this country it is believed that they will grow readily in the South. They can be grown between rows of citrus trees and also on land previously ruined for cotton growing by the boll weevil. The Government will let contracts for crushing the picked crops.

Briefly, the process of manufacturing castor oil entails the cold pressing of the beans for the extraction of the oil suitable for aviation engines and medicinal purposes. This oil is purified by a filtration process and is then ready for use. The residue of the first pressing is treated and an additional supply of inferior oil is obtainable. This is known as No. 3 grade. After the extraction of the inferior oil, castor pomace remains, which, when ground, makes a valuable fertilizer.

Before the war, the demand for castor oil for airplane engines, American medicinal and industrial needs called for about 2,500,000 gallons per year. Commercially it was used in the manufacture of soaps, inks, dyes, artificial leather and fly paper.

### Co-operation Helpful

The results of this work, now well under way, are due in great extent to the co-operation between the Department of Agriculture, the War Trade Board, and the Materials Department of the Bureau of Aircraft Production, with foreign advice and assistance.

India has long been the world's leading source of supply for castor beans. Of the total imports into this country before the war, 80 per cent came from India. The American industry, which originally flourished in Oklahoma, Kansas, Missouri and Illinois, succumbed some years ago to the cheaper importations from India and could contribute but little to the demands of the air service.

In September, 1917, the castor oil situation assumed such a serious aspect that the Signal Corps, through the Secretary of War, secured the appointment of a board to deal with the difficulty. This body comprised representatives of the Aviation Section of the Signal Corps, Department of Agriculture, Export Bureau of War Trade Board and civilian experts. Deliberations of the Castor Oil Production Board resulted in the planting of castor beans in more than 100,000 acres in and near this country under Government contracts. The price recommended to be paid for beans so grown was \$3.50 per 46 lb. bushel.

Seeds Brought from India

Arrangements made with Great Britain for the seed supply resulted in releasing the steamship *Adelaid*, then being held at Bombay, although already consigned to this country. On January 7, 1918, this ship arrived with about 6000 long tons of castor beans. Approximately 200 tons were used as seed and the remainder pressed for oil by the original contractors, for immediate Government needs. This supplied about 500,000 gallons. More than a million gallons of oil were obtained from England for shipment direct to France. These supplies, together with oil from other sources, made a total of 2,400,000 gallons available.

### Seeds Brought from India

Although castor oil is not essential as a lubricant for the Liberty engine, or most of the other reciprocating engines, it is essential to the efficient operation of rotary motors. In this type the gas is taken in through the crankcase where it comes in contact with the oil, but, as castor oil is only slightly soluble in gasoline, it is practically unaffected. Other important properties of this lubricant are its heavy viscosity and high lubricating value.

Although little has been said regarding the rotary motors in the air program, great numbers are now in use abroad and many more are in course of manufacture. The Air Service is using engines of this type in advanced training planes. One hundred and fifty of them have been finished and are now in use. Some 500 planes, now being manufactured, will take rotary motors, as will a new single seater, pursuit type plane for advanced training. The need of castor oil as a lubricant, therefore, has become a feature of the air program and the lack of it a serious handicap.

Oakland Employees to Have Holiday

PONTIAC, MICH., July 27—Thursday, Aug. 22, will be a holiday for employees of the Oakland Motor Car Co. On that date the company will entertain its workers with a picnic at Lake Orion.

# AUTOMOTIVE MATERIALS MARKETS

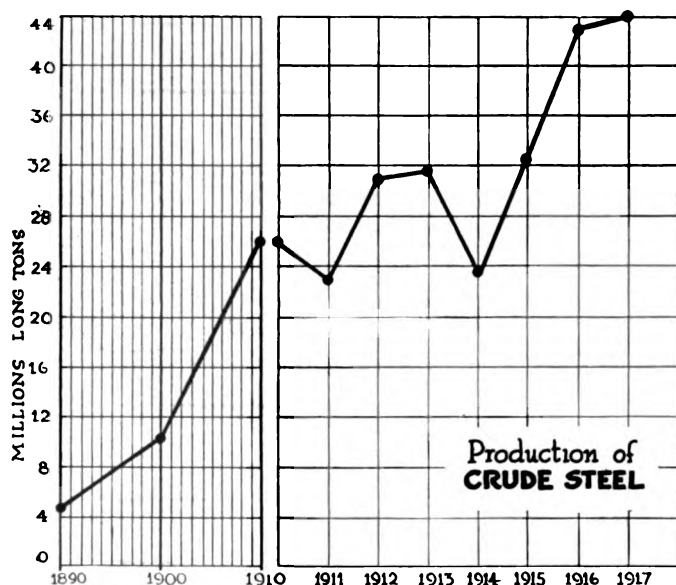
## Material Market Prices

<b>Acids:</b>	
Muriatic, lb. ....	.02-.03
Phosphoric, ct. ....	.35-.39
Sulphuric (60), lb..	.11
<b>Aluminum:</b>	
Ingot, lb. ....	.13
Sheets (18 gage or more), lb. ....	.40
Antimony, lb. ....	.13½
<b>Burlap:</b>	
8 oz., yd. ....	.19
10 oz., yd. ....	.24½

**Copper:**  
Elec., lb. .... .26  
Lake, lb. .... .26

**Fabric, Tire (17½ oz):**  
Sea Is., combed, lb.1.65-1.70  
Egypt, combed, lb.1.25-1.35  
Egypt, carded, lb..1.20-1.30  
Peelers, combed, lb.1.05-1.20  
Peelers, carded, lb..95-1.05

**Fibre (¼ in. sheet  
base), lb. .... .50**



*Showing how the production of crude steel in the United States has increased in the past 27 years and the small percentage of increase in 1917 over the year before*

**Graphite:**

Ceylon, lb. ....	.07½-.25
Madagascar, lb. ...	.10 -.15
Mexican, lb. ....	.03%

**Lead, lb. .... .08½**

**Leather:**  
Hides, lb. .... .18-.33½

**Nickel, lb. .... .40-.43**

**Oil:**

<b>Gasoline:</b>	
Auto., gal. ....	.24
68 to 70 gal. ....	.30
<b>Lard:</b>	
Prime City, gal..	2.25
Ex. No. 1, gal. ....	1.50-1.55
Linseed, gal. ....	1.84
Menhaden, gal. ....	1.15
<b>Petroleum (crude).</b>	
Kansas, bbl. ....	2.25
Pennsylvania,	
bbl. ....	4.00

**Rubber:**  
Ceylon:  
First latex pale  
crepe, lb. .... .63  
Brown, crepe, thin,  
clear, lb. .... .60  
Smoked, ribbed  
sheets, lb. .... .62  
Para:  
Up River, fine, lb. .68  
Up River, coarse,  
lb. .... .40  
Island, fine, lb. .59  
Island, coarse, lb. .27  
Shellac (orange), gal. .70-.76  
Spelter ..... .08%

**Steel:**  
Angle beams and  
channels, lb. .... .03  
Automobile sheet  
(see sp. table).  
Cold rolled, lb. .... .06½  
Hot rolled, lb. .... .03½  
Tin ..... .94  
Tungsten, lb. .... 2.40  
Waste (cotton), lb. .... .12%-.17

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lb.	Primes when seconds up to 15 per cent are taken Per 100 lb.
Automobile body stock .....	\$5.95	\$5.85
Automobile body stock, deep stamping.....	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock .....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping .....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping .....	6.55	6.45
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 to 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in to 44 in., 80c. per 100 lb.		
Black Sheet Extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds, 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.....	61	63	-2
*J. I. Case T. M. Co., pfd.....	80	86	..
Chalmers Motor Co., com.....	4 1/2	6 1/2	+ 1/2
Chalmers Motor Co., pfd.....	20	30	..
*Chandler Motor Co.....	85	85 1/4	+ 1/4
Chevrolet Motor Co.....	130	133	-2
*Fisher Body Corp., com.....	38	39	+1
*Fisher Body Corp., pfd.....	89	90 1/2	-1 1/2
Fisk Rubber Co., com.....	55	58	..
Fisk Rubber Co., 1st pfd.....	98	103	..
Fisk Rubber Co., 2nd pfd.....	78	83	..
Firestone Tire & Rubber Co., com.....	108	111	..
Firestone Tire & Rubber Co., pfd.....	92	95	..
*General Motors Co., com.....	154	154 1/2	-1 1/2
*General Motors Co., pfd.....	80	82	..
*B. F. Goodrich Co., com.....	46	46 1/2	-1
*B. F. Goodrich Co., pfd.....	98	100	..
Goodyear Tire & Rubber Co., com.....	166	170	+3
Goodyear Tire & Rubber Co., pfd.....	97	97 1/2	..
Grant Motor Car Corp.....	2 1/2	3 1/4	- 1/4
Hupp Motor Car Corp., com.....	3 1/2	4	- 1/2
Hupp Motor Car Corp., pfd.....	79	82	-3
International Motor Co., com.....	27	33	..
International Motor Co., 1st pfd.....	55	65	..
International Motor Co., 2nd pfd.....	35	40	-3
*Kelly-Springfield Tire Co., com.....	50	51	..
*Kelly-Springfield Tire Co., 1st pfd.....	79	87	..
*Lee Rubber Tire Corp.....	21	21 1/2	+1 1/2
*Maxwell Motor Co., Inc., com.....	28	28 1/2	-1
*Maxwell Motor Co., Inc., 1st pfd.....	56	57	..
*Maxwell Motor Co., Inc., 2nd pfd.....	21	22	-1
Miller Rubber Co., com.....	110	112	-1
Miller Rubber Co., pfd.....	95	96	-1
Packard Motor Car Co., com.....	115	125	..
Packard Motor Car Co., pfd.....	94	97	..
Paige-Detroit Motor Car Co.....	18	20	..
Peerless Truck & Motor Corp.....	14 1/2	16 1/2	- 1/2
Portage Rubber Co., com.....	119	122	-3
Reo Motor Car Co.....	13 1/2	14 1/2	- 1/2

	Bid	Asked	Net Ch'ge
*Saxon Motor Car Corp.....	6 7/8	7 1/2	- 1/8
Standard Motor Construction Co.....	12	14	
Standard Parts .....	60	65	+ 5
*Stewart-Warner Speed. Corp.....	59 3/4	60 3/4	- 1/4
*Studebaker Corp., com.....	45 1/4	45 1/4	- 1/8
*Studebaker Corp., pfd.....	83	85	- 5
Swinehart Tire & Rubber Co.....	50	55	- 3
United Motors Corp.....	32	32 1/2	- 1/2
*U. S. Rubber Co., com.....	61 1/4	61 1/2	- 1/4
*U. S. Rubber Co., pfd.....	104 1/4	105	-
*White Motor Co.....	42 1/2	43 1/4	+ 1/8
*Willys-Overland Co., com.....	19 1/2	20	- 1/2
*Willys-Overland Co., pfd.....	81	84	+ 1 1/4

\*At close July 27. Listed N. Y. Stock Exchange.

## OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	Bid	Asked	Net Ch'ge
Auto Body Co.....		7½	
Bower Roller Bearing Co.....	16½	18½	
Chevrolet Motor Co.....	132	134	—1
Continental Motor Car Co., com.....	5½	5½	
Edmunds & Jones, com.....	14	17	
Edmunds & Jones, pfd.....	75	90	
Ford Motor Co. of Canada.....			
Hall Lamp Co.....		14	
Michigan Stamping Co., com.....	12¾		
Packard Motor Car Co., com.....		125	+1
Packard Motor Car Co., pfd.....	93		—1
Faige-Detroit Motor Car Co.....	18¾		+ ¾
Prudden Wheel Co.....		12	
Reo Motor Car Co.....	14½	15	+ ½

## INACTIVE STOCKS

Atlas Drop Forge.....	..	26	..
Kelsey Wheel Co.....	25	..	..

# Industrial Review of the Week

## A Summary of Major Developments in Other Fields

### Steel Makers to Increase the Allotment for Shipyards

A conference in New York Monday between Government leaders in ship-building, the Director of Steel Supply and the steel manufacturers' committee had to do with means of increasing the allotment of steel to shipyards, in view of the enlarging program for the Schwab drive. At a meeting in Washington later in the week plans will be made to insure shipyard work against interruption in the coming year, also for the prevention of lost motion through competing efforts of Washington departments, the commanding general in France and the Allies.

The whole tenor of the conference talk was that however detailed figures might be changed, the main fact was the increasing war demand for steel and with it an indefinite but inevitable reduction in the amount available for other uses.

The large schedules of steel for direct and indirect war needs give weight to the claim still widely made that all Governmental agencies concerned have put their requirements at top figures, in spite of repeated requests for pruning. In short, if deliveries meet schedule figures, it is believed the reservoir would be an ever filling one, unless the talked-of-railroad breakdown should be really serious. The half-year's demand for shell steel has risen to 3,000,000 tons, requiring a shipment rate probably 15 per cent above that now obtaining, and the plate total is close to theoretical capacity and about 12 per cent more than the recent record outputs.

Washington has come to the help of the jobbers, many of whom were left with small stocks owing to poor deliveries in recent months. For August the Director of Steel Supply permits them to receive from the mills shipments equal to their average in the first six months of the year. Beginning with September, however, the War Industries Board's plan becomes effective, permitting the replacement each month of the amount shipped by the jobber from stock for Government and essential purposes in the preceding month.—*Iron Age*.

### Fifty Tractors in National Demonstration at Salina

(Continued from page 178)

said were impossible. They declared that it was impossible to do good plowing at speeds of 3.5 and perhaps 4 m.p.h., but to-day they saw some of the best plowing being done at those speeds. The redesigning of the plows has made this possible. To-day we saw a 10-foot Moline mower which makes it possible to cut 25 acres of hay in a single day and

also makes it possible to use a tractor efficiently with such a machine. The old 6-ft. machines were really too small for the tractor. To-day self-binders for cutting grains are being designed to withstand tractor speeds. They are better made and heavier. They must travel faster.

The tractor and the shortage of farm help demand it. So it is all along the line of farm machinery, and so already we see the entering of the wedge of an era of redesigning in farm machinery, changing it from the horse pace that it has followed for generations and placing it on the tractor pace standard.

### Scripps Price Advanced

DETROIT, July 31—The Scripps-Booth Corp. will advance the prices of its cars on Aug. 1 as follows:

Model	Old Price	New Price	Increase
6-cylinder, touring...	\$1,195	\$1,385	\$190
4-cylinder, touring...	985	1,065	180

The price of the 8-cylinder model remains the same. New 6-cylinder coupe and sedan models, to be known as Model 42 and Model 41, respectively, will be sold for \$1,985. The company will bring out shortly a new Model K semi-coupe with a winter top. The sample has already been finished and production will begin immediately. No price has been announced yet.

The company manufactured 750 cars during July.

### Used Car Sales Brisk in Detroit

DETROIT, July 29—Brisk sales of used cars are reported from Detroit territory. Only a few dealers say that business is not as good as it should be. Practically all dealers estimate their July business to be from 25 to 33 1/3 per cent better than June, and nearly all show marked increases over last year's business.

The Simonds Sales Co. reports that it sold during the first 27 days of July 95 used cars and 99 new ones, forty-nine being "trade-ins."

The future of the used-car business is exemplified in the action of the Thomas J. Doyle Co., distributor of Dodge Brothers cars. The company is about to establish another company to have the same name, which will be a new organization formed to buy and sell used cars. No cars will be accepted on consignment; all cars will be bought outright for cash and sold on easy terms.

Three men have been sent out on the road to cover the entire country in search of used cars. A large store at 734 Woodward Avenue has been leased and all lines of cars will be handled. The new business will open about Sept. 1.

### Production of Coal and Distribution Satisfactory

The week's coal production while not establishing any new records has been heavy, closely approximating the best week the country ever experienced. Car supply has also been good, in some few cases equaling or even exceeding requirements. The accumulation of stocks is gradual and most pronounced in the case of the domestic and small industrial consumer. Railroad stocks are increasing with slowness as are also those of big industrial consumers.

The householders on the other hand are accumulating their winter's supplies, and it is probable that by cold weather there will be but few that ordered their coal last spring that will not have a supply sufficient to carry well into the winter.

Recent fear of congestion at various points, particularly in New England, has arisen more from a shortage of labor wherewith to unload cars than from lack of motive power. A greater variety of cars than formerly are also being employed in the coal trade and the use of other than dump bottom cars is occasioning considerable inconvenience. No one thinks of entering complaint, however, as all dealers and consumers are glad to get the coal irrespective of the car it is shipped in.

The Lake trade is heavy and it is probable that there will be no greater shortage in the Northwest during the coming winter than there was during the past.

In the Middle West some coal has been sold at less than the Government price. This is perhaps significant of the position that coal occupies in the market. Since the Government prices went into effect it has been seldom indeed that coal has been sold in the open market for less than the Government figures.

The car supply, taking the country as a whole, appears to be somewhat better than in some past weeks. In some localities in the East the car supply has been fully equal to the demand, while in Illinois some mines have only been able to work about three days per week. Much complaint is heard concerning this car distribution.—*Coal Age*.

### To Produce 300 Tractors Daily

DEARBORN, MICH., July 30—The new Fordson tractor plant to be built in Hamilton, Ohio, is expected to be in production within 90 days and will employ between 500 and 1000 men. The plant will manufacture and assemble tractors for Ohio, Indiana, Illinois and territory south of the Ohio River. About 300 tractors will be manufactured a day.

**Warner Joins Federal Truck**

DETROIT, July 29—Harry J. Warner, former vice-president of the Continental Motor Co., has associated himself with the organization of the Federal Truck Co. He will act as vice-president in charge of production.

H. O. Penland, who has been sales engineer for the U. S. Ball Bearing Mfg. Co., with headquarters in Cleveland since the first of the year, has been appointed manager of the Cleveland office.

H. A. Van Tine has become affiliated with the Hurlburt Motor Truck Co., New York, as factory manager.

Coulter Merrick has been made head of the automobile accessory department of the Merrick-Anderson Co., Ltd., Winnipeg, Man. He is the son of Joseph A. Merrick, secretary-treasurer of the organization.

H. A. Conlon has been elected vice-president of the Acason Motor Truck Co., Detroit, to succeed J. F. Bowman, resigned. He will have full charge of Acason sales. Both Mr. Conlon and Mr. Bowman have been associated with the Federal Motor Truck Co.

Howard C. Caldwell, assistant advertising manager of the Haynes Automobile Co., Kokomo, Ind., has resigned to enter the Great Lakes Training Station.

Guy W. Morgan, former president of the Abbott Motor Corp., Detroit, who was in charge of the spare parts, tires and accessories for the original Motor Transport Section of the United States Army, has been appointed to similar duties under Colonel Glover in the new Motor Transport Service.

J. Monroe has been appointed district manager for the Denby Motor Truck Co. in the Rocky Mountain section, and will make his headquarters at Denver.

E. C. Molitor, for 8 years a district manager for the Cadillac Motor Car Co., Detroit, formerly with the General Motors Export Co. in the West Indies and South America, is now general sales manager of the Isko Co., Chicago.

A. B. Walker, until recently associated with the Budd Wheel Corp., Detroit, has joined the Bureau of Aircraft Production and will report immediately at a station in the East.

**Williams Foundry Elects Officers**

CLEVELAND, July 29—At the annual meeting of the Williams Foundry & Machine Co., the following officers were elected: President and general manager, F. E. Holcomb, vice-president, S. F. Zili-ox; secretary and treasurer, William Leary. These officers represent the interests which purchased control of the organization last fall. A 3-story building, 275 x 40, has been added which is devoted exclusively to the manufacture of Akron-Williams tire repair equipment.

## Men of the Industry

*Changes in Personnel and  
Position*

**Acme Adds to Personnel**

CADILLAC, MICH., July 29—The Acme Motor Truck Co. has made several additions to its sales organization. G. M. Rockwell, formerly associated with the Republic Motor Truck Co., has been appointed district manager and special representative of the Acme Motor Truck Co., Cadillac, Mich., in charge of Virginia, Maryland, Delaware and North Carolina territory. J. A. Bell has been appointed district manager of the Gulf states east of Texas. F. P. Walker, formerly associated with the Hupp Motor Car Corp., will have charge of Acme sales in Nebraska and the western half of Iowa.

**Lacey Leaves Cunningham**

ROCHESTER, N. Y., July 26—V. E. Lacey, for eight years chief engineer of the James Cunningham Sons Co. of Rochester, manufacturers of high grade motor cars, has resigned to devote his entire attention to the Rochester Boat Building Works, now operating on government contracts. G. E. Franquist, formerly of the Simplex Motor Co., will succeed Lacey.

**Moore Is White's New York Manager**

CLEVELAND, July 26—William H. Moore, formerly manager of the White Co.'s Pittsburgh branch, has been appointed manager of the New York branch, to succeed R. H. Johnston, recently assigned to special executive work, with headquarters in Washington.

**To Use Amber Lenses in Massachusetts**

BOSTON, July 30—The Massachusetts Highway Commission has announced that a new regulation has gone into effect which legalizes the use of amber or yellow-tinted headlamp lenses in the state.

Herbert A. Townsley has been elected secretary of the Akron Automobile Co., Akron, succeeding Grover Reese, resigned.

H. M. Prewett has been appointed district manager of the Detroit branch of the Willard Storage Battery Co., in charge of service station sales. S. S. Jenkins, formerly district manager at Detroit, has been made district manager in charge of manufacturers' sales, with headquarters at Detroit.

Joseph L. Hardig, for several years with the Curtis Advertising Co., has been appointed director of advertising of the Remy Electric Co., Detroit. He will direct the national, trade paper and newspaper advertising of the Remy, which is a member of the United Motors Corp.

**Hamilton Heads Lane Truck**

KALAMAZOO, MICH., July 22—At a directors' meeting of the Lane Motor Truck Co., L. M. Hamilton, formerly secretary, treasurer and general manager of the company, was elected president and general manager. Dr. W. W. Lang, former president, was forced to retire from that office due to other obligations. Edward W. Bitzer was added to the board of directors and elected secretary-treasurer.

John A. Drake, associated with the Campbell-Ewald Co., Detroit advertising agency, has joined the United States Army, and is stationed at Camp Custer. He has the rank of corporal.

R. B. Merrill has been appointed director of material purchases by the Swope-McCracken Co., Detroit, production machinist, which supplies materials to automotive companies. He was formerly connected with the Ford and Packard companies.

A. C. Westfall, former traffic manager for the Cadillac Motor Car Co., Detroit, has become associated with the Lincoln Motor Co., Detroit, in a similar capacity.

J. F. Bowman, vice-president and general manager of the Acason Motor Truck Co., Detroit, has resigned, and H. A. Conlon, sales manager, has been elected vice-president and director of sales. Mr. Bowman has been an official of the company for the past year, having resigned as sales manager of the Federal Motor Truck Co. after 5 years' service to take the position.

C. M. White, Jr., has joined the Firestone Steel Products Co., Akron, as sales manager. For the last 3 years he has been factory representative of the Detroit Steel Products Co., and previous to that, manager of the Stromberg Motor Devices Co.

**Edwards Heads Milwaukee Show Committee**

MILWAUKEE, July 29—Frank J. Edwards, head of the Kissel-Kar Co. and the Edwards Motor Car Co., Dodge dealer, has been appointed chairman of the show committee of the Milwaukee Automobile Dealers, Inc., to take charge of the annual fall show to be held in conjunction with the Wisconsin State Fair at Milwaukee, Sept. 9 to 14.

At the latest meeting of the association the proposition of enlarging the scope of the body to include truck, accessory and supply and tire divisions was considered, and a special committee appointed to investigate the feasibility of the plan and ways and means of carrying it out. The M. A. D. is now distinctly a motor car dealers' organization, and the proposed changes would make it a broad trade association covering all lines of activity in the industry. A joint meeting of the various elements is planned to be held shortly.



## Chevrolet-General Motors Stock Transfer Is Coming

NEW YORK, July 30—It is regarded as probable that the formal transfer of stock between the Chevrolet Motor Co. and the General Motors Corp., by which Chevrolet becomes a division of General Motors, will be effected within a very short time. Although the complete plan has been ratified by both companies, the actual transfer of stock has not been made yet. That this will be done soon, however, is indicated by the fact that the Capital Issues Committee has taken favorable action on the application of the General Motors Corp. to issue \$28,000,000 additional common stock with which to acquire the Chevrolet property.

### Machine Shop Addition for Falls Motor

SHEBOYGAN FALLS, WIS., July 29—The Falls Motors Corp. will erect a machine shop addition immediately. This will be a 2-story building, 60 x 125, and is to be used for the completion of Government contracts for truck, airplane and tractor engines and parts.

### Highway Trailer Erecting Addition

EDGERTON, WIS., July 29—The Highway Trailer Co., which is executing Government contracts for trailers for hauling airplanes, ordnance and quartermaster supplies, is erecting a new shop, 10 x 250 ft. James W. Manhall is general manager.

### North-Light Motor Adds

TORONTO, ONT., July 29—The North-Light Motor Co., with offices in the Wesley Building, has taken over the 2-story factory at Hamburg, formerly occupied by the Silversmith Mfg. Co. A 4-cycle, high-speed gasoline engine, for boats, automobiles, trucks and tractors, as well as stationary engines, will be manufactured.

### Additions for Motors Metal

DETROIT, July 29—The Motors Metal Mfg. Co. is erecting two large additions to its plant to take care of a Government order for metal parts to be used on ambulances. One building is 60 x 200, the other 60 x 50.

### Addition for Wilson Body

DETROIT, July 29—The C. R. Wilson Body Co. is erecting a three-story addition to its factory at Clay Avenue and the Grand Trunk Railroad.

### Litnum Bronze in Production

MILWAUKEE, July 29—The Litnum Bronze Co., organized some time ago by Milwaukee and Menomoneie capital, is completing the work of converting the former plant of the Laursen Automatic Pump Co., Menomoneie, into a foundry, rolling mill and manufacturing shop for

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

the production of Litnum bronze material under the Ampco patents. The plant is already producing a limited quantity of welding rods for use in the oxy-acetylene process, and within a short time will be making billets. The plant will be equipped to manufacture bronze wire, tube stock and similar material.

### Limousine Top Expands Plant

KALAMAZOO, MICH., July 22—The Limousine Top Co. has awarded a contract for the erection of a new building immediately adjacent to its present plant. Work has already begun on this structure.

### Knight Tire Increases Output

CANTON, OHIO, July 29—The Knight Tire & Rubber Co. has increased its output from 200 to 760 tires per day.

### Michigan Steel Castings Expands

DETROIT, July 27—The Michigan Steel Castings Co. is erecting an addition to its plant which, when completed, will add 53,700 sq. ft. At least 100 additional men will be employed. The building will be used for moulding, core making and the engineering department. The new unit will be completed in the fall.

### Clark Equipment Opens Auditorium

BUCHANAN, MICH., July 23—The Clark Equipment Co. has provided an auditorium for its employees which may be used for athletics, theatricals and motion picture exhibitions. It has a seating capacity for 625 persons, and contains a complete stage with lighting and scenery.

### Capital Increases

CANTON, OHIO, July 23—The Timken Roller Bearing Co. has increased its capital stock from \$200,000 to \$10,000,000.

AKRON, July 23—The Western Reserve Rubber Co., Akron, has increased its capital stock from \$10,000 to \$50,000.

### General Aluminum Increases Capital

DETROIT, July 29—The General Aluminum & Brass Mfg. Co. has offered for sale a new issue of \$155,640 common stock and \$77,820 of 7 per cent preferred stock. The new stock is offered to present holders in the ratio of 30 per cent of the par value of the common stock holdings and 15 per cent of the preferred stock of July 10 record. Payments may be made in equal instalments, Aug. 10 and Sept. 10.

## G. M. to Build Tractors in Monroe Motors Plant

PONTIAC, MICH., July 29—Two Samson tractors have been completed in that part of the Monroe Motors Co. plant which the General Motors Corp. leased some time ago. The schedule calls for 500 tractors in that plant. By the time these are finished it is expected that the tractor plant which the General Motors Corp. is erecting in Janesville, Wis., will be ready for operation. The report that the company intended to take over the entire Monroe plant is denied. At the Stockton, Cal., plant of the General Motors tractors for the Western trade and export business are being built. There are enough standing orders to keep that plant running for some time to come.

### Evinrude Motor Making Grenades

MILWAUKEE, July 29—The Evinrude Motor Co., manufacturer of detachable rowboat engines, has converted 60 per cent of its capacity for war work. The company has received a contract for phosphor hand and rifle grenades. About 40 women are employed, and this number will be increased to 100 on Aug. 1.

### Addition for Obenberger Forge

MILWAUKEE, July 30—The John Obenberger Forge Co. will erect a forge shop addition immediately for the manufacture of crankshaft, camshaft and similar forgings for the Government. The present plant was erected in 1916, and has been undergoing constant enlargement during the last 9 months.

### Twin Fire Spark Expands

DETROIT, July 30—The Twin Fire Spark Plug Co. has moved to a larger factory at 720 Grand River Avenue. The company's dealer organization has also been enlarged considerably.

### Bailey-Drake Offices Moved

CHICAGO, July 23—The Bailey-Drake Co., which represents manufacturers selling the jobbing and manufacturing trade, has moved its main offices to 1118 South Michigan Avenue. The company has branches in Minneapolis, Kansas City, Seattle and San Francisco.

### General Aluminum Enlarges Factory

DETROIT, July 29—Construction on an extensive scale of factory buildings for the General Aluminum & Brass Mfg. Co. is now under way. The buildings are being added to the company's group, and are to be used in completing war work for the Government. The new units are as follows: Aluminum foundry, 2 stories, 100 x 100; brass furnace building, 40 x 100, to be equipped with sand bins in the basement and with simplex and coke furnaces.

## Ordinance Contracts

WASHINGTON, July 29—The Ordnance Department of the United States Army has placed the following contracts and purchase orders:

Hale & Kilburn, Philadelphia; trays for supporting sewing machines, pedestal stands, vise plates.

Hydraulic Pressed Steel, Cleveland; steel billets.

Greenfield Tap & Die Corp., Greenfield, Mass.; adjustable tap wrenches.

Four Wheel Drive Auto Co., Clintonville, Wis.; tubular radiator.

Salisbury Wheel & Axle Co., Jamestown, N. Y.; Nash quad axles.

Sparks-Withington Co., Jackson, Mich.; dies for making shin guards.

Ford Motor Co., Philadelphia; overhauling trucks.

West Steel Castings Co., Cleveland; steel motor truck wheels.

B. F. Goodrich Rubber Co., Akron; rubber packing for howitzers.

The Nash Motors Co., Kenosha, Wis.; repair parts for Nash quad ammunition trucks.

Russel Motor Car Co., Toronto; machining shells.

Ford Motor Co., Detroit; set dies and tools.

Detroit Copper & Brass Rolling Mills, Detroit; cartridge case disks.

Elsemann Magneto Co., Brooklyn; magneto.

Nash Motors Co., Kenosha, Wis.; steering knuckle arms.

L. S. Starrett Co., Athol, Mass.; tools for 4-ton trailer.

H. Channon Co., Chicago; tools for artillery repair trucks.

Inley Mfg. Co., Indianapolis; light repair truck bodies.

The White Co., Cleveland; standard 1-ton truck chassis.

The Standard Tent & Awning Co., Toledo; tarpaulins for truck chassis.

The Nash Motors Co., Kenosha, Wis.; repair parts for Nash trucks.

Hale & Kilburn, Philadelphia; searchlight covers.

Edward G. Budd Mfg. Co., Philadelphia; release mechanisms for airplane flare.

## Seek Bids for Canal Supplies

WASHINGTON, July 29—Sealed bids in triplicate are invited by the General Purchasing Officer of the Panama Canal, Washington, D. C., to be filed not later than 10:30 August 1, and furnished by steamer, free of all charges, on dock at either Cristobal (Atlantic Port) or Balboa (Pacific Port) Canal Zone, Isthmus of Panama. Full details regarding the

## Contracts

form of contract, guaranty, etc., can be secured from the Washington office of the Panama Canal.

The articles specified follow:

500 feet cable, ignition, combination, high tension, single strand, 31-64 in. outside diameter of finished cable; to be suitable for severe tension service, "Packard" or equal.

12 Horns, Klaxonet, hand, type "S", for Indian motorcycles.

24 Horns, hand, Klaxon, type "L", for motor boats.

24 Pumps, tire, automobile, motorcycle and bicycle, to be equal to Cyclone pump shown on page 90 of Iver Johnson Sporting Goods Company's "Lovell Diamond" Bicycle Catalog; to fit standard automobile, motorcycle or bicycle valve stems.

12 Pumps, auto tire, 3-cylinder; to be equal to No. 9401, page 70, Catalog No. 9, Automobile Sundries Co., New York City.

200 Asbestos gaskets, 4 in. x 6 in. x 3/4 in. x 1/4 in. handhole.

60 Asbestos gaskets, 12 in. x 16 in. x 1 in. x 1/4 in. manhole.

Above gaskets to be in accordance with Panama Canal specification No. 329.

800 lbs. 1/4 in. packing, sheet, asbestos, millboard, plain, 40 in. x 40 in.

1800 lbs. 1/4 in. packing, sheet, asbestos, millboard, plain, 40 in. x 40 in.

Asbestos millboard must be made up of not less than 70 per cent pure long-fibered asbestos. It must be boxed for ocean shipment in boxes not containing over 75 lbs. It must stand a dry heat of 400 degrees F. without injury and not burn or disintegrate when dipped in acid.

500 lbs. packing, asbestos, sheet, brass wire insertion, 1/16 in.; to be in accordance with Panama Canal specification No. 327.

125 lbs. packing, fibre, sheet, red, 1/4 in. x 12 in. x 36 in.

25 yards drill, rubber, white back, 22 ounce, 50 in. wide, in one piece.

350 feet belting, rubber, 6-ply, 8 in.; to be in accordance with Panama Canal specification No. 331.

15 soft rubber valves, diameter 4 1/2 in., hole 1/4 in., thickness 1/4 in.

25 soft rubber valves, diameter 3 in., hole 1/4 in., thickness 1/4 in.

75 medium rubber valves, diameter 4 in., hole 1/4 in., thickness 1/4 in.

25 medium rubber valves, diameter 4 in., hole 1/4 in., thickness 1/4 in.

Above valves to be in accord with Panama Canal specification No. 326.

6 Pairs rubber boots, size 8, hip.

12 pairs rubber boots, size 9, knee.

3000 feet hose, fire, canvas, rubber-lined, 3 1/2 in., in 50-foot lengths, complete without couplings.

Specifications for above can be secured from Panama Canal Office, Washington, D. C.

## Dividend Declared

The Paige-Detroit Motor Car Co. has declared a monthly dividend of 2 per cent, payable Aug. 10 to stock of record July 31.

## Engineer Contracts

WASHINGTON, July 27—The following contract was awarded to-day by the General Engineer Depot, War Department:

Dayton Rubber Mfg. Co., Dayton; Dayton airless tires and mounting tires.

WASHINGTON, July 27—The following contract was awarded by the Bureau of Supplies and Accounts, Navy Department:

Republic Motor Truck Co., Alma, Mich.; motor trucks.

## Seek Bids for A Trucks

WASHINGTON, July 29—Bids for the manufacture of class A trucks will be opened at 11 a. m., Monday, Aug. 5, by the Motor Transport Service. Bids are requested for the manufacture of 5000 of these trucks.

## Bids for Tractors Sought

WASHINGTON, July 24—The U. S. Indian Office requests bids on the following articles to be filed before 2 p. m., Aug. 2, 1918. A certified check of 5 per cent of the amount of the bid or a proper bond, must be submitted if the bid amounts to more than \$500. If the bid amounts to more than \$5,000 it will not be accepted.

1. One 12-to-16-ton capacity per hour ensilage cutter with automotive self-feed attachment and extension siding table connected to feed; provided with automatic safety device to protect feeder against knives; all gears and chains covered to protect operator from injury; to be all steel and mounted on trucks; all bearings to be self-aligning; cutter to be flywheel type with 3 knives and fan attached to flywheel to be about 42 in. diameter; size of cutter at throat to be 1/2 in. to 1 1/2 in.; to be equipped with 35 feet of 9 in. heavy blow pipe with deflector hopper joint and 30 feet of detachable joint distributor pipe.

2. One 10-to-20-h.p. farm creeper type tractor operating successfully on kerosene or distillate, so equipped as to give proper revolutions per minute for above ensilage cutter; tractor to be fitted with extra extension angle lugs and equipped with adjustable hitch so it can be fitted to any kind of farm implement.

3. One endless canvas belt 100 ft. long, 8 in. wide, 5 ply for above equipment.

4. Also quote for use with ensilage cutter and complete with belt a 20-h.p., 3-phase electric motor, 440 volts.

Bids on high wheel tractors will also be received and receive consideration. Articles not differing radically from the above specifications will also be considered.

## Calendar

## RACING

- Aug. 3—Uniontown. Uniontown Speedway Assn.
- Aug. 10—Providence, R. I.
- Aug. 17—Sheepshead Bay.
- Sept. 2—Uniontown. Uniontown Speedway Assn.
- Sept. 7—Chicago. Chicago Speedway.
- Sept. 21—Sheepshead Bay.
- Oct. 5—Cincinnati. Cincinnati Speedway.

## ASSOCIATIONS

- Aug. 5—Atlantic City, N. J. Motorcycle and Allied

- Trades Assn., United Cycle Trade, Cycle Jobbers of America, Cycle Parts and Accessories Manufacturers' Assn. and Bicycle Manufacturers' Assn., Hotel St. Charles.
- Oct. 7-12—Milwaukee. American Foundrymen's Assn. and 5 allied organizations. Milwaukee Auditorium.

## SHOWS

- July 29-Aug. 4—Salina, Kan. National Tractor Demonstration. "Auspices of National Implement and Vehicle Assn."

- Aug. 6—Fulton, N. Y. Tractor Demonstration. New York State Food Commission.
- Sept. 2-7—Indianapolis, Indiana. State Fair. Indianapolis Automobile Trade Assn.
- Sept. 9-14—Milwaukee. Milwaukee Automobile Dealers, Inc. Fourth Annual Wisconsin State Fair. Hart J. Ruddle, Mgr.
- Sept. 14-21—Chicago. Automotive and Accessories War Exposition. Municipal Pier.
- Oct. 14-27—Dallas, Tex. Seventh Annual Texas Automobile Show. Texas State Fair.

- Oct. 16-18—Ottawa, Ont., International Plowing Match, Tractor and Farm Machinery Demonstration. Experimental Farm.

## ENGINEERING

- Sept. 2—Cripple Creek, Colo. American Institute of Mining Engineers.
- Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.



# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

Vol. XXXIX  
No. 6

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UNIV. OF MICH.

# The Crisis Proves The Car

## In the Very Face of Curtailment Hudson Dealers Find Reason for Self-Congratulation

Hudson dealers are feeling the curtailment in production keenly.

They're asking for more Super-Sixes every day than can possibly be delivered in a month.

It is costing them money not to get them.

And yet they're not whining.

They seem disposed to accept conditions much in the spirit of the French—shrug their shoulders and make the best of it—"C'est la guerre".

In fact, we believe there is not a Hudson dealer who is not congratulating himself more than before.

Why?

Because this crisis is proving again—more emphatically than ever—the caliber of the car he handles.

It almost seems as if Hudson engineers built three years ago with the present crisis in mind.

The power and endurance they put into the Super-Six then and have refined and improved since is proving the Hudson essentially a war-time car.

Hudson quality is the quality that endures.

With the need for automobile transportation greater and the requirements more severe, Hudson Super-Sixes are "seeing their owners through".

Little wonder that it stimulates a man's pride to handle a car like the Super-Six.

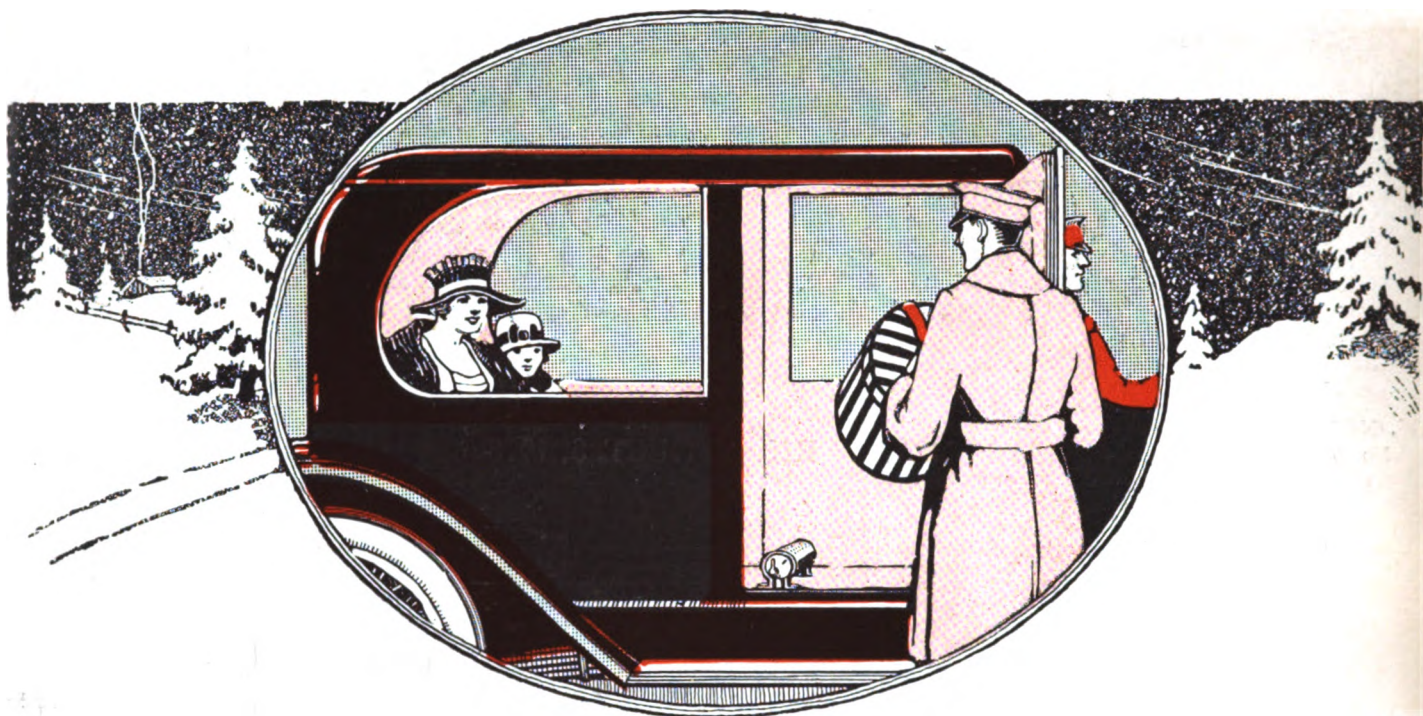
These are the reasons why, in the face of curtailment, Hudson dealers find good reason for self-congratulation.

Hudson Motor Car Company



Detroit, Michigan





## UTILITY *Protected Foot Rail* HEATER

### WHY NOT PREPARE FOR WINTER TRADE NOW?

Cold weather will soon be here, with a greatly increased demand for Utility Heaters. Our live dealers are ordering now, as there is already a well-established demand for Utility Heaters. It is to the advantage of every dealer and jobber to see that he can supply the trade. Better not wait—send in your initial order now.

The Utility Heater is the accepted standard of motor car heating. Its principle is sound, logical and convincing. It insures perfect driving comfort, even in the coldest weather, by tempering the atmosphere of the car to any desired degree. It keeps you warm all over, as though you were in a carefully heated house.

UTILITY Protected Heater—installed in place of the foot rail—is the heater universally recommended by thousands of motorists during the past season—the heater jobbers catalog and the heater manufacturers you will know install as standard equipment.

Ease of installation, attractive appearance, freedom from dust, odor or trouble make it the highly desirable heater.

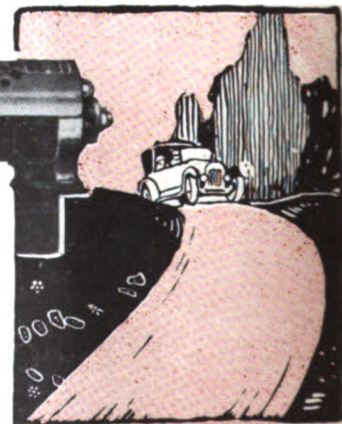
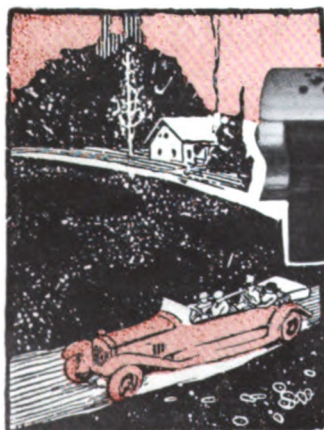
*DEALERS—Ask your jobber or write to us for details*

## THE HILL PUMP VALVE CO.

Archer Avenue and Canal Street

Chicago, Ill.

*Manufacturers of Famous UTILITY Auto Specialties*



#### PRICES

Utility Protected Heater.....	\$20.00
Utility Front Seat Heater.....	12.50
Utility Jr. Heater for Fords.....	9.00
Utility DeLuxe Heater for six and eight cylinder cars.....	25.00



# AUTOMOTIVE INDUSTRIES

## AUTOMOBILE

VOL. XXXIX

NEW YORK—THURSDAY, AUGUST 8, 1918—CHICAGO

No. 6

## Provision of Adequate Housing Facilities Big Tractor Problem

Makers Must Insist on Farmers Taking Care of Their Machines  
as a Conservation Measure—Need for Standardized Parts  
More Apparent—Air Cleaners Are Important

By David Beecroft

**K**ANSAS CITY, August 5—A major problem confronting the farm tractor industry is that of adequately housing the tractor on the farm and not leaving it all winter in the corner of the field where it finished the last job. The Kansas farmer—this may also apply to the farmers of many other states—is notorious for his carelessness with farm machinery.

Yesterday we drove from Salina, where the National tractor demonstrations were held, to this city through one of the finest winter wheat-growing areas, and it was almost agonizing to see the wrecks of farm machinery strewn around nearly every farmyard. One could not fail to feel how inconsistent we are as a people in permitting this enormous annual waste of metal in these days of steel conservation when we are restricting the uses of steel in many useful and essential industries.

The average farmer is a poor hand at caring for his machinery. Perhaps this is due to the fact that the machinery makers have not been continuously insistent enough that he do this. We are led to this conclusion by the fact that you will find on the same farm that we saw yesterday a good, modern, up-to-date garage that will accommodate two motor cars, and in the farmyard surrounding this garage you will see standing out, exposed to the weather, such farm machinery as binders, corn harvesters, mowing machines, plows, harrows, disks, and in some instances tractors.

The fact that the farmer has built not only a single garage but a double one is evidence that he is susceptible to advice as to the care of his farm equipment. His car is

as clean-looking as those kept in the average western town or city. Undoubtedly the automobile manufacturer and the automobile dealer have been largely responsible for this. They have taught the farmer his first lesson in caring for machinery.

There is a strong hope that through this same channel the farmer will be taught to give better care to his tractor and his farm machinery as well, because this same automobile dealer who sold him his automobile is now selling him his tractor, his threshing machine, his plows, his disks, his seeders and his other tillage instruments. Many of these dealers are to-day automotive dealers in every sense of the term.

If tractor manufacturers will constantly urge through their dealers the propaganda of caring for farm machinery, it will not be long before the disgraceful sight of farmyards strewn with weather destroyed farm machinery will be corrected to quite an extent. The destruction of farm machinery by this cause is of such proportion that the local Councils of National Defense should take it up and institute a general movement for the conservation of these machines, thereby conserving our supply of steel and also conserving labor.

It is not unusual to see as many as three binders standing in the corner of a large wheat field, perhaps in the shade of a few trees. Some of them have the canvas for elevating the grain removed and others have not. Where the canvas is not removed \$70 or \$80 will be required next year to put in new canvas to take the place of that rotted during the winter. This canvas is made from

# Views at the Salina Tractor Demonstration

Where the Various Types of Tractors and Farm  
Implements Were Put Through Their Paces



*General view of plowing scene at the Salina tractor demonstrations*



*This tractor has stood outside for a year; so has the plow attached to it. It is a bad advertisement for the tractor as well as the farm*



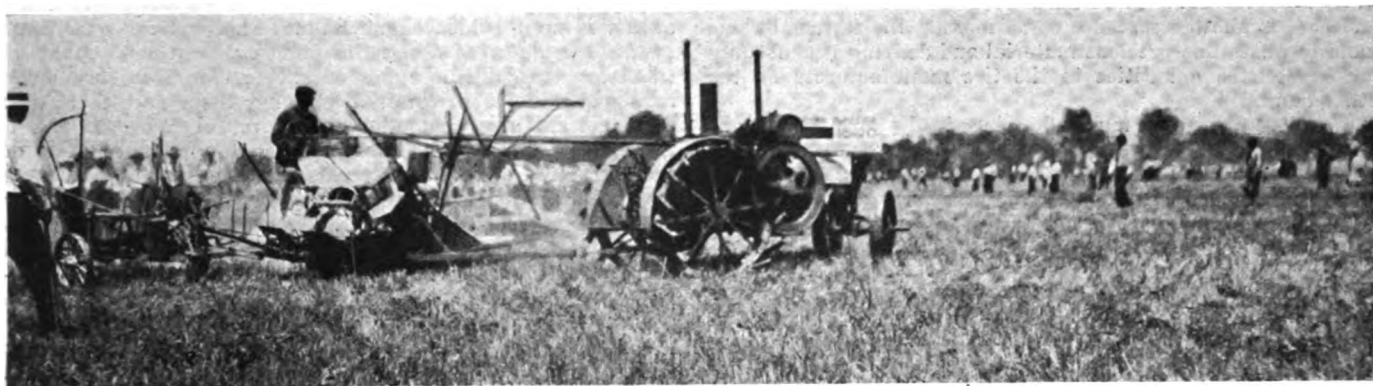
*The International Harvester Co. demonstrated its two-wheel tractor unit pushing a binder, so that one man could operate the tractor and binder*



*The Fordson tractor disking on newly plowed soil at the Salina demonstration*



*The Model H Parrett 12-25 tractor which made a 103-hr. test and plowed night and day for 80-hr.*



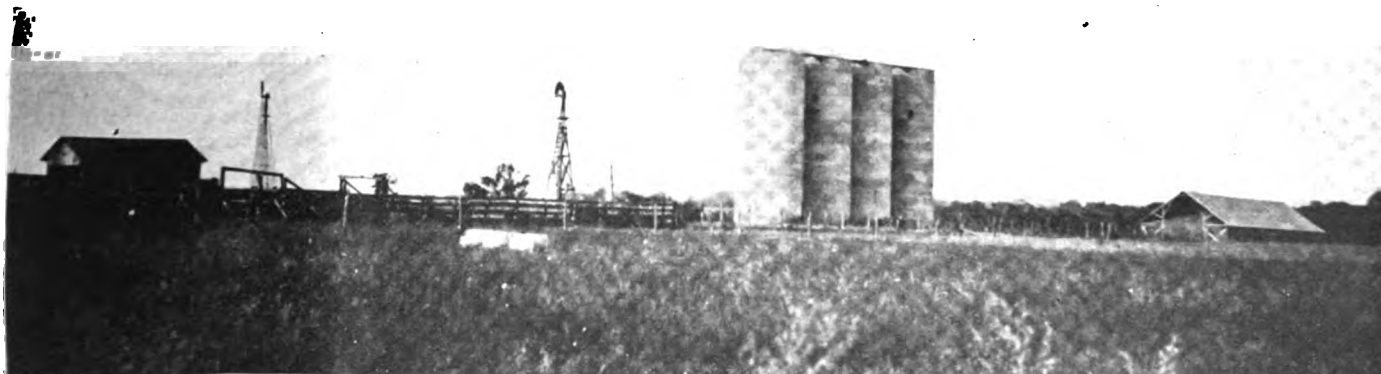
*The wrong way to do it—here the operator sits on the binder and controls the tractor by extension controls. He should sit on the tractor and have the binder controls brought close*

*Right—This is a typical farm yard in Kansas showing how machinery is left outside to rot and rust. On this farm is a good double garage for the automobile and buggy*



*Above—Double garage on a farm near Salina, Kansas. If the farmer will build a garage for his automobile he can also be induced to build a house for his tractor*

*Right—Corner of a large Kansas farm showing machinery overgrown with weeds. This farm has a good garage, sleeping porches and electric lighting*



*On hundreds of farms in Kansas you see these cement silos for corn. Generally there are one or two cylinders, but this one has four. Yet on this farm the machinery is not housed*



practically the same material as is used in automobile tires, and here is another instance of permitting the farmer on one hand to waste this precious material and denying it or issuing it in restricted quantities to the tire manufacturers on the other hand.

Complete revolution must take place in the farm machinery field so far as the care of it is concerned. The automotive manufacturer must take a hand in this work and there is no time more opportune than the present.

The redesigning of farm machinery so that it can be operated by one man, preferably the one who rides on the tractor, has not made as good progress during the year as it should have. This work is one of the important ones facing the tractor manufacturer and also the manufacturer of farm machinery. There is no help on the farms to-day for two-man machines—that is, one man driving the tractor and the other seated on the binder or another piece of farm machinery.

#### Implements Must Be Redesigned

It is necessary to turn the farm machinery almost directly around; heretofore the farmer has ridden on the back of the machinery and the levers for controlling it have been placed to be convenient for him in that position. With the tractor hitched ahead of the machine, it is necessary to rearrange these levers and bring them up to the front so that they can be operated by the man riding on the tractor.

Farm machinery manufacturers were urged last fall to redesign their machinery along this line and the progress is rather disappointing. One or two manufacturers have revamped some of their binders but the work has scarcely been started.

A few machinery makers think that the operator can ride on the binder, for example, and control the tractor through an extension of the steering gear and with some system of ropes for regulating the engine speed and the clutch. This latter scheme is not generally looked upon as satisfactory, the general conclusion being that the operator should ride on the tractor and the farm machinery should be modified to make its operation quite easy from the tractor.

The necessity for a greater supply of standardized parts for use in the tractor, which was mentioned last week, has been further impressed as the demonstrations have progressed. There is urgent demand for a good design of steering gear which can be fitted on many makes of tractors. Such a steering gear should be quite inclosed with adjustable parts, the same as on a motor truck or motor car. Two or three firms have already intimated that they are developing such a type but none which seems to measure up with all of the requirements has as yet come on the market.

The extent to which a steering gear, which is not properly protected, wears out was evidenced at the Salina demonstrations, by a farmer who operates a tractor with an exposed type of steering gear. It has been necessary to replace the steering gear twice each year since he installed the machine. The cost of two new steering gears per year is a factor in itself, but another factor not to be overlooked is the time required in making the replacement and the added cost if this is to be done by a mechanic from a garage or tractor service depot.

#### Need More Standardized Parts

The necessity for further standardization of tractor parts was apparent many times during the Salina demonstration and was frequently commented upon by engineers who are designing tractors, and by others who are making parts for tractors.

A case in question is that of the bell housing for engines intended for tractors. The bolt holes are too near the edge of the housing to give the necessary strength where the engine housing and the gearbox housing form a continuous bridge construction, making it possible to lift off the frame side members as every tractor maker is doing at present. Not only will the flanges on the bell housing have to be increased in size, but larger diameter bolts will have to be used to take the extra strain in this type of tractor construction. Now is the time to get this standardization work lined up, rather than allowing different engine makers to bring out their individual widths and diameter of flanges and to use their own diameter bolts.

A possible market for some standardized design of front axle was well evidenced at Salina where there were over twenty-five different designs of front axles in use. Many of these are the built-up types of axles made from bar stock arranged in different forms of bracing; there are others that are steel castings, and others that are forgings. It was a favorable comment on standardization to find not a few of those tractors that had different front axles using the same engine, the reason being they were able to buy a satisfactory type of engine but were apparently not able to buy a standardized design of axle that met their requirements. Had there been standardized axle designs, the same as standardized engine types, unquestionably these would have been used and a good deal of cost and labor conserved thereby.

If the Salina demonstrations accomplished nothing further than to prove it is possible to plow as well at high speeds as at low, this in itself was well worth while. In a 2-hr. plowing test, some of the smaller machines averaged 3.5 m.p.h. A year ago too many tractor manufacturers declared that it was impossible to plow at such a speed. The redesigning of mould boards on plows during the past year has demonstrated that you can plow as well as 3.5 m.p.h. as you can at 1.5 m.p.h. Plowing speed depends entirely on the shape of the mould boards of the plow. This redesigning of farm machinery thus putting it on a tractor pace as compared with horse pace is one of the hopeful tractor developments of the past year.

#### Air Cleaners Are Important

The question of air cleaners is still a mooted one in tractor design. While the centrifugal type of air cleaner still leads in the number of equipments, there is more attention being given to the water cleaner than there was a year ago. As yet, sufficient reliable data have not been compiled on the relative merits of the different types of cleaners to establish the future of any one type, and undoubtedly the salability of the different concerns will for some time be a determining factor as to which type of cleaner is used.

The air cleaner has the advantage of light weight and relatively compact shape. On the other hand, several of the water cleaners are rather large. They call for frequent replenishing of the water supply.

For the average farmer, it is a problem as to whether he can give the necessary attention to the water cleaner or not, especially because he is even neglectful of lubrication of the engine and many of the engine troubles are due to his failure to change the lubricating oil as frequently as he should, and to his failure to give the engine sufficient oil.

The water type of cleaner has already given indication that quite a percentage of the water passes in through the cylinders and where kerosene is being used as a fuel, this water does its part in reducing the temperature and preventing pre-ignition. Some tractor makers have mentioned that in tests they have noticed the disposition of the engine to heat up and lose power when the water in the cleaner is exhausted and after a replacement of water the engine has renewed functioning without any indication of heat.

#### Dealer Must Handle Service

The question of tractor service is one which the tractor manufacturer must pass on to the dealer. The time is past when the tractor manufacturer, if he is an old line implement man, can handle the service business by a corps of service experts traveling the country at the request of the farmer. These manufacturers are admitting this. They state unqualifiedly that the dealer must give the service and that in giving this service he must give it promptly and charge for it. By prompt service is meant giving the farmer spare parts and doing repair work for him within a few hours from the time the farmer telephones for such parts.

Tractor service must be taken to the tractor on the farm, as the tractor cannot be brought from the farm to the garage or the repairshop of the dealer. There is not a single tractor manufacturer who has a quantity of machines in use but who admits that the old service methods that have served for the binder and other farm machinery are inadequate for the tractor. There is not a tractor maker big enough to cover the country with the necessary number of service men to give adequate service on the machines in use.

This brings tractor manufacturers face to face with the

new problem of discounts to dealers and distributors. These manufacturers who have been giving a 15 per cent discount to dealers based on a service practice in the past will find it inadequate for the future. Some of the best dealers admit that it requires approximately 15 per cent to do business on, and that they cannot give necessary service on this discount.

The aggressive practical tractor dealer has already his service car or truck with which his mechanic makes trips of 10, 15 and as high as 30 miles in the country to repair tractors and farm machines. Up to the present the farmer has not been given a very strict schooling on paying for service for his farm machinery. Most of the machinery houses admit that they have handled the different cases as they thought best. In some cases they have charged for service and in other cases they have not.

In this respect, the old line implement dealer has not been a strong enthusiast on service. He has not been prepared to give any kind of service, but has passed the business along to the branch houses of the implement company. The implement dealer of this type has generally sided with the farmer, not only on the question of service, but also on the question of time payments on machinery.

The tractor manufacturer must recognize that his dealers have this handicap to overcome. They have to introduce the tractor. They have to educate the farmer in its use. They have to make many repairs and replacements for the farmer. Lastly, they have to perform many little service jobs which the farmer should be able to do himself. Tractor manufacturers must take recognition of this, and not forget that a healthy dealer means a healthy business. Unless the dealer is making money, he cannot be a good representative of the manufacturer.

The automotive dealer of to-day, on the other hand, is going to have an opportunity of making a little extra money out of the sale of farm machinery, which will partly recompense him for the cost of tractor service. When a dealer sells a tractor he generally sells the plow that goes with it. Some dealers are stocking these plows, but where the factory has a branch house in the territory it is scarcely necessary to do this.

There are dealers who are selling threshing machines, disk harrows and all other lines of farm machinery, and the

day has arrived when the automotive dealer is going to sell a large percentage of the farm machinery that goes with the tractor.

Tractor manufacturers should, in practically all contracts with dealers, insist on the dealer arranging to carry a small stock of spares. This is necessary for the good will of the tractor. It will greatly reduce sales resistance. The farmer is going to act a little differently in the purchase of the tractor as compared with the purchase of a motor car which may not be such a business proposition.

He was not averse to going 30 miles to purchase his new motor car, but is insisting on buying the tractor nearer home. As a result, there are springing up through the grain belt automotive dealers who are located in towns of 1000 population and are selling more tractors than dealers in places of ten times the population.

The farmer wants to buy his tractor as near home as possible. He knows that the dealer is then only a half hour from him instead of a half day or perhaps a day. The tractor to be a success must be kept working all the time, and the makers must co-operate with the dealer and assist him in carrying this load.

There is no necessity for a manufacturer or dealer giving free service. The farmer will pay for legitimate work done. But he insists on having this work done as quickly as possible. Having a tractor used for threshing laid up for a half day or one day is a serious loss as compared with a motor car or even a motor truck incapacitated for the same period.

Tractor manufacturers must work more closely with their dealers on this service problem than they have heretofore. They should offer their dealers special discounts where they carry stocks of parts above a certain value. They should offer special discounts where the dealer is prepared to give service by the way of service wagons and expert help specially for the farm use.

In this connection one of the makers of the farm lighting equipment has set up a good standard by insisting that all dealers have one man who gives all of his time to the sale of this article and that there be provision for moving a demonstrating unit through the territory. While this is selling service, it suggests how necessary it is to put tractor service on as high a standard.

## 100-Hour Plowing Test of Kerosene Tractor

**SALINA, KAN., Aug. 3.**—The Parrett model H tractor which started on July 26 to make a 100-hour non-engine-stop plowing demonstration on one of the large winter wheat farms four miles from this city completed its official test, which was conducted by J. B. Davidson of the University of California.

The engine was run on kerosene for 103 hr. and 19 min., during which period there were two stops totaling 5 min. and 40 sec., both of which were due to sediment collecting on the bowl in the fuel line between the kerosene tank and the carbureter. Outside of these two enforced engine stops the engine was running all of the time.

It was necessary to stop plowing for 13 hr. and 28 min. due to rain, during which time the engine was kept running at 360 r.p.m., which was a good idling demonstration with kerosene.

Throughout the demonstration accurate record was kept of kerosene, lubricating oil and water, as well as the depth of plowing. The tractor plowed for a total period of 80 hr., 42 min. and 20 sec., although this was not a continuous performance, there being several stops to take on fuel and make repairs. It was necessary to replace a defective bearing in the left front wheel requiring 1 hr. 28 min., most of which time was needed for getting the bearing.

Throughout its plowing period the Parrett averaged 2.4 m.p.h. while pulling its three 14-in. Oliver plows. This is quite a remarkable speed and demonstrated the argument that the tractor can work as efficiently at high speeds as at

low. Traveling at this speed it averaged .95 acre per hour.

Kerosene was used as fuel from start to finish. The average consumption was 1.99 gal. per hr. The official report gives the consumption on an hour-acre basis and places it at 2.008 gal. per hour-acre. The term hour-acre is similar to ton-mile in motor truck transportation, and has been used as the unit of measurement.

The consumption of lubricating oil approximated 1 gal. to every 12 acres plowed. During the 103 hr. and 19 min. the engine was running 6.5 gal. of oil was used. On a per-hour-acre basis this is .084 gal.

The Parrett tractor in this test used a water air cleaner and 7.5 gal. of water were used in this cleaner. The test unofficially demonstrated that a goodly portion of this water enters the cylinders and serves to keep the temperature of the kerosene mixture down. No other provisions were made for injecting water into the mixture.

During the 103 hr. and 19 min. 24.2 gal. of cooling water were used in the radiator, which approximates .314 gal. per hour-acre.

During the official test the depth at which plowing was done was measured 247 different times, and the average depth was 6.36 in., which is equal to that required by all scientific farmers who depend on winter wheat in the Kansas belt.

It was demonstrated during the test that night plowing can be done as efficiently as that done by daylight. The tractor was equipped with two Prest-O-Lite lamps which provided ample illumination.

# Non-Distributor and Multipolar Magnetos

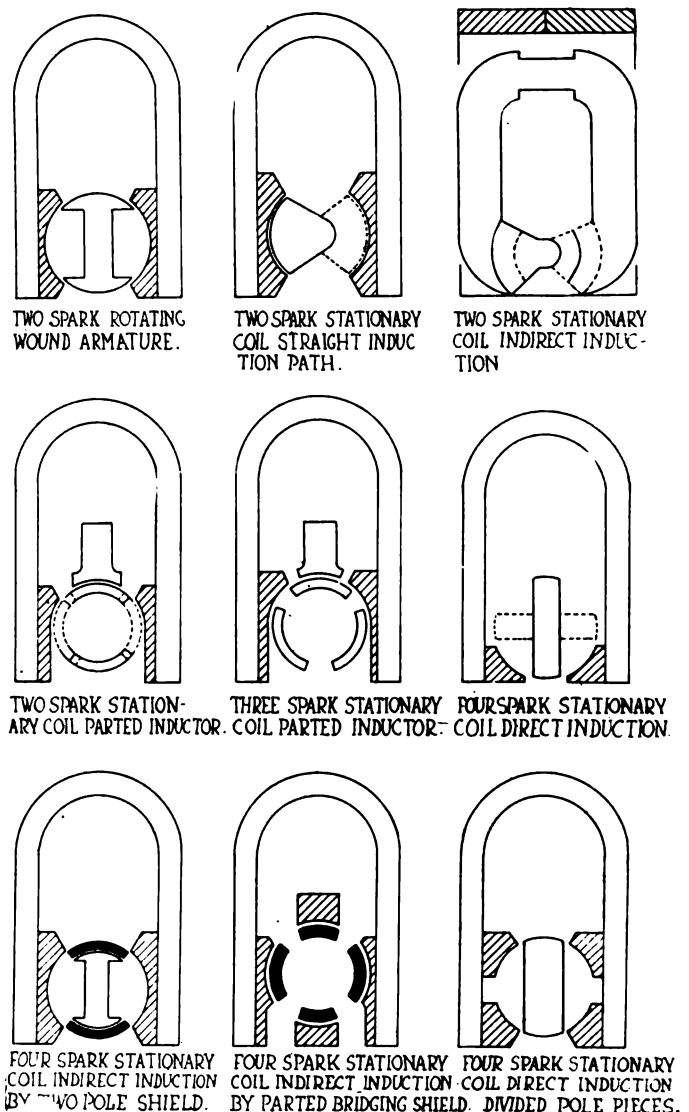
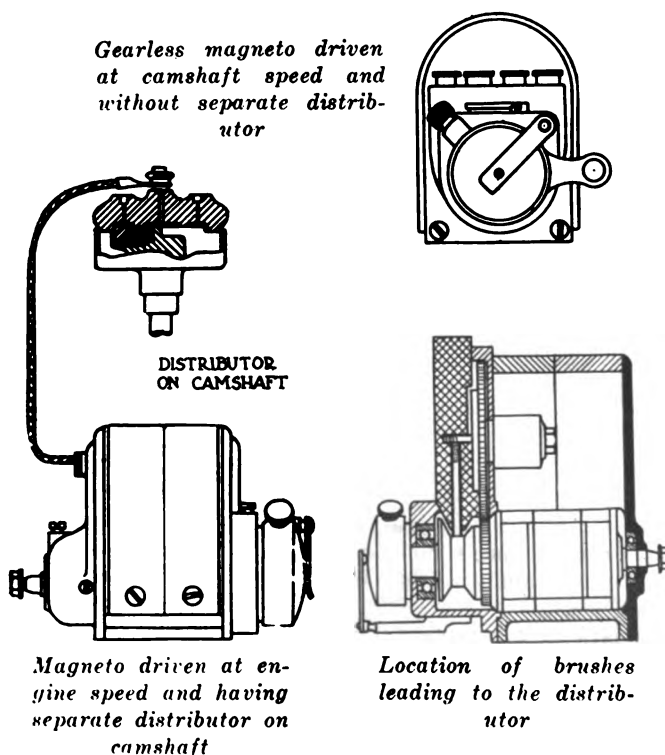
## A Discussion of the Practical Possibilities of Magnetos Designed for Use with Separate Distributors on the Engine Camshaft—Multipolar Magnetos Delivering Up to Six Sparks Per Revolution

By Fred I. Hoffman

**W**ITH the exception of magnetos used for the ignition of gasoline engines with one or two cylinders, the magneto-electric machine for ignition purposes has been developed on lines that cannot be considered absolutely ideal. The inability of the manufacturers to design igniters to give any number of sparks per complete revolution has introduced most peculiar constructions and has not simplified or improved matters to the same extent as in other departments of automobile engineering. Attempts, no doubt, have been made, but the problem is not easy to solve satisfactorily, and great difficulties must be surmounted before any advantageous result can be obtained. Lack of reliable and authentic research data and the fixed idea that the wound H shuttle armature is the best have been responsible for the stagnation. Another reason (also very important) is the manufacturer's lack of knowledge of what is being done in other automobile producing countries.

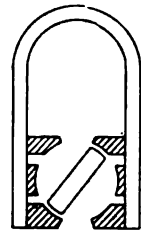
The success of the Bosch Company, the well-known German firm, and its high reputation, are solely due to the supply of a very well made and accurate article from the beginning, when mechano-electrical ignition

machinery was in its infancy. A world-wide monopoly was thus created which left the impression upon the manufacturer and the public alike that generators working in a 2-pole field with the wound H armature were the acme of perfection and would remain so for some time to come. The stagnation in design on other lines but those embodying the original Bosch construction can clearly be traced and can be attributed to this German

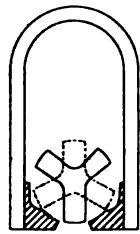


Various types of magneto construction

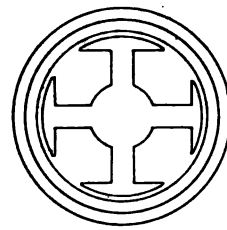
*Principal types of magneto armatures, showing shape of pole pieces and their relation to the armature itself*



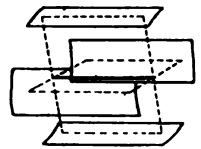
SIX SPARK ROTATING  
WOUND ARMATURE  
DIVIDED POLES



SIX SPARK STATIONARY  
COIL DIRECT UNION



FOUR SPARK  
FOUR POLE WOUND  
ARMATURE



ARMATURE OF FOUR SPARK  
MAGNETO. THICK LINE  
DENOTES CORE OF SINGLE COIL.

form. It is quite evident that workers in this field with limited knowledge and capital would prefer to copy an existing successful article than to start experimenting with new ideas and thereby leave the trade in the possession of the firms first in the field. However, this alone is not the only reason. The reluctance of the engine builder to test and fit generators not of orthodox design and embodying features other than those of accepted practice is really the main cause. When so many improvements tending toward greater simplicity are being brought out, it is very strange to note the number of makers producing standard magnetos for multi-cylinder engines. Of course, the present day machine unit can be replaced in a few minutes by a new one and will fit in the place of any other make, but this is not the main advantage to consider. A professional man will find the replacing and retaining of any magneto a very simple procedure, but not so an inexperienced amateur driver, and considering the number of the latter drivers of vehicles we have to side with the civilian, so to say.

To simplify the ignition distribution, we have only to employ a multi-cylinder machine giving any number of sparks per revolution to suit the cylinders, or employ an ordinary magneto as used for single cylinder engines, but fitted with a double cam, and a high-tension distributor coupled to or driven off the camshaft gearing somewhere on the engine. The former arrangement is the ideal one, but the latter certainly is an advancement on the running practice.

A distributor arranged somewhere on the front, side or back, and fitted in a very accessible position, getting the current which is to be distributed from the magneto terminal by a single wire, will surely be looked upon with more favor than the self-contained apparatus. Another advantage of employing a distributor fitted on the engine proper lies in the wiring to the spark plugs, which in this form has not to be disturbed when changing the generator. The relative cost of a gearless magneto—even if we consider that an additional special distributor be employed—as compared with a machine with self-contained arrangement is certainly one-half. What plausible reason is there to burden a magneto with a set of gearing when a similar reduction transmission already is provided on all engines for working the valves and could be made use of? A magneto driven at a certain speed and giving the requisite number of sparks is all that is required. By utilizing such a firing system we get the following advantages as well: One standard magneto for engines with different number of cylinders; a standardized distributor, standard terminals, brushes, etc. The magneto would have smaller overall dimensions, would be lighter, more compact and neater in appearance; it would have less parts to wear and could be fitted and adapted in an easier way. It may be urged by the manufacturer of multi-cylinder magnetos that the generator with a distributing device fitted at a distance from its supply source requires an extra brush, which is liable to give trouble, but this is certainly not

the case. With the exception of a single magneto (a French make) there are no magnetos on the market using a wound H armature and doing away with the second primary brush, viz., the one on the other end from the slipping terminal connection.

The types of magnetos at present employed can be subdivided into those using a rotating armature with an H core and an induction coil, those having a stationary coil and a solid unwound rotating inductor sending the flux direct through the coil center and those that have a stationary coil winding which is being indirectly excited by a communicating or bridging agent revolving between field and core.

The number of periodic inductions per complete revolution of inductor, mainly depends either on the rotor or field design or the two combined (in some designs there are special combinations) and little on the relative position of the transformer unit. There are certain individual advantages in each one of the above mentioned constructions. The wound H, or Siemens' armature, is favored by a great many manufacturers, as this construction lends itself to a more robust design, the coil being direct and closely wound on the laminated core and fitted with condenser. The stationary coil magneto, on the other hand, employing an unwound simple rotor, either in shield rod or disc form, is cheaper to build, more easily repaired (for it consists of fewer parts) and is more durable. The rotating part being without any wiring whatever, is not subjected to the same centrifugal stresses as if wound. The disadvantages of this type are the somewhat longer path for the flux and the double airgaps, reducing the induction factor.

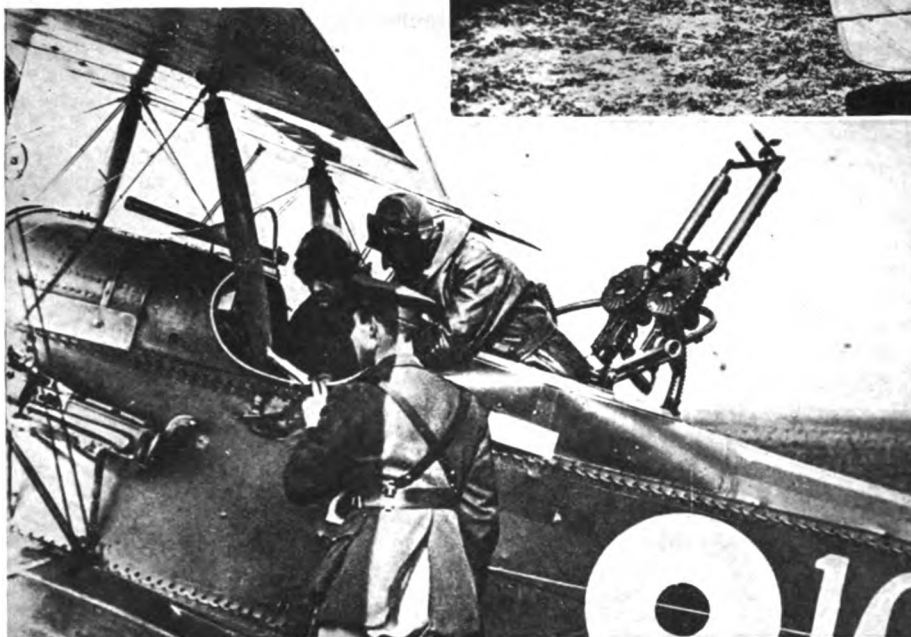
The number of sparks of the ordinary H pattern magneto in a two-pole field, as shown in the sketch, is two per revolution; the same applies to the design of the pattern with stationary coil and employing a two-ended inductor, bridging disc or core rotor. To obtain three sparks with a two-pole field the simplest form is the one with the coil between the magnet limbs and a star pattern rotor. Magnetos of the two-pole field type, giving four sparks per revolution and using a stationary winding, are those with a rotary divided shield or opposed pronged pattern rotor and a longitudinally or concentrically situated transformer. In one design the bobbin is mounted on the outside. Four interruptions can also be obtained by dividing the pole pieces symmetrically, thus making four poles and having the stationary coil in between the limbs or wound on the rotary armature. With a wound coil and a three-parted pole piece we can also get six sparks per revolution.

There remains now only one other principle for our consideration, and that is the multiple armature design. Although the four-pole magneto has not given really satisfactory results, it may be just as well to illustrate the two constructions for comparison with the others. It will be noticed that the one pattern employs a single coil, the other four individual ones, and both embody the rotary Siemens idea.



# With the British Airplane Forces

*Type of British observation plane which is used for spotting enemy gun positions and directing the Allied artillery. This machine is about to ascend*



*This view shows very clearly the twin type of machine gun which now is coming into more extensive use among the Allied forces. The pilot has just landed and is turning over his reports of enemy gun positions*



*The Royal Flying Corps does not discard anything where there is the barest possibility of salvage work. This view shows two machines which will be reconstructed, using parts of other machines which have been damaged through accident or by enemy gunfire*

# Sopwith Dolphin with Hispano Engine



*Front view of the Sopwith*

**W**E show herewith three views of the present principal British scouting machine, the Sopwith Dolphin. It is equipped with an eight cylinder high compression Hispano-Suiza Vee engine of 200 hp. At an altitude of 15,000 feet it is capable of developing a speed of 115 m.p.h. and its climb is 10,000 ft. in 8.3 min.

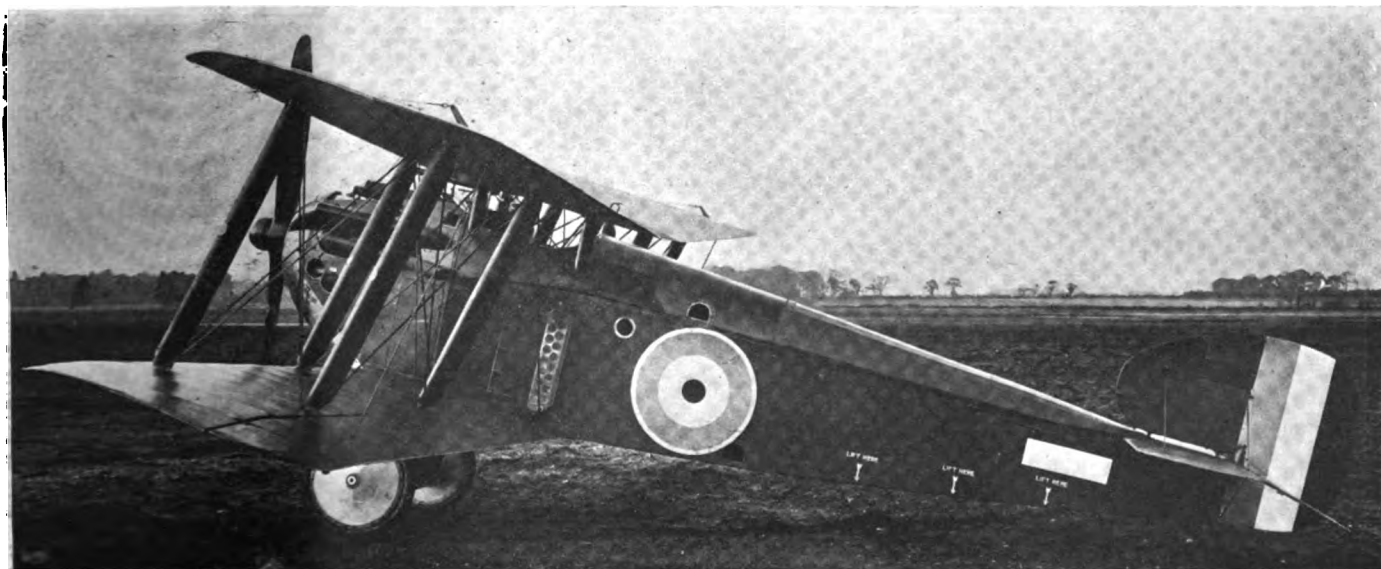
The armament consists of four machine guns. Of these two are Lewis guns mounted on a bar above the pilot's head, and two synchronized Vickers guns which fire through the propeller. One of the unusual features of this machine is the negative stagger of its planes, the top planes being set back from the lower planes. There are two pairs of struts on each side of the fuselage and the wing bracing is of the conventional type. Both the upper and lower wings are fitted with ailerons.

The upper wings do not run straight across but are set with a considerable space between them, where the pilot's seat is located. The forward end of the fuselage is covered with a cowl which gives about as good a streamline effect as is possible with a Vee engine.

There appear to be windows in the lower planes through which the pilot may observe the field below him. The radiator is mounted on the sides of the fuselage.



*Forward part of the Sopwith Dolphin*



*Side view of Sopwith Dolphin, showing negative stagger of planes*



# Organization of the German Army Aviation Service

Four Classes of Squadrons for Bombing and Reconnaissance, Artillery Work, Fighting and Photographing—Traveling Circuses Named for Their Leaders

**A**CCORDING to Major H. O. D. Segraves of the Royal Flying Force, who was interviewed in Washington a day or two ago by a representative of AUTOMOTIVE INDUSTRIES, the German reconnaissance or photographic aviator never makes an attempt to secure his information or to make photographs when trouble in the form of a hostile aviator appears on the horizon. Instead, he stops his work and implicitly obeys instructions from headquarters, getting away as fast as possible.

The German aviation service on the Western front is commanded by Col. von Tomsen, who is stationed at German general headquarters at Charleville. Col. von

Tomsen is under General von Höppner, who is in charge of the aviation service of all the German armies and is located in Berlin. The "flugchef," Major Wildt, who is in direct charge of a series of staff officers, assigns one to each aviation unit of the army.

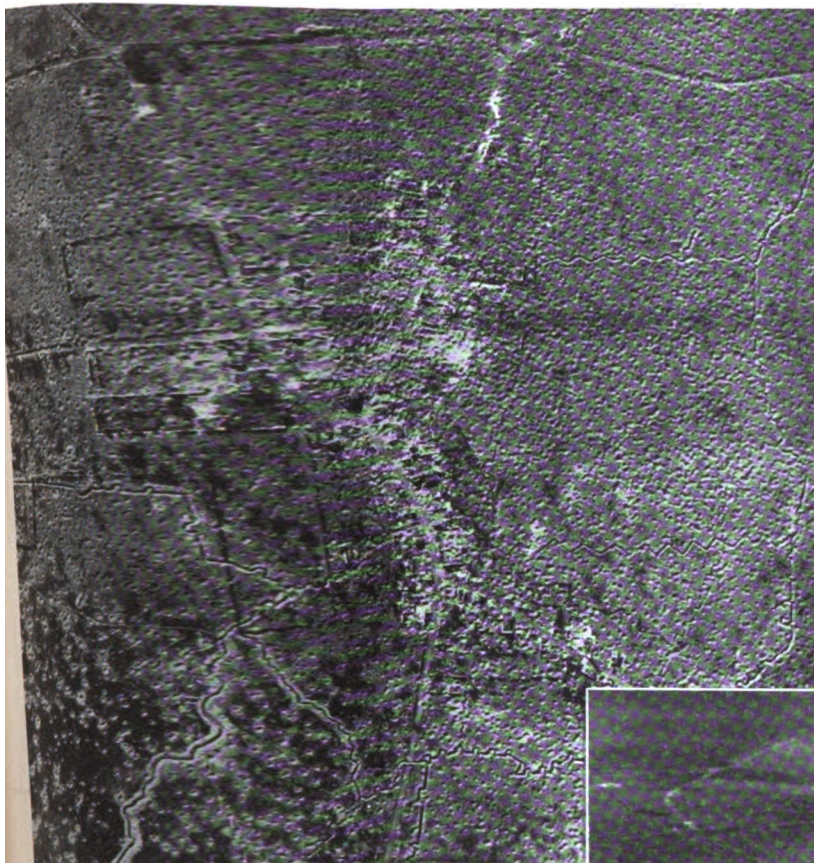
"The German squadrons," said Major Segraves, "receive their orders from and are solely responsible to the staff officers."

"The squadrons are divided into four classes: Bombing and reconnaissance, artillery, fighting, and photographic. The first two are carried out only when specially ordered. From time to time a long distance



*This photograph of the Somme battlefield shows the immense value of the "eyes of the air," the photographing airplane. Without this complete and accurate picture of the enemy's lines, an army would be well nigh helpless—with it, it is prepared, knows the exact artillery range and meets the enemy promptly*





What was left of Bullecourt village in the Hindenburg line after the artillery of the British finished its work. The trenches are prominent

reconnaissance squadron is specially sent out to report on movements of trains, etc. The second, artillery work, is performed by squadrons especially equipped for this duty, and for this duty alone, each machine being fitted with wireless.

"Fighting is done by the special Jagdstaffeln, or 'traveling circuses,' as they are called, comprising 18 pilots all picked for their skill in fighting and fitted out with the latest and best types of machines that Germany can produce.

"These squadrons are not numbered or lettered, but are called by the name of the squadron commander, as 'von Richthofen's Squadron,' etc.

"The traveling circuses have no fixed airdrome, but tour up and down the lines, staying usually close to where the fighting is thickest, hence the name 'traveling circus.'

"In addition to the Jagdstaffeln, each artillery squadron has attached to it two or more scout machines which go up and protect the pilots on artillery observation. Their duty is not so much to attack as to defend in case of attack, when they engage the opponents until the observer is safely away. As a rule these scout pilots are not as efficient as the pilots of the traveling circuses.

"The Germans place far more individual value upon a machine than we do. When

a squadron is moved to a different airdrome the pilots never fly their machines there. They always go by motor truck transport, and for this purpose practically every type of German machine is so made that it can be dismantled in about 15 minutes.

"The German machines vary considerably in type. The fighting scouts used principally are the Fokker triplane, the Pfalz and the Albatross VA. Baron von Richthofen, premier German aviator, was shot down while using a Fokker triplane. These machines have a speed of about 116 m.p.h. near the ground and a climb of 10,000 ft. in about 10 minutes. The engine is a 9 cylinder rotary Oberursel, a German copy of the French Gnome. The next machine, the Pfalz, is practically the same as the Albatross VA, which made its first appearance on the Somme in June, 1917. The performances of the two machines are very similar. Speed near the ground is about 108 m.p.h., with climb to 10,000 ft. in 11 or 12 minutes.

"The chief bombing machines include the



A photograph of German trench positions. An excellent example of the war territory, filled with trenches, shell holes and barbed wire. The photograph was taken at a height of 1000 ft.



A.E.G., a twin engine bomber with two 260 hp. Mercedes engines. They are used for short distance work behind the lines. Other bombing machines are the Gotha and the Friedrichshafen, the latter being of the Riesenflugzeug or giant airplane class. There is no actual machine named 'Riesenflugzeug,' as many people think. It merely denotes a certain class of machine of giant size, meaning literally 'the giant flying machine.'

"The Gotha and the Friedrichshafen types are used for all long range bombing work, such as the raiding of London. The engines are two 260 Mercedes or Maybachs.

"The speed of these machines ranges between 45 and 85 m.p.h. and the ceiling is about 15,000 ft., with full military load of bombs, guns, ammunition, etc.

"For artillery and photography work the Germans usually use the D.F.W., L.V.G., Albatross type D, Aviatik and the Hannover Fabrik. The latter is easily recognizable by its box tail.

"All the German machines are actually inferior to our machines as regards speed and ceiling. Even von Richthofen, in his diary, complained that his machines compared unfavorably with those of the Allies both in speed and ceiling.

"The same type of engine is almost universally used, namely, the 260 hp. Mercedes, which has 6 cylinders. It is a long stroke, low revolution, upright engine and has a minimum number of parts, making standardization easy.

"As regards the pilots themselves, little can be said that is not already known. They seldom attack unless the odds are 3 to 1 in their favor and even then fight only

over their own lines. The Hun flies, not for pleasure, but because he has to. He never comes across the lines to seek trouble as the Allied aviators do."

Describing the photographic work, Major Segraves stated that the photographing planes are always accompanied by two or three fighters who aim to protect the photographer, who, contrary to the German plan, sticks to his job despite an attack until he has the pictures he started after. The photographs shown on these pages were taken by British aviators and in the majority of cases were secured only by "sticking" despite attack.

The system of airplane construction, in England, works for very efficient results. The British air service offices in France send in their requirements for new machines to the Air Ministry at London. This division in turn notifies various airplane makers in the country, by means of special blanks, of just what types of airplanes they require. The forms used tell what the speed, climb, ceiling, etc., must be. Each manufacturer in turn studies the notice, and if he believes he can undertake the job, so notifies the Ministry. He is then sent sufficient money to proceed with blue prints and the manufacture of three airplanes. When these are completed they are sent to what is called Martlesham Heath, the greatest experimental air field in England, where they are given a thorough trial under supervision of a trial board. Those airplanes found to be best of all sent in by the various makers are then recommended as the new type. Blue prints are ordered from the original manufacturer and sent to each airplane factory with orders for specified numbers.

## A New Type of British Tank—The Whippet



*The name given to this newer type of Hun destroyer carries with it a suggestion of speed, but the speed developed is, of course, great only relatively. It is about 12 m.p.h. maximum. This British light tank corresponds to the "mosquito" tank of the French and the American two-man tank, which will soon be heard from*

# Gile Engine Employs Sub-Piston

Works on Two-Stroke Principle, with Piston-Controlled Port for the Inlet and a Poppet Valve in the Head for the Exhaust

**A** TWO-STROKE engine embodying several rather novel principles has been placed on the market by the Gile Marine Engine Co., 50 Congress St., Boston. The operation of the engine differs materially from that of the conventional two-stroke engine, and some of the disadvantages usually encountered with that type are overcome.

In addition to the regular trunk piston or working piston, there is in each cylinder what is referred to as a sub-piston which is operated from a special crank on the crankshaft. From this special crank a short connecting-rod leads to a lever arm pivoted near the base of the crankcase. On the same shaft on which this lever arm is mounted, there is another lever arm from which a link connects to a somewhat longer single arm lever in the upper part of the crankcase. The free end of this single arm lever connects through a short link to the lower end of the piston rod of the sub-piston. The motion of the piston rod is steadied by means of a cross-head moving up and down in a guide secured to the crankcase.

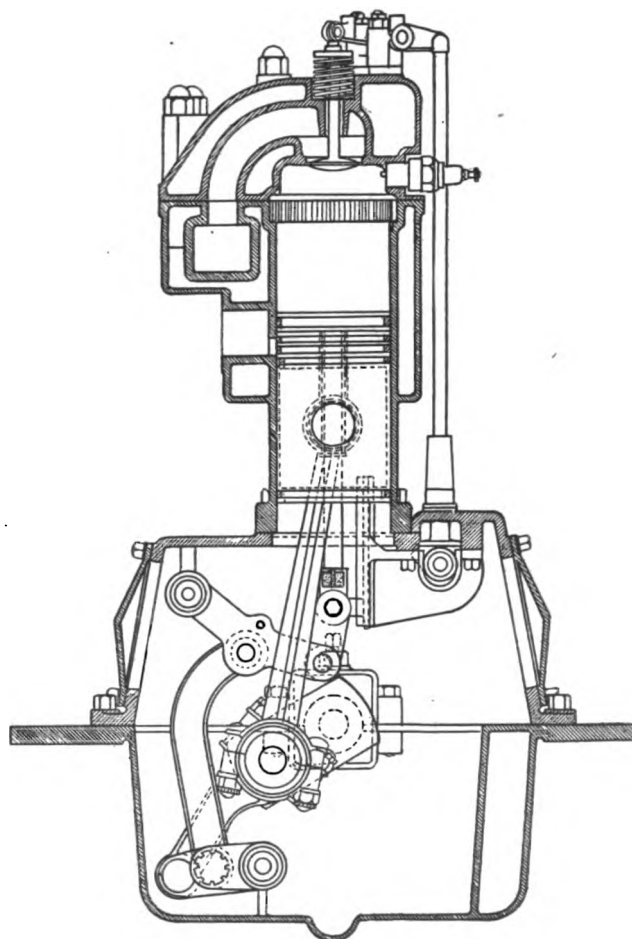
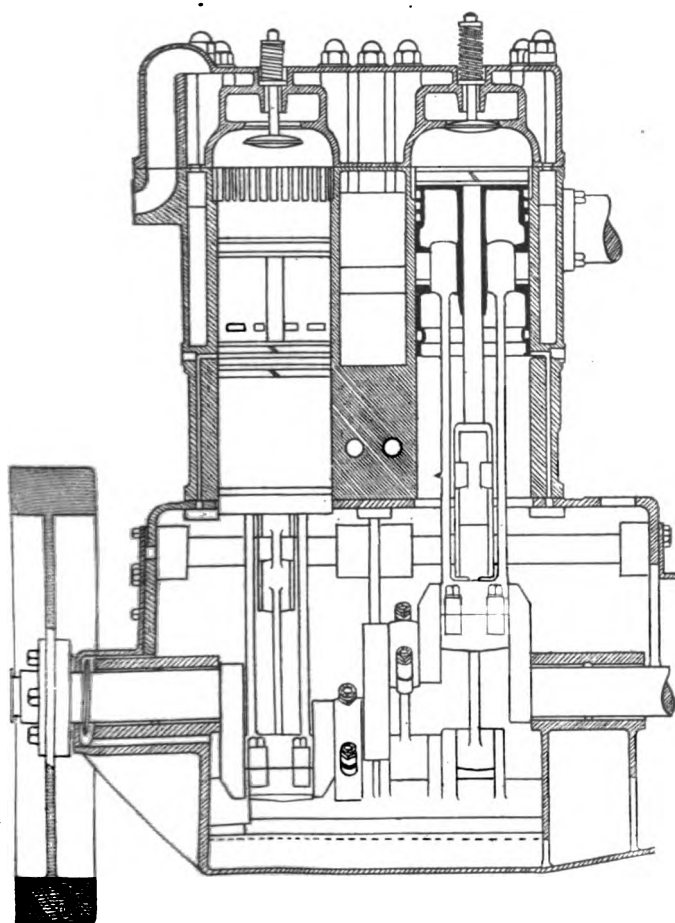
## Principle of Operation

During the power stroke the main and sub-piston both travel in the same direction and at substantially the same rate of speed. This continues until they have reached a point where the main crank is within 45 deg. of the bottom dead center, at which point the exhaust valve begins to open. As soon as the exhaust valve opens, the sub-piston is gradually stopped by the rocker arm movement described, and it then starts on

its return stroke. During this return stroke, the sub-piston scavenges the cylinder of the burnt gases, and at the same time it draws in a fresh charge of gas from the carbureter through the intake ports in the cylinder walls near the lower end of the stroke. These ports are uncovered by the main piston during the last part of its downward stroke.

During the time that the main piston uncovers the inlet ports at the bottom end of the stroke and closes them again, the sub-piston has reached the top end of the stroke and thereby has drawn in a full charge of fresh gas into the space between the two pistons. While the main piston completes the upward stroke, the sub-piston is practically stationary in its uppermost convention. It will be observed from the sectional view of the engine, herewith, that there is a series of flutes in the cylinder walls at the upper end, which afford a passage for the gas in the space between the main piston and the sub-piston, whereby it can get into the space above the sub-piston. Therefore, when the main piston reaches the upper end of its stroke, all of the fresh air has been transferred to the space above the sub-piston, or what is generally referred to as the compression chamber. As the transfer of the charge goes on at the same time as the compression of same, the gas passes through the flutes at considerable speed, and this has a tendency to keep the flutes clean and open. As the main piston reaches the top end of its stroke the gas has been fully compressed and is then fired by the ignition spark.

(Continued on page 238)



Longitudinal and cross-section of Gile engine

# "Laying the Egg on the Hun"

How the Aviator Uses Smoke, Incendiary, Demolition and Illuminating Bombs—  
Flare Lighting for Landing and Observation Work—  
The Training of a Bomber

**G**AS, smoke, incendiary, demolition and illuminating bombing exhibited in Washington at Congress Heights before important Allied and American officers recently demonstrated the close relationship between trench warfare and aviation. The exhibition was given by the trench warfare section of the engineering



*The demolition bomb used by airplanes. These bombs tear craters in the ground 80 to 200 ft. in diameter*

division of the Ordnance Department. The vast improvement in flares, bombs, and in the devices for shooting them was convincingly demonstrated. A DeHaviland airplane equipped with two Liberty engines fired four demolition bombs of medium size from an altitude of 2,000 feet, aiming at a target 30 feet in diameter and



*The illuminating bomb. This bomb is dropped by the aviator over the city he intends to bomb. At about 2000 ft. it bursts into a 30-ft. parachute with a light below of 350,000 candlepower, illuminating over a radius of 2 miles. The aviator is not blinded by the light nor revealed by it*

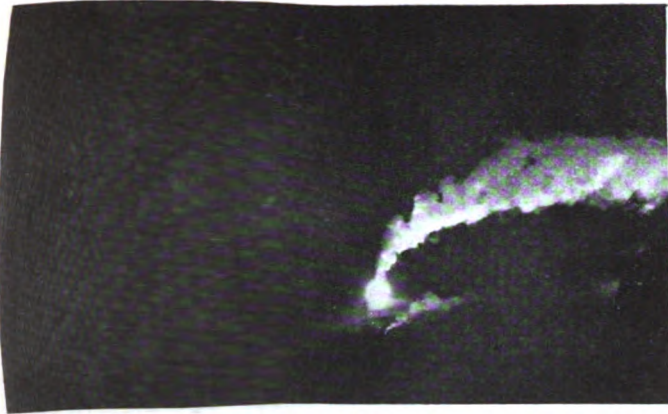
striking within a radius of 200 yards with each shot. Each bomb burst with a terrific concussion, tearing great holes in the ground, leaving craters 30 to 40 feet in diameter. The bombs used in the exhibit were made for demonstration purposes and of but one-fourth the effectiveness of the bombs used by the night bombing airplanes, which comparison shows the havoc created by the normal bomb.

Smoke bombs discharged from the plane burst, spreading a great pall of white smoke which combined with other smoke clouds discharged by ground soldiers into a screen that filled the entire valley, completely hiding



*At left—Explosions of smoke bombs dropped from an airplane. At right—Smoke screen, the result of smoke bombs dropped from an airplane and thrown by ground soldiers. The screen effectively hides operations from the enemy*



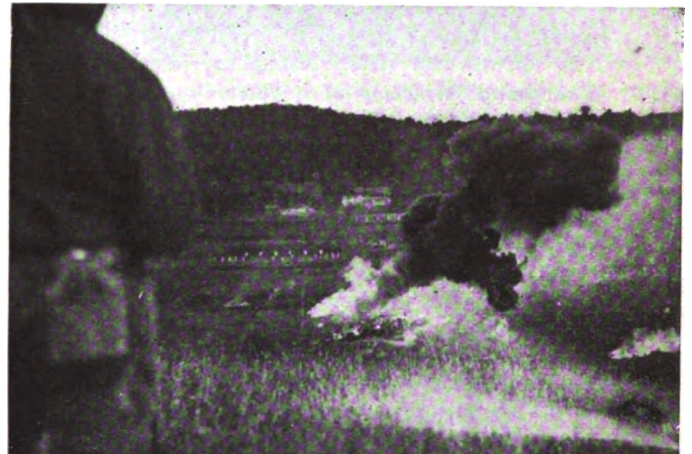


At left—**The night flare.** Two huge flares developing hundreds of thousands of candlepower are arranged, one at each end of the flying field, where they serve as beacon lights to aviators many miles distant. At right—**The night flare fully developed.** Here the telegraph post and the group of soldiers standing close to the flare box show how far into the sky the flare reaches

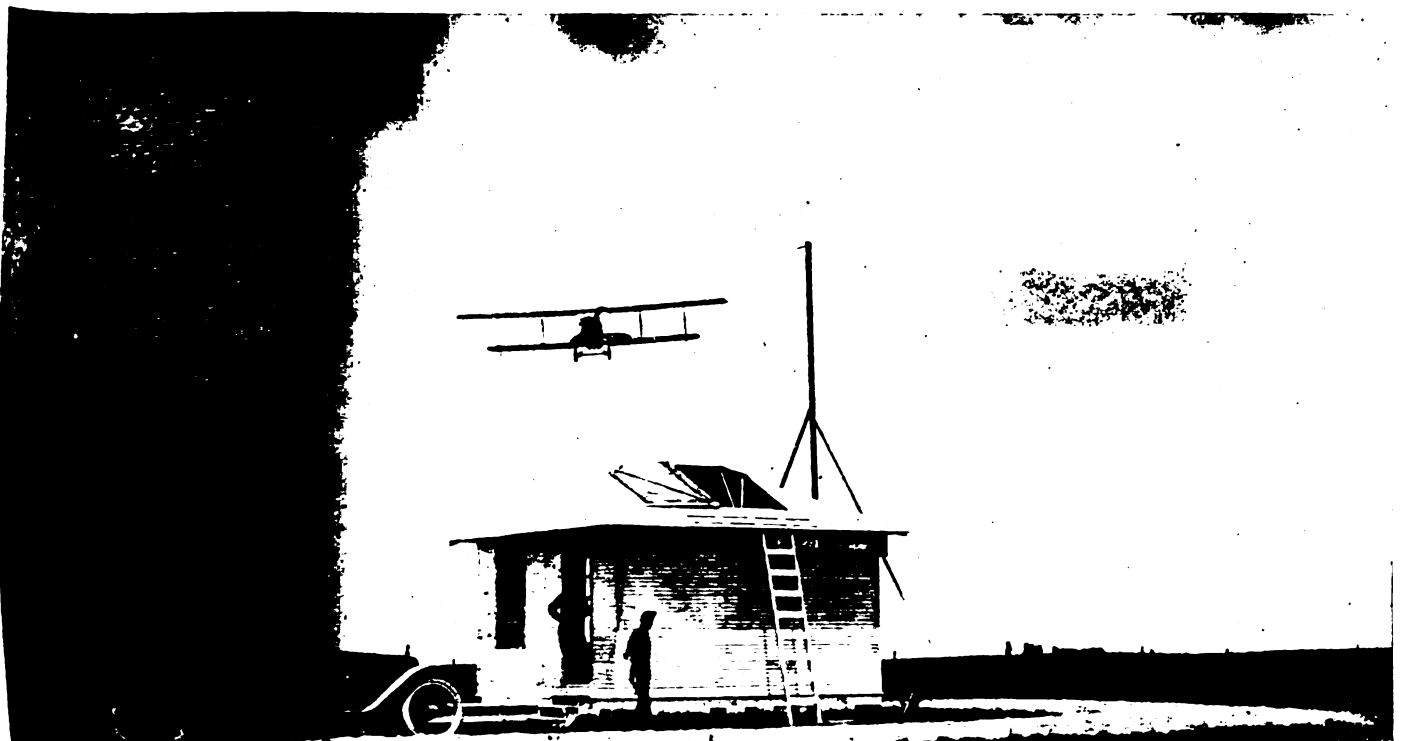
the operations of those on the other side. Gas bombs discharged clouds of gas fatal to any one within inhaling distance. Incendiary bombs containing inflammatory material splashed the earth with flaming fragments, starting huge fires almost as promptly as they exploded.

Nightfall developed a series of brilliantly lighted exhibits. Rockets were discharged which carried small parachutes and various colored lights high into the air. As the stick of the rocket broke from the stream of sparks the parachute on each opened and hung in the sky, displaying a small light with red, blue, yellow or green color. Each color has a meaning to the night bomber returning from or proceeding on a bombing expedition. Hand pistols known as "Very pistols" were also exhibited. These are used both by aviators and by the soldiers in charge of the hangars and at the trenches. They discharge parachutes with different colored lights to a distance of 50 feet and are also used for signaling at night.

Methods of illuminating hangars by night were displayed. A series of intensely bright lights are spread

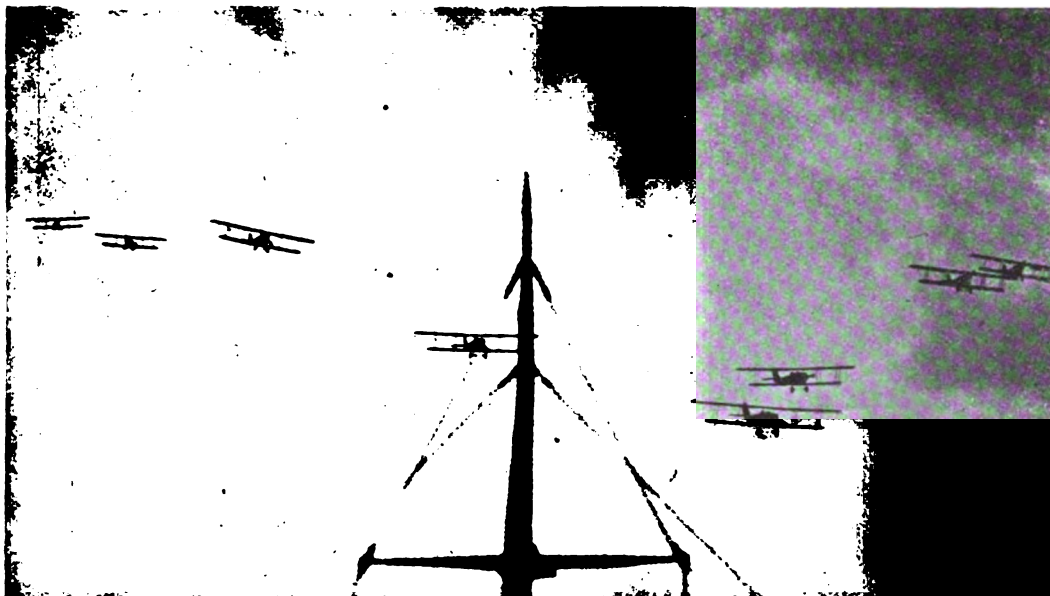


The explosion of an incendiary bomb released by an airplane. These bombs explode into hundreds of pieces of highly inflammatory material. They quickly burn even the green grass at the demonstration field



The preparatory bombing stage school house. This house, with its roof open to the sky, is equipped with camera obscuras and Batchelor mirrors. The fliers are checked and traced on charts





*The flying formation of a bombing squadron, with the leader lowest and the following planes arranged in pairs on each side forming a V, graduating in altitude, with the last planes the highest*

around the outer edge of the landing field, making it easy for the aviator to effect a landing. Another method of lighting up the field is by means of two flares, one at each end of the field, which develop a light so powerful that the observers of the exhibit, standing on a bluff 2,500 yards distant, could plainly discern every movement of the individual soldiers below.

A most interesting exhibit was the aerial flare bomb which is discharged by the night bombing airplane to enable the aviator to see and select easily the objectives for his demolition bombs. This bomb is 36 in. in length and 8 in. in diameter, contains a parachute and material throwing an intense light. The bomb is discharged at a high altitude and bursts at about 2,000 feet, the parachute spreading over a 30 foot radius with the light developing 350,000 candlepower and illuminating a radius of 2 miles over the aviator's objectives. It is so arranged that the light neither blinds the aviator nor discloses him to the enemy.

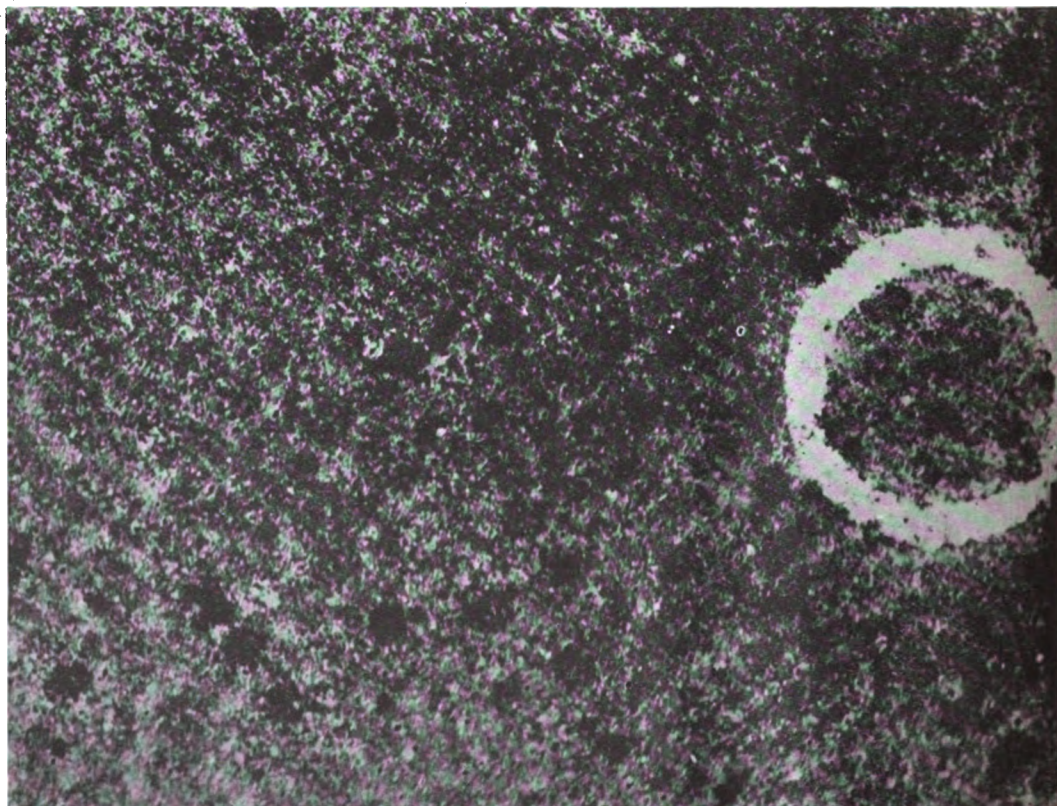
The display did not go into all of the 150 or more devices being produced by the trench warfare section, some of which are new and will be first employed against the enemy. Other exhibits included grenade barrages, salvos of grenades, knapsack flame projectors and hand gas attacks.

It is said that the aviators are now

equipped with three new devices on their planes, rendering bombing considerably more effective. One of these provides a new method of aiming bombs with considerable accuracy, another measures the speed and altitude of the machine for the aviator and the third is the illuminating bomb mentioned above.

Night bombing is just becoming an efficient and effective war measure. There were no aerial bombing organizations in the allied flying corps in the first year of the war, when all planes were used for observation purposes only. To-day 25 per cent of the aerial forces are bombing squadrons with 12 machines in each.

Originally the bombing, performed by volunteer pilots, was concentrated on camps and cantonments. Only three or four bombs were carried and dropped. They were made from artillery shells and seldom reached the mark. Occasionally showers of small steel arrows were spilled. The Germans, however, commenced day bombing of cities early in 1915. The Allies in a reprisal operated their first day bombing expedition against Karlsruhe in October of the same year. Late in 1915 the French began night bombing, which was adopted by the Germans in August, 1916.



*The circular ground target used for training. The photograph shows the work of embryo bombers and the effect of the bombs on the ground*

To-day several squadrons of bombing machines go over the lines frequently and completely destroy their objectives. Unfortunately the Allies' air forces have to travel over much hostile territory defended by anti-aircraft guns to attack German cities, while the enemy can attack French cities by short flights beyond our lines. To overcome this obstacle we are developing the huge Caproni, Handley-Page and DeHaviland night bombing planes, recently announced, which will carry sufficient fuel for the long excursions and armament for protection. These bombing squadrons will be escorted by 18 fighting planes over the lines of the enemy for protection against the enemy fighting planes, after which they are left to their own devices, as the fighters do not carry sufficient fuel to accompany the bombers on the complete round trip. The bombing planes fly in a formation similar to that of the fighting planes, which is a V with the leading plane lowest and the following planes arranged in pairs on each side of the V and graduating in altitude with the last planes the highest, much like a flight of stairs. This permits the higher planes to pounce on enemy planes attacking the leaders below.

Bombing crews, comprising a pilot and a bomber, are given highly specialized training in flying, aiming, firing, navigating and fighting. This training is essential, else fliers traveling many miles over hazardous country would be likely to achieve their objective only to see the bombs dropped strike on open ground, or they might lose their route and be obliged to descend in enemy country, or again they may be met in combat by enemy planes. Consequently, they must be trained to meet all emergencies.

Shooting bombs is much like shooting a rifle. The sights and wind-gage are set, the rifle held properly and the trigger pulled.

Elemental training is given the bomber and pilot in a preliminary ground school. It includes a three months'



Three bombs just released from an airplane falling toward the objective. The bombs are still in the horizontal position, with the one above just beginning to turn its nose downward



The night bomber with plane set, bombs in place, ready for his expedition. In the lower left-hand corner can be seen bombs and rockets

course in the theory of flight, aeronautic engines, instruments and airplanes, plain and aerial navigation, astronomy, meteorology, map reading, machine guns, bombs, artillery observation and radio telegraphy. The course is so complete that many of the students are able to build workable machines after completing it. It has been prophesied that after this war the country will be overrun with homemade airplanes constructed by the present students and graduates of the military aviation course.

#### "Laying an Egg on the Hun"

"Laying an egg on the Hun," which is the term for bombing, follows the preliminary training when the graduates who stood highest are permitted to volunteer as bombers. They go to a bombing school, while the bombing pilots are sent to primary flying fields. The bombers thus advance more rapidly than the pilots, as they, at the bombing school, meet pilots already trained with whom they will work. The pilots and the bombers are urged to cultivate each other to form congenial teams, adding efficiency in this way, since from this time on the team mates work and sometimes die together. In the preparatory bombing stage, the bombing crews fly over a course over camera obscuras and Batchelor mirrors located in houses on the ground. The houses are open to the sky and the course of the planes flying is thus checked and traced on charts and show the smallest errors of the fliers.

Bomb dropping instruction follows, first from low altitudes, 3,000 to 4,000 feet, and then from higher points, 10,000 to 12,000 feet, as the aim of the bomber improves.

The target is usually a circle 25 feet in radius, painted on the ground, not hard to hit with a rifle at the distance but exceedingly difficult to strike from an airplane moving at 100 m.p.h. and far from steady. Well-trained bombers can score 7 hits out of 10 shots, while some of the best marksmen do even better.

After the marksmanship test is concluded the bombers usually fly to 10,000 feet altitude, at which height they are comparatively safe from anti-aircraft shots. Even at 4,000 feet the German batteries score 1 hit for 10,000 shells. At 10,000 feet they average less than 1 hit to every 50,000 shots.

BRITISH iron and steel manufacturers have agreed to form a national council on trade policy, which will be representative of all the ironmakers of the country, and probably of labor interests as well. It will deal with trade matters only, and will not concern itself with technical questions.



# The Labor Problem and Export Trade After the War

Foreign Business Begins at Home—Labor Turnover, Wages and Manufacturing Costs and Efficiency Are the Factors to Be Considered First

By Edward N. Hurley

*Chairman United States Shipping Board*

WITH something like 25,000,000 tons of merchant shipping to be employed inside of two years, it is none too early to look around for cargoes, both in this country and abroad. So, amid all his splendid effort in producing equipment to win the war, the American manufacturer must be asked to take thought for to-morrow and think in terms of shipping and foreign trade. This might appear like a distraction now—something which will take the attention from the supreme duty of winning the war. But, far from being a distraction, it fits in with war production and war psychology. While our factories and factory employees are building war material to-day, they are also building foreign trade, if we can only see things whole and make one factor work with another.

When the business man turns his attention to export trade he looks abroad and thinks of foreign customers. But foreign trade actually begins in his own factory. He looks abroad and studies such factors as ocean freights, foreign exchange, export packing and international salesmanship. If he would look into his own factory first, and study factors close at hand, such as labor turnover, wages, manufacturing costs and efficiency, he would be laying solid foundations for export trade.

With the bugaboo of cheap foreign labor haunting us in former years, we got into the way of thinking that export trade necessitated some lowering of wages and American living standards. Probably that was crooked thinking before the war. Certainly it is crooked thinking now, for the war is bringing other nations closer to our American standards of wages and living.

True development of foreign trade in our factories means better and better American standards.

In most of the countries of the world there will be a decided shortage of labor after the war. That country will best succeed which protects its workmen by improving their living conditions, guaranteeing a fair return for labor, protecting workmen and their families against accidents and idleness, and making workers better citizens. The country taking those measures will be the country that develops and makes products most economically, and will perform a world service by making goods at the prices fair to other nations.

In the Army and the Navy we have a visible mobilization of man power for results in a foreign country. If we could have the same visible mobilization of man power in our factories for foreign trade it would be a splendid object lesson for those who manage the factories and make the export goods.

## Cheap Labor Will Not Win Export Trade

To think of cheapness in connection with foreign trade is just as wrong as trying to pin bargain tags on soldiers. Foreign markets are not going to be won or held by cheapened American workers, or bargain methods in American life. As manufacturers we have got to lay the foundations for foreign trade by going out into our factories and studying labor and costs together. We can sell our export products at reasonable prices by increasing wages along with output, and decreasing the losses caused by labor turnover, untrained workers, spoiled materials and other inefficiency.

Our experience along these lines in the Emergency Fleet Corporation has been most encouraging. With the task of

creating new shipyards in a few months, and manning them with several hundred thousand workmen, most of whom came from other trades, we ran into about every difficulty, and problem, and tangle that could conceivably arise in management. On a large scale we effected an adjustment of man power such as is called for now in preparing the average American factory for the export trade which we will need to keep our ships employed.

To get production at unheard-of speed and in record-breaking quantity, we did something simple and fundamental—and thoroughly human. This was nothing more nor less than arranging wages so that, while our workers produced more for us, they were also able to produce more for themselves. We established the rule that a piecework wage rate set by any shipbuilder must stay in force during the period of the war. Any manufacturer who sets a piecework rate, and then reduces that rate if he finds that he has made a mistake against himself, is doing a great injustice to his employees. Profiting by our experience in the shipyards, I should like to see Congress pass a Federal law making it compulsory to keep every piece rate in effect one year. That would protect workers and furnish a real basis for increased production.

## A Lesson from the Shipyards

We found ourselves confronted with enormous losses and dangerous delays through lack of skill in special trades needed by workers in the shipyards, and also through the cost of labor turnover. To find 100 capable shipbuilders who would stick on the job it was necessary to hire and try, discharge or lose 1000. Every manufacturer will recognize in these difficulties exactly the difficulties that he himself faces from day to day, and which put excessive burdens of cost upon his products. In the shipyards we got around those difficulties by establishing training centers for the various trades we needed, and also by appealing to the splendid spirit which lies in the average worker. We had to train everybody, from the boy who heats rivets right up—foremen and superintendents, and even executives. Starting with a little nucleus of skilled riveters, caulkers, reamers, carpenters and so forth, we took them out of the shipyard for a time and taught them how to teach their trades to others. Then they went back into the yards to teach green recruits, not in any school or class, but on actual ships, while doing the regular day's work. Under this system it was possible to quickly bring green gangs up to about 80 per cent of the efficiency of skilled workmen.

As fast as these men learned their trades and acquired high earning power under our protected piece rates, they became steady enough, and the costly item of labor turnover began to drop. After that nothing more was needed but the appeal for patriotic service. We found that the shipworkers would not only stick on the job like soldiers, but that in their inherent spirit as fighters and loyal Americans there was an enormous reserve of man power to draw upon—a reserve capable of meeting every demand and every emergency, with power to spare.

That reserve of spirit exists in every American industry. War has brought it to light where executives can see it, and to develop this great reserve for foreign trade is distinctly the executive's job.

# Training Girls for the Drafting Room

Making Tracers by Intensive Methods to Meet the Demands of the Day—  
A High Degree of Skill Acquired in 4 to 6 Weeks' Course

FOR many years the Westinghouse Electric & Manufacturing Company has gone extensively into the training of employees. Educational courses in practical shop work have been conducted on an elaborate scale in the company's various manufacturing plants as well as in special night schools. The production of tracers, draftsmen, pattern makers, foundry men, machinists, tool makers, electricians, and other classes of skilled workmen has been as much a part of the company's regular business as has the making of electrical equipment.

In September, 1917, the class conducted by the educational department for instructing boys in tracing was opened also to girls. The class had originally been operated on a part-time basis, the boys receiving 4 hr. instruction a week, while still attending to their regular duties in the offices or works. In addition to this instruction the class is now operated full time for the intensive instruction of girls. Practice is given in lettering and tracing, with some instructions in drawing.

The girls who are selected for this intensive training have had at least two years of high school education. The instruction covers from 4 to 6 weeks, during a part of which time the student makes actual working tracings.

Thirty-two girls have taken this training course and have been placed in regular tracing positions. Several of these girls have qualified for more advanced work and are receiving 4 hr. per day instruction in detailing.

On the first of this month a special section of the department for training machine tool operatives was opened for women. This training section is equipped with standard machine tools and the girls will be instructed in the lighter kinds of standard work.

The methods adopted by the Westinghouse educational department for converting raw material in the form of inexperienced young men into finished draftsmen are the following: Beginners are first placed in the drafting room as tracers. If aptitude for the work is shown, an opportunity is given them to prepare for more advanced work in the department.

This preparation consists of experience in the shops on pattern making, foundry and machine shop work, and systematic training in the drafting office on the various phases of the work. Six hours per week are spent in the special training section conducted in the Educational Department. This instruction covers design problems involving various applications of mathematics, physics, mechanics, materials, shop methods, estimating and cost calculating and tool design.



A class of girls receiving intensive training in tracing in the educational department of the Westinghouse Electric & Mfg. Co. Several of the girls so trained have qualified for advanced drafting work



# Products of the Royal Aircraft Factory

Models of Planes Developed at the Establishment of the British Government—  
Further Development Work Left to Private Concerns

**S**INCE 1912 the British Government has operated works for the production of military airplanes in competition with private concerns. Innumerable types of machines have issued from these works, some successful, but more rather deficient in comparison with contemporaneous designs by private builders. Recently the R. A. F., as it is known, has been reorganized into the Royal Aircraft Establishment, and *The Aeroplane* takes advantage of the occasion to review the development work done at the R. A. F. and, with the permission of the Air Ministry, to publish photos of many of the models turned out by it in the course of time.

• The nucleus of R. A. F. was the Balloon Company, R. E., of



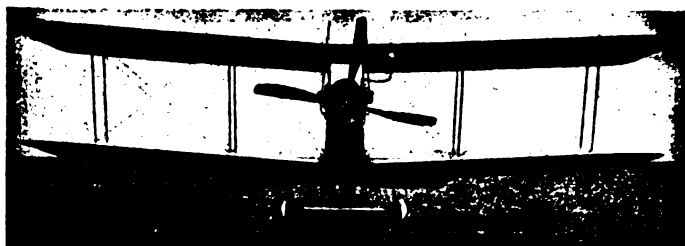
*The original R. E. built for speed early in 1914 with 70-hp. Renault engine*

Farnborough, which controlled all the aerostatic appliances of the British Army and came into being during the first years of the present century. A few years later, when the British Army acquired its first dirigibles, the balloon company was placed in charge of this equipment also. The original establishment and the original name both became inadequate, so additional sheds, etc., were built, and the name was changed first to the Army Aircraft Factory and later on to the Royal Aircraft Factory. Control was placed in civilian hands, and Mervyn O'Gorman was appointed superintendent. Experiments were made both with privately designed aero-



*B. E. 2c biplane with 70-hp. Renault engine*

planes and with machines developed at the R. A. F., but it was only in 1912 that a machine was produced at the R. A. F. which would really fly. In the summer of 1912 a tractor biplane with a four-bladed propeller, a two-seater, was produced which flew in the British military airplane competition, without competing, however. The machine made quite a respectable showing, as it beat all of the competitors with the exception of that of the late S. F. Cody, whose large machine



*B. E. 2d biplane with planes of equal span and ailerons operated by cable*

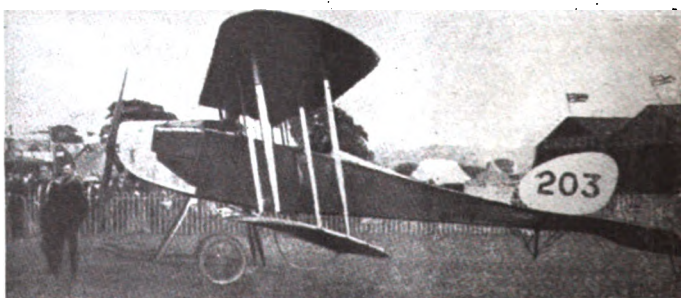
was ahead of the times in the matter of engine power. This R. A. F. tractor biplane, which was designed by Geoffrey de Havilland, now chief designer of the Aircraft Manufacturing Company, Ltd., probably compared favorably with anything produced up to that time. It was designated the B. E. biplane, which stood for Bleriot Experimental, because Louis Bleriot was officially regarded as having originated the tractor type of aeroplane. It was a sort of composite design,



*B. E. 2d biplane with 90-hp. R. A. F. engine*

embodying features of the Bleriot, Wright, Deperdussin, Nieuport and Avro.

During the next two years the B. E. biplane was produced in a number of variations, the most noteworthy being the B. E. 2b and the B. E. h, the latter with a Gnome engine inside a coal scuttle cowl. Shortly before the outbreak of the war there arose a craze for inherent stability, and the first B. E. 2b was evolved, in which this feature was aimed at. This differed from the original B. E. machine in that the



*Side view of B. E. 3, which is very similar to B. E. 4 and B. E. 8*





*Front view of B. E. 2c biplane with 90-hp. R. A. F. engine*

wings had considerable dihedral, and the warp control had been replaced by double-acting ailerons. An enormous tail, more or less rectangular in shape, and a big fin in front of the rudder, combined with proper weight distribution, made the machine perfectly stable, although her lift was not all that might have been desired.

Later models were equipped with more powerful engines built by the R. A. F. These included the B. E. 2d, B. E. 2e and B. E. x. The first B. E. 2 had a 70-hp. Renault engine and a single open cockpit for the pilot and gunner. The B. E. 2b had separate cockpits and a better streamline fuselage. The B. E. 2b was the first machine designed for inherent stability, and it also had a marked forward stagger to the upper plane. The B. E. 2d was similar, but had a faster wing section. In this type the under-carriage skids were



*Three-quarter front view of B. E. 2e biplane with 90-hp. R. A. F. engine*

abolished, the exhaust pipes were carried up over the upper planes and the machine generally was streamlined down to get increased speed. Most machines of this type were equipped with a 90-hp. R. A. F. engine instead of a 70-hp. Renault.

A marked change was made in the B. E. 2e type, which had a single pair of inter-plane struts outside the center section of the wings, and a big overhang to the upper planes, in which overhang the ailerons were connected by a slender tubular strut to the small lower ailerons, this strut being outside the line of the inter-plane struts. This machine also was designed to give more lift than its immediate predecessor, but its power plant and fuselage were practically the same. In all of these machines the passengers sat in front of the pilot.



*R. E. 8 biplane with 130-hp. R. A. F. engine*

Some months before the outbreak of the war a need was felt for faster and larger types of aeroplanes, and the R. E. (Reconnaissance Experimental) was produced. The first of this type was a modified B. E. with a single pair of struts outside the center section on each side. This was equipped with a Renault engine of 70 hp. It was fast, but did not have much lift. A subsequent type, the R. E. 4, which was fitted with an Austro-Daimler engine of 120 hp., had good climbing ability and, piloted by Norman Spratt, easily beat the existing height record. It was a very slightly machine, but is believed to have involved some aerodynamic defects. Later developments of this type included the R. E. 5, R. E. 7 and R. E. 8, these being used as self-protecting artillery observation machines, night bombers and contact patrol machines. They were fitted with 12-cylinder R. A. F. engines of about 130 hp.



*Three-quarter front view of R. E. 8 biplane with 130-hp. R. A. F. engine*

For a period in 1916-17 they were very unpopular, but subsequent changes in design made them both pleasanter and safer. By this time, however, they were already becoming obsolescent.

The first aeroplanes fitted with machine guns were of the pusher type. Machines of this type manufactured by the R. A. F. were known as type F. E., which letters indicate Farman Experimental. These machines were rather queer looking, and the second type brought out is described as "a bull-nosed brute with a deep nacelle, at the rear of which was a 70-hp. Renault engine driving the typical R. A. F. four-bladed propeller." The Bleriot shaped, Wright braced warping, B. E. type planes were retained, as was also the B. E. type pear-shaped rudder hitched to Farman type tail booms. The machine was inclined to spin, and it was not long before an accident occurred in which the passenger was



*R. E. 4 with 120-hp. Austro-Daimler engine which established a new altitude record*

killed and the pilot crippled. Later examples, fitted with rigid wings, ailerons and Beardmore engines were more satisfactory in their performance and were largely used at the Front, first for fighting, and second for night bombing. The official significance of their name has changed from Farman Experimental to Fighting Experimental. Colloquially they became known as Feeplanes.

A single-seater pusher fighter with a Gnome engine, on the lines of the de Havilland 2, and known as the S. E. 8, gave quite a creditable performance. Another model, known as the S. E. 2b, was developed, and the very first example of this type to cross the Channel landed behind the German lines and was captured without being seriously damaged.

Next the R. A. F. attacked the problem of the fast single-seater and produced the F. E. (Fighting Experimental) type.





*F. E. 2b biplane with 120-hp. Beardmore engine and trip wheel under carriage*

In the F. E. 2 a special attempt was made to reduce the head-on resistance, only a single pair of struts being used between the wings and a round, tapering fuselage. Driven by a 160-hp. Gnome, with 24 cylinders, this small machine exhibited great speed, but otherwise its performance was poor, and it was almost impossible to control. The type of engine was also very unreliable.



*Three-quarter rear view of S. E., showing position of Lewis gun on top plane*

An improved design, the F. E. 5, with Hispano-Suiza engine, showed a better all-around performance. In this type, stability was developed to such a degree as to be a fault, for the machine was difficult to maneuver rapidly in air fighting. This gave the advantage to especially controllable enemy aeroplanes in that they could hold their own by keeping on fighting inside the F. E.

## The New Giant German Airplane

THE French aviation authorities recently announced officially that during the night of June 1-2 a giant enemy airplane provided with four motors and carrying a crew of eight men had been brought down near Nanteuil-le-Haudoin—about half way between Soissons and Paris. Further particulars concerning this machine have been supplied by a correspondent on the French front. The machine is stated to be of the "Lizenz" model, but we accept this name with reserve, as it is merely the German word for "license." The following numerical data are furnished by the correspondent:

Engines	four of 300 horse-power.
Span of wings	141 ft.
Length overall	92 ft.
Weight, empty	20,300 lb.
Weight, fully loaded	32,200 lb.
Weight of bombs carried	4,400 lb.
Maximum speed	75 to 80 miles per hour.
Armament	four machine guns.

The crew of eight apparently consisted of the pilot, an assistant pilot, two gunners and four mechanics.

It is of some interest to analyze these data as far as we are able, and to compare this new type of machine with the Gotha or Friedrichshafen bombing machines, the largest machines of which, hitherto, we have had definite information. We can assume, we think, that the engines are of the Mercedes 260-horsepower six-cylinder design, for it seems unlikely that the enemy has developed a new type of engine and applied it to a new type of airplane. The Mercedes engine of the model named consumes fuel and oil combined at the rate of 146 lb. per hour at normal speed. The crew can be reckoned at 180 lb. per head. The Friedrichshafen machine is provided with tank capacity sufficient for about 3¼ hours of flight at full speed, and usually carries a crew of three, although accommodation is provided for four. With these figures we get the following comparison of weights:

	Friedrichshafen.	"Lizenz."
	lb.	lb.
Weight, empty	5929	20,300
Fuel oil for 3¼ hours	948	1,896
Crew	540	1,440
Bombs	1229	8,564
Total weight	8646	32,200

It will be noticed that the weight of bombs carried by the new machine, according to this reckoning, is nearly twice as great as the figure named in the unofficial account. If the latter figure is correct, it would seem that the machine is provided with sufficient fuel and oil capacity for some 5½ hours' flight at full speed. It would thus appear to be capable of carrying nearly two tons of bombs to a point some 200

miles from its base and returning. The German airdromes in West Flanders are about 140 miles from the center of London, as the crow flies. Hence the new machine has been designed, it might be presumed, not to bring new regions within the range of airplane attack, but, primarily, to enable bombs of greatly increased weight to be dropped on the targets already reached by the Gotha and Friedrichshafen.

We do not know what the speed of the Gotha is, but it is obvious that it must, in order that the machine may be able to bomb London and return within three hours, be at least 100 miles per hour. It will be seen, therefore, that by doubling the power and by being content with a materially lower speed the enemy has nearly quadrupled, in the new machine, the weight of bombs carried. To obtain the increased lift it is not, of course, sufficient merely to increase the power; the size of the machine, as a whole, must also be increased. The span of 141 ft. in the new machine compares with 78 ft. in the Friedrichshafen, and the overall length of 92 ft. with 42 ft. Thus the actual area of the target presented by the machine is approximately four times as great as in the case of the Friedrichshafen. This figure has, further, to be multiplied by some factor greater than unity, in order to allow for the effect which the reduction of the speed has on the probability of successful attack by gunfire.—*The Engineer.*

### Gile Engine Employs Sub-Piston

(Continued from page 229)

From this point on, the two pistons travel in a downward direction together and the cycle is then repeated.

It is claimed for the Gile engine that it burns kerosene as readily as gasoline. This is explained on the theory that the fuel particles are thoroughly broken up in being passed through the small flutes in the cylinder walls. No preheating of the fuel or air is required. It is stated that observation and chemical analysis of the exhaust gases show substantially complete combustion of kerosene as well as of gasoline.

The exhaust valve is located centrally in the head and is operated by means of a cam through a mushroom type cam follower, a tappet rod extending up the side of the cylinder, and a tappet lever. Another peculiarity of the engine design is that the exhaust manifold, which is of square cross section, runs alongside the cylinder block, being cast integral with the cylinder casting and completely surrounded by the water-jacket.

# British Post-War Industrial Plans

## Committee for Engineering Trades Makes Report Containing Recommendations as to Methods to Be Pursued During the Reconstruction Period and Later

**I**N Great Britain the term "engineering" has a somewhat different meaning from that usually given it in this country. What is referred to as the engineering trade is what we in this country would call the mechanical industries or machinery manufacturing industries. A report has recently been made by a departmental committee of the British Government dealing with the prospects and requirements of the British engineering trade after the war. This contains a number of recommendations which should prove of interest to American manufacturers. One of the measures requested of the Government is a total prohibition of imports of engineering material from present enemy countries for a period of at least one year from the time peace is concluded. Exceptions might be made in special cases where imports are advisable in the national interest, and in such cases importation is to be made under Board of Trade license.

### Difficulties of Controlled Firms

In the opinion of the committee, the firms controlled by the Government are entitled to special consideration. Most of them are engaged on work for which there will be no demand in peace times, and the change-over from war work to peace work will entail great difficulties. Labor difficulties, it is believed, will be more accentuated than in uncontrolled plants. The knowledge that work is being done without competition for the Government has produced a feeling among workmen—and indeed among the staff—that inasmuch as the Government pays, the rates of wages can be indefinitely increased and that no particular attention need be paid to cost. In the necessary pressure to produce work urgently required many concessions have been made in the matter of wages, with the consent of the authorities, which would be impossible in normal working. The controlled firms, when the control is lifted, will have the greatest difficulty in reorganizing their payrolls along anything like normal working lines.

In view of these and various other difficulties pointed out it is urged that the controlled firms have their works returned to them unimpaired as to capacity, and that the many and great difficulties which will confront them on their return to normal trade, both as to obtaining orders and reorganizing their works, should be regarded generously by the Minister of Munitions under the powers entrusted to him.

### Japanese and Canadian Competition

Considerable competition is expected from the engineering trades of Canada and Japan and the report has the following on this subject:

"As a matter very relevant to the considerations of international competition after the war, it is necessary to refer to the great growth of engineering works in Canada since 1914. We have no details, but report says that with a population of eight millions Canada is now equipped with engineering works capable of dealing with

the wants of twenty-four millions of people. If this is true, the competition of Canada may hereafter have to be included in any reckoning of international trade.

"It is not only Canada which promises a large competing output in the future. No engineer can afford to ignore the signs of rising competition from Japan. Intelligence, enterprise and cheap labor combined may easily make Japan a formidable competitor, in spite of her relative lack of coal and ironstone. As yet there are signs only, but to these we think it necessary to draw attention."

### Raw Materials

British manufacturers are comparatively well situated with respect to raw materials, but structural engineering firms have at times bought some of their girders and sections and locomotive and car builders their axles and tires from German and Belgian firms. Some of these fear the effect upon their export business if import of raw materials and parts were forbidden.

Some interesting remarks are made in the report regarding trade organization. Undoubtedly, a considerable step has been taken in Great Britain in the direction of working in larger units—not necessarily in the nature of actual amalgamation of firms, but by subdivision of production. So far, no practical steps seem to have been taken by any engineering association, with one exception, toward perpetuating the improvement which is now existing; but the recognition of the faulty system of the past is general and finds expression in conferences and resolutions. The desire for improvement in the future is very evident, and it does not seem beyond the capacity of the abilities of ordinary business men to come to some arrangement which may in the future improve production and eliminate waste. Where amalgamation may not be possible, it seems that firms should in many cases be able to pool their resources.

### Large vs. Small Establishments

The chief bar to the attainment of this most desirable result is a characteristic at once admirable and obstructive. While in Germany independence does not appear to be the leading characteristic of the manufacturer, in Great Britain the manufacturer's strong individualism imparts to him the desire to stand alone, to make or mar his own fortunes, to be beholden to nobody, and to be controlled by no one. In this he has been supported by the public, who think the assembled article lacks the guarantee of the manufacturer. It was undoubtedly the multiplicity of small manufacturers closely applying themselves to their trade in the past which produced the engineering trade as it exists in Great Britain to-day. Conditions have, however, changed, and the progress and maintenance of the engineering trade in future depend a good deal upon production upon a large scale, with the minimum of standing charges and of waste. Under the head of preventable waste must be included the waste of effort involved in restriction of output by workmen.



In the view of the committee, however, despite the tendency toward larger units, the small manufacturer will continue to exist. He may not have before him much hope of large profit, but he undoubtedly has great uses in his readiness to adopt and try new things—in the application of his inventive genius, and in the practical knowledge that he himself acquires through actually working in his own shops and in daily contact with his own men. Many of the men at the head of great works to-day, in the capacity of directors, have only a theoretic knowledge of the works they direct as compared with the practical knowledge which their fathers and grandfathers had before them.

#### Decimal English System Recommended

The committee recognizes the advantages of a decimal system, but makes only a very slight concession to the champions of the metric system. It is held to be desirable that the division of the inch into one-eighth, one-thirty-second and one-sixty-fourth should be abandoned altogether in favor of the division into hundredths, which is already used exclusively for high-class work; it would not be necessary to vary the higher measures, as, with the occasional exception of the foot, they are not much used for precise measurements.

The hundredweight and ton should be replaced by the cental and short tons of 100 and 2000 lb. respectively, the latter in conformity with American practice. The change would simplify invoicing and freight charges, and would be less mystifying to the foreigner.

The statement is made by the committee that it would approve of a similar change in coinage if it were within their terms of reference and provided that the pound sterling were retained as the unit of value for all purposes. They do not consider the dollar a suitable unit. The absurdity of such a complication as 73 tons 13 cwt. 3 qrs. 17 lbs. at £11 17s. 6d. a ton is obvious, and a great saving of time would result both in work and in education by the adoption of decimal notation in connection with the present English bases of measures and coinage.

An interchange of opportunities between factories and universities is advocated. The university work might be greatly assisted by facilities for its students to carry on practical work in workshops while pursuing their university career, so that, as far as possible, the university education might be joined up with practical experience, as is indeed done to a great extent in Scotland and to some extent in England. It is of the utmost importance that university authorities should keep in the closest possible touch with the manufacturers if the full benefit of university education is to be obtained, and for this purpose lectures on technical subjects, and luncheon clubs arranged at which the university authorities and manufacturers meet fortnightly have proved to be most valuable.

#### Stricter Enforcement of Patents Act Working Clause

It is held that the object of the British Patents Act has been frustrated in many cases by foreigners applying for British patents not with the purpose of working these patents in Great Britain but for the purpose of securing a monopoly of the British market for goods manufactured abroad by owners of British patents. It is suggested that that part of the Patents Act which requires manufacture within Great Britain should be more stringently enforced, and should refer not merely to nominal manufacture or to the assembling of parts made abroad, but to actual manufacture of commercial quantities. In the view of the committee manufacture in Great Britain would be best attained if it were possible to define a proportion of the articles to be manufactured

under the patent in that country as against the total import of such article under patents held abroad.

The subject of licenses and royalties is also referred to and the thought is expressed that the clauses of the Patents Act requiring licenses to be granted might be materially improved by providing some competent body to decide as to the reasonableness of the royalties and of the terms demanded for the grant of such licenses without the expense involved in a reference to the court. At present the fixing of such royalty depends practically upon bargain with the patentee. If he is desirous of preventing any manufacture under license, the terms he may demand will necessarily choke off the intending licensee, who will be reluctant to institute proceedings to get a reasonable rate fixed. The obligation to grant licenses is only enforceable if it can be proved that the patentee has not in fact manufactured in this country. This condition is almost prohibitive so far as the intending licensee is concerned. It is suggested that the onus of proving that he has manufactured in Great Britain within the terms of the act should be thrown upon the patentee.

Finally, the report refers to trade prospects after the war. The belief is expressed that for a short time after peace is declared the need for engineering products will be so urgent that prices will be maintained at an abnormally high level till the most pressing demands are satisfied.

#### General Decrease in Purchasing Power

Reference is also made to reconstruction work in the devastated sections of France and Belgium, and British manufacturers are believed to be ready to allocate a definite proportion of their output to orders for this purpose. It appears to the committee that the purchasing power of the whole world, outside the United States and Japan, will be much diminished, and that the ability to satisfy needs will depend upon ample supplies of raw materials and of engineering products at reasonable prices. Says the committee: "The United States will certainly make a considerable attempt to meet these demands, but the high cost of production there prevailing should enable British manufacturers at anything like normal prices to meet that competition in neutral countries with fair hopes of success."

#### Book Review

**STEAM Road Vehicles**, by L. M. Meyrick-Jones. Published by Iliffe & Sons, Ltd., London. Price, 3s. 10d.

This book is intended for the use of drivers and owners of steam trucks and tractors. In England, contrary to the conditions here, steam is a very important factor in road haulage, and its importance has even increased during the war because the fuel of the steamer, coal, is a national product, whereas gasoline and other petroleum products have to be imported.

The author is a practical engineer with long experience of steam engines and he has dealt with their application to road vehicles in a most comprehensive way, the descriptions of the working of the engine, the generation of steam and the means of transmitting the power to the road wheels being clear and concise. Apart from the engine itself, all other components and accessories are fully dealt with in separate chapters, and there is also given much useful advice on the preparation of vehicles for the road and their management while in commission. The need for frequent "shed days" is emphasized and the writer provides some valuable hints on overhauling and washing out, as well as minor repairs that the driver can undertake in the garage.

The book contains close to 200  $5\frac{1}{2}$  x 8-inch pages and is illustrated with numerous simple diagrams and some half-tone cuts. It is well indexed.

# A. C. Arc Welding and Cutting

A New System Involving the Use of a Novel Principle—No Running Machinery Required and Current Consumption Low

**E**LECTRIC arc welding, cutting and repairing are accomplished by the application of the heat produced when the electric current jumps a gap in a circuit. The temperature and amount of the heat generated at the arc can be varied to suit the melting point of nearly all metals by varying the electrical characteristic of the apparatus employed to hold the arc.

Arc welding apparatus marketed in the past employed direct current at the arc, which in the case of either an a.c. or d.c. power supply required a heavy motor generator set and an elaborate switchboard. For general welding a 10 to 15 hp. motor and an 8 to 10 kw. generator, with switchboards for both, were required, together with starting apparatus, the whole set weighing from 1 to 2 tons, and for cutting, 2 tons and upward.

The Electric Arc Cutting & Welding Co., Newark, N. J., claims to have solved the problem of holding and controlling an alternating current arc, and it has placed on the market a light weight a.c. welding machine consisting of a special transformer with no moving parts.

It is a law that the heat produced by an electric arc is proportional to the product of the volts across the arc and the amperes flowing through it, or to the wattage, and this wattage must be varied to suit different conditions of metals, electrodes and work. It is claimed for the alternating current arc machine that it automatically holds the heat of the arc substantially constant for any given setting. As soon as a person becomes accustomed to the sound and sight of the arc and can deposit the molten metal where he desires, it is said to be impossible to burn the metal from too much heat, or to make imperfectly joined, or "cold shot" welds, from too little heat. Different metals, electrodes and conditions in shops require various amounts of heat and varying temperatures, and these adjustments are obtained by an easily moved adjustment handle on the special transformer, together with taps arranged on the plugging board, the operation being similar to that of inserting a plug in a telephone switchboard.

The transformer develops an efficiency of between 80 and 90 per cent, considered as a piece of electrical apparatus. From 1½ to 2¼ kw.-hr. are required to deposit a pound of mild steel. A feature of the machine is its portability. In the largest 60 cycle type, the machine weighs about 200 lbs. Means are provided for two men to carry this apparatus to any location, set it up on a bench, or under the bench, or in any position relatively remote from the work.

## Can Be Operated from Any A. C. Circuit

The machine can be designed to operate from any-power supply. Any alternating voltage can be made use of, except that for the sake of safety it is not advisable to introduce in the shop any machine taking more than 650 volts in the primary. This lowering of the shop voltage is regular practice. The machine can be designed for single-phase, two-phase three wire, and two-phase four wire circuits, or to operate across the outside wires of a two-phase system or from a three-phase power supply. The polyphase machine is 30 per cent heavier than the single-phase machine; for welding, a power demand of from 3 to 4½ kw. is made with the polyphase machine, and for cutting, from 6 to 8 kw. There is, however, no necessity for buying a polyphase machine, which is heavier and costs more. In the case of two-phase circuits, absolutely balanced current can be drawn from each of the two phases by placing the single-phase machine across the outside wires.

The amount of copper required for the installation of this welder and cutter is comparatively small. The distribution

wiring is on the high-voltage side and requires only wires of nominal size. For instance, for a 400-volt shop, two No. 8 wires are sufficient to reach any welding location, and a simple plugging-in arrangement is used.

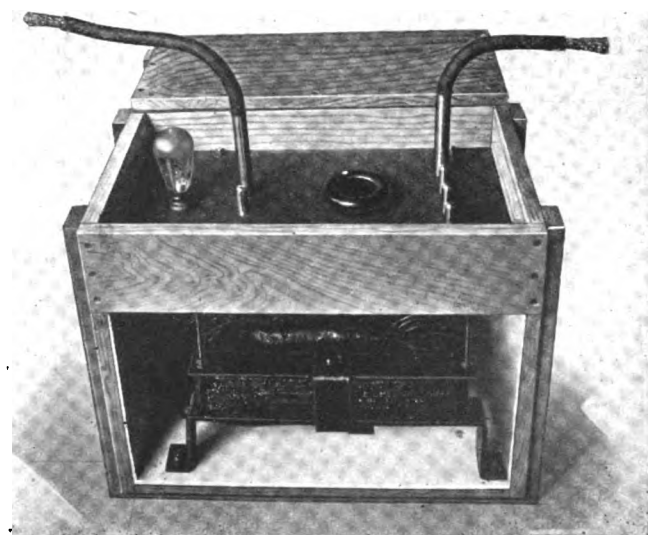
As regards penetrative ability, it is significant that the advent of the a.c. arc has resulted in the practical cutting of cast iron. This has always been considered an impossibility or at least impractical with other systems of cutting, as a layer of cementite would form between the weld and the original cast iron, which had a very low strength and was so hard that machining was impossible. The a.c. arc, owing to its penetration, causes a molecular penetration of from ¼ to ⅝ in. into the cast iron, distributing the weld and the cast iron so that there is no definite hard layer, except for the very outer edges, which can be ground off.

## Quality of the Weld

With certain electrodes it is possible to get ductility and elongation. While these qualities are not present to the same degree as in boiler plates, the ductility and elongation of mild steel can be equalled. With boiler plates test pieces can be welded which bend flat on themselves, the bend being in the weld, and which in the twisting test will twist two complete revolutions before tearing.

The machine can be made for either cutting or welding or both functions can be combined in one machine. It can be designed to use any make of electrode—bare wire, slag covered electrodes, gaseous fluxed electrodes, or carbon electrodes.

Among the uses to which the machine can be put are various operations in automobile construction and repair. An example of its use in automobile construction is the welding of the complete rear axle housing together with the axle tubes, these parts being put together without the use of rivets. A repair job to which the machine is applicable is the welding up of a cracked cylinder, and this should be done without stopping the engine running. The water up to the line of the leak is required to distribute local heat strains in welding, and this water should preferably be hot, so that the temperature difference between the arc and the water will not be so great, hence the advisability of keeping the engine running.



# Karry-Lode Industrial Trucks, Tractors and Trailers

Built to S. A. E. Standards Throughout—Employ Roller Pinion Type Internal Gear Drive and Are Provided with an Automatic Safety Switch

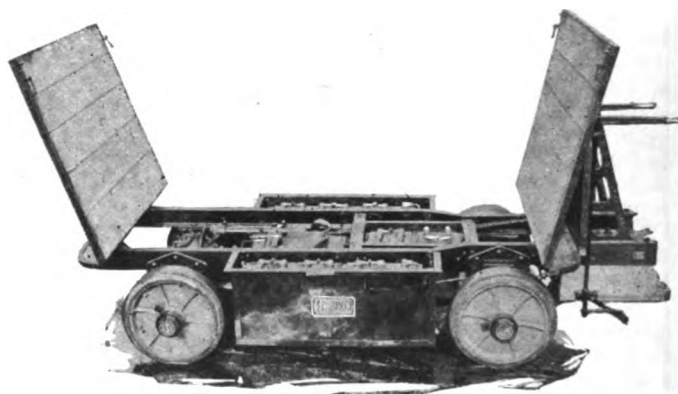
**T**HE Karry-Lode Industrial Truck Co., Long Island City, N. Y., has placed on the market a line of industrial trucks, tractors and trailers of the electric type for use on steamship piers, in railway yards and in industrial plants. Their line comprises one size of tractor developing a drawbar pull of 600 lb.; two platform trucks, one with a 60-in. wheelbase and 96 x 45-in. loading platform, and the other with an 80-in. wheelbase and a 116 x 45-in. loading platform; also a compensation crane truck, with a crane fitting into the standard freight car and having 180-degree swing, and a steel trailer with a 36 x 72-in. platform.

Before the design of the Karry-Lode line of industrial trucks and tractors was taken up, a thorough study was made of all machines of this type on the market at that time. Special attention was given to the requirements of strength, flexibility, simplicity, accessibility and reliability. The electric motor used on all models is of  $3\frac{1}{2}$  hp. capacity and is of a type specially designed for industrial trucks. It forms a unit with the entire electrical system, which makes for convenience in repair and overhauling. The frame is built up of 4-in. channel beam, the side members being securely tied together by cross members of ample section and reinforced by gusset plates. The battery box is so arranged that every cell of the battery is instantly accessible. The batteries are placed below the loading platform, where they are out of sight.

## Rear Axle of Internal Gear Type

The rear axle is of the internal gear type, the load being carried on a 2 $\frac{1}{4}$ -in. dead axle made of Shelby seamless tubing. The driving shafts are of solid nickel steel, and the wheels run on large sized Hyatt roller bearings. The front axle is also of tubular design and is provided with drop forged, heat treated steering knuckles. The wheels run on Hyatt roller bearings. Large sized steering connections are used throughout, and the joints are bushed so as to make it an easy matter to take up wear. Cast steel wheels are used, and the internal spur gear drive on the rear wheels is completely inclosed.

The Type P industrial truck has a capacity of 2 tons and a chassis weight of approximately 2200 lb. It is provided with a battery equipment of eighteen 11-plate Ironclad Exide cells, the battery alone weighing 800 lb. The motor operates



*Platform of truck swung back showing accessibility of battery*

at 30 volts and consumes a full load current at 40 amp. By means of the controller, three forward speeds and an equal number of reverse speeds are obtainable. The tread is 34 in. and 20-in. steel wheels are used with  $3\frac{1}{2}$ -in. solid rubber tires.

An external contracting brake acts on the propeller shaft. The frame is suspended on coil springs both in the front and rear. A speed range of from 1 to 7 m.p.h. is afforded and the rated mileage on level surface is 25 miles on one charge. The overall dimensions of this truck are 52 $\frac{1}{2}$  in. in width, 116 in. in length and 43 $\frac{1}{2}$  in. platform height.

There are no great differences from the above in the design of the type PL truck, which has a 116 x 45 in. loading platform and the same capacity as the Type P, namely, 2 ton. The chassis weight is 2450 lb. and it carries 20 cells instead of 18, the battery weight being 1000 lb. This machine has a wheelbase of 80 in., and its overall dimensions are as follows: Width, 52 $\frac{1}{2}$  in.; length, 136 in.; platform height, 23 $\frac{1}{2}$  in.

The battery and motor equipment of the tractor corresponds to that of the lighter of the two trucks. However, in order to make as much of the weight of the tractor as possible available for traction purposes, it is designed with three wheels, and most of the load of the battery is carried on the rear wheels. The total weight of the tractor is 2500 lb. and its wheelbase is 41 in. The tractor has a rated speed of 1 to 6 m.p.h. and a rated mileage on the level of 25 miles. Its overall dimensions are: Width, 48 in.; length, 69 $\frac{1}{2}$  in. Its drawbar pull is 600 lb.

A double reduction is obtained from the armature shaft to the rear wheels by a pair of bevel gears at the center of the rear axle and the internal gears and pinions at the wheels. The pinions meshing with the internal gears are of the roller type. They are located directly above the stationary load carrying axle. A Thermoid fabric universal joint is

inserted between the electric motor and the propeller shaft and the Bailey non-skid differential is fitted. As a safety device there is a switch which is operated by the driver's seat or footboard and in case the driver should be accidentally thrown from the truck, the latter would



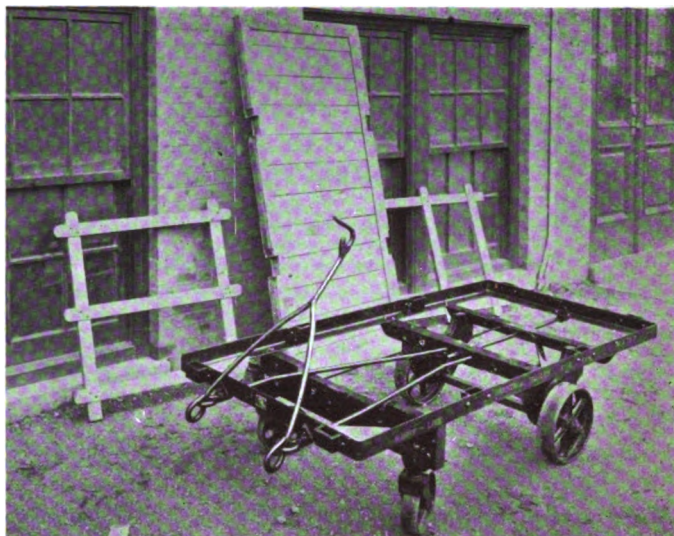
*Karry-Lode industrial tractor and truck*



automatically come to a stop. Further, if the driver gets into the truck again, he will have to start it over in the usual way by first going into the low speed and passing through the intermediate into the high. It would be injurious to the battery, and to the motor as well, if the controller remained in the high speed position and the current was switched on by the automatic switch. The entire control is effected by means of two levers extending forward from a pair of pedestals secured to the frame side members. The driver stands on the front platform and controls the truck with his two hands, steering by moving one lever in a horizontal plane and starting, varying the speed and braking by moving the other lever in a vertical plane. Motors and controller are of General Electric make.

A view of the trailer chassis is shown herewith. It is of the four-wheel type, having two caster wheels at the forward end and two cast steel wheels on the axle stubs at the rear end.

The frame itself is made of angle steel, reinforced by gusset plates at the corners, and sockets for stakes are riveted to the inside of the frame members. The trailers can be very quickly hooked together, and unhooked, and in some places women have been employed for this work. Women are also used for driving the trucks and tractors.



Karry-Lode trailer with platform and stakes removed

## Official Test of Tire Pumps

A TEST has been made at the testing laboratory of the Automobile Club of America, New York, of the Cassco power tire pump, manufactured by the West Side Foundry Co., Troy, N. Y., and sold by the Edward A. Cassidy Co., New York City. The test bore mainly on the time required for inflating different sized tires to certain definite pressures, and on the power required for operating the pump.

The Cassco pump has a single cylinder. Cylinder and crank case are of cast iron. The three pumps which were tested were provided with a single piston ring of cast iron. The cylinder and crank case are in two parts with a fiber gasket placed between them. The valves were of the poppet type. During the test the pumps were lubricated with 300 W transmission oil. The pumps were 2½ in. bore and had a stroke of 15/16 in.

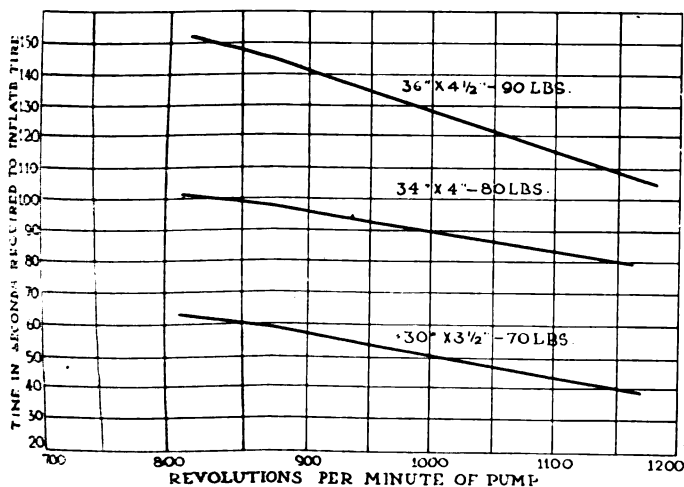
In the test the gear and gear shaft were dispensed with. The crank shaft of the pump was directly connected to an electric dynamometer operating as a motor by means of a flexible coupling. A piece of ¼-in. copper tubing, approximately 10 ft. long, was connected between the discharge valve of the pump and an Ashcroft test gage. A three way cock was placed between the end of the tubing and the gage. A piece of rubber tubing 24 in. long was placed between the gage and the Schrader tire air inlet. The valve portion of the Schrader tire valve was removed from the metal inlet, in order to allow the full air pressure in the tire to be recorded in the gage. This necessitated the pump not only filling the tire to the required pressure but also filling the

hose and large gage to the same pressure, therefore giving the pressure in the tire as shown on the gage less than what the pump actually delivered. To overcome the pulsation of the air in the gage a stopcock which was kept partially closed was placed between the main air line and the gage. As a result the gage needle did not vibrate and a more accurate reading could be obtained.

The pressure to which the tires were inflated was 20 pounds per inch of cross-section. The speed of the pump was determined by a Veeder odometer counter and the time by a split second stop watch. The results of the test are recorded graphically in the curve sheet. The manufacturer guarantees that the pumps used in the test were taken from stock and no changes were made in their construction, except that the top of the outlet valve was shortened 1/16 of an inch on all three pumps.

The results indicate that a Cassco tire pump operated under the conditions mentioned above will be able to inflate a 30 x 3½ tire in from 43 seconds to 1 minute and 3 seconds, according to the speed at which it is driven between the limits of 823 and 1138 r.p.m. A 34 x 4 tire will require 1 minute and 20 seconds to 1 minute and 41 seconds between the speed limits of 821 and 1152 revolutions per minute. The inflation time of the third tire (36 x 4½) varied between 1 minute and 45 seconds to 2 minutes and 30 seconds when running the pump between speeds of 828 and 1165 revolutions per minute.

Horsepower determinations were made while inflating a 30 x 3½ inch tire and the power consumption was found to be 0.20 hp. at 800 r.p.m.; 0.27 hp. at 900 r.p.m.; 0.35 hp. at 1000 r.p.m. and 0.44 hp. at 1100 r.p.m. It is stated, however, that no great degree of accuracy can be claimed for these figures, as the power consumed is so small in comparison with the size of the dynamometer.

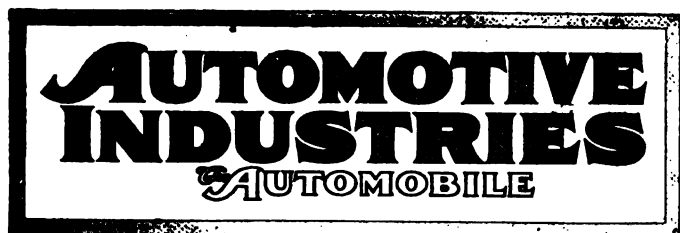


Time required to inflate tires

## Canadian Registrations

AS illustrating the ratio of increase in the registration of motor vehicles of all kinds in Ontario, the past year shows a total of 83,799 passenger and commercial cars as against 54,375 in the previous year, an increase for the 12 mos. of more than 50 per cent.

Motor cars were first licensed in Ontario in 1903, when 220 vehicles were registered. Up to and including 1917, the registration advanced to 83,799 vehicles, and Canadians prominent in automobile affairs say that despite the war and its burden the close of the present year will see the 100,000 total far exceeded. In 1903 when motor cars were first licensed in Ontario, not one was owned by a farmer. To-day the farmer car owners of Ontario number 23,409.



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## Super-Induction and Variable Pitch Propellers

VARIOUS suggestions have been made to overcome the effect of the loss of power of an aircraft engine at high altitudes, especially on the lift of the machine. It is mainly to secure a means of counteracting this effect that the Aircraft Board is looking for a variable pitch propeller. The production of such a propeller obviously involves serious mechanical difficulties, and it is doubtful whether these could be eliminated during the period of war.

What is desired chiefly in high altitudes is increased lift. The drift or propulsive effort in the direction of flight, of course, is reduced in the same proportion, but inasmuch as the air resistance also decreases with the density of the atmosphere this does not affect the speed of the plane.

It has been suggested that the loss of lift with increase in altitude could be overcome by using super-induction, employing perhaps an automa-

tic arrangement whereby the pressure at the carburetor inlet could be maintained substantially constant. This alone, however, would not solve the problem, for if the propeller were designed to absorb the maximum power of the engine at the speed corresponding to that power and when operating in air at normal atmospheric density, at an altitude of 20,000 ft., where the atmospheric pressure is down about 50 per cent, it would absorb only 50 per cent of the engine power. The result would be that the engine would increase in speed until its power output would equal the increasing power absorption of the propeller. Inasmuch as the power absorption of a propeller varies as the cube of its speed, there would not be such a very great difference between engine speed near the earth and engine speed at 20,000 ft. altitude. But if the engine and propeller are to be operated near their maximum safe speed in low altitudes, for the sake of maximum plane speed this increase in engine speed of high altitudes is not permissible.

Consequently super-induction will not obviate the need for a variable pitch propeller, but combined with such a propeller it promises to give results in respect to plane speed and lift at high altitudes which are not obtainable with present constructions.

## Some Things That Have Hurt

WITHIN the recollection even of some of the newcomers into the ranks of the automobile industry there was staged with much pseudo-pomp and more press-agenting at a national show in Grand Central Palace, New York, a champagne-christening of a highly colored and gaudily decorated representative model of a new make of automobile. This display of bad taste and worse business judgment did not, of course, indicate, except by contrast, the standards of the more substantial and conservative portion of the industry. But it affected every one in the industry to an extent which it is hard to measure.

It was, it is true, an exceptionally aggravated case of misconceived and badly directed advertising effort; but, unfortunately, it was not so much of an exception or so radically different from the general selling methods of the day as it might well have been. And it can also be truly said that in a milder form and in varying extent this same disease has been more or less prevalent among us from year to year.

At all recent shows we have seen too much of the nickel-plated chassis trimmed with satin ribbons, and the silver-plated car with black and yellow striped upholstery made, according to the exhibiting company's ambitious publicity manager, to the special order of some well-known moving picture star or the wasteful daughter of a thrifty millionaire not long deceased.

We have had too many "society days," with doubled prices of admission and their resulting umns of newspaper comment on the attendance and purchase of cars by those whose chief claim to fame lies in the fact that their names are to be in the social register.

Our show decorations have been too elaborate. There has been too much of the theatrical in our show methods and show advertising. The automobile industry is paying for it all now.

We thought it was good salesmanship, modern merchandising and, to be perfectly fair, if the world had not gone to war we should probably still think so. It has developed, however, that many of these things, of which we all approved at the time, have actually worked an injury upon us which, when the real merits of the automobile are considered, is wholly undeserved.

There is evidence to be had from many sources

that our future shows are to be very different in certain ways from those of past years. It has been suggested that we start to reform by calling them expositions, which they are, instead of shows, which they are not. It is a good beginning. Let us modify our decorative schemes. Let us exclude the gaudy, freakish cars and exhibit the chassis as they are in real life. Let us make our expositions business shows, and emphasize utility and practical value without slopping over in trying to do so. We can't fix up the past—it has many times been given up as a hopeless job—but we can build on more solid ground as we build for the future.

## Lessons Learned from a 100-Hour Tractor Test

ONE of the most interesting and instructive features of the attempted 100-hour non-stop test of the Parrett tractor at Salina, Kan., was the demonstration which it afforded of the feasibility of night plowing. Equipped with two powerful acetylene headlights, the tractor worked at night with the same ease as in the day. A great deal of interest was manifested in this night work and it is to be regretted that the official report does not contain a special record of the fuel consumption as compared with that of the daylight operation. It would also be instructive to compare the plowing speed at night with the daytime speed.

The ability to work at night is one of the most valuable features of the tractor. It not only increases the farmer's working day but enables him, in certain localities when the heat of mid-day is oppressive, to do his plowing at a time when both he and the machine can work more efficiently.

It seems likely that when the next tractor demonstration takes place, there will be many non-engine-stop plowing tests. They seem to be more convincing to the farmer than any other sort of demonstration. Many dealers handling tractors have been

asked by farmer prospective purchasers to give them a 10-hour continuous plowing demonstration. They are apparently convinced that if the tractor will work successfully during so long a period it will meet all of their requirements.

The test of the Parrett tractor would have been made more valuable if those conducting it had taken account of the kerosene consumption during the 13 hours and 28 min. when the engine was running idle at 360 r.p.m.

The average of 2.4 m.p.h. for 80 hours made by the Parrett tractor in the test is quite remarkable, but even this does not, in all probability, represent what the average performance is likely to be soon.

It seems reasonable to expect that speeds of from 3 to 3½ m.p.h. for similar periods will be demonstrated within the next year. Speeds as high as this were made with good economy and good plowing in the fuel economy test which formed a part of the demonstrations at Salina.

Everything seems to indicate that with redesigned plows, it will be possible to do as good or better work at double and perhaps three times the speed with tractors as is now done with horses.

## Motor-Propelled Cultivators

PRACTICALLY none of our present agricultural tractors are adapted for operating cultivators for cultivating corn and similar crops. As cultivation is of equal importance to plowing, and as a farmer cannot dispense with his horses unless he can cultivate as well as plow with his tractor, it is rather remarkable that no more attention has been paid to the motor cultivator. In one respect there is more need for substituting motor power for horse power in cultivating than in plowing, because most of the former has to be done in midsummer when horses suffer greatly from the heat.

Probably the proneness of people to follow the path of least resistance furnishes the explanation why so many engineers have developed plowing tractors and so few motor cultivators, for the design of a practical cultivator involves some decidedly knotty problems. The tractor must afford sufficient ground clearance midway between its wheels so as to be able to straddle the row without injuring

it at the last plowing. As the cultivator requires comparatively little draft, the tractor must be made light, else more power will be required to move the tractor itself than to pull the cultivator, and the efficiency will be low. Where so little power is required it seems hardly warranted to employ four cylinders in the engine, but with a smaller number it is difficult to secure a tolerable degree of balance.

In order to prevent covering up the small plants at the first plowing the driver must hold the handles of the cultivator, and therefore must ride behind it. This would point to a two-wheeled tractor with a two-wheeled sulky attached behind as the most logical construction.

In view of the light draft of a cultivator an engine developing about 8 hp. on the brake would seem to be amply powerful. The type of engine most suitable, its arrangement on the frame, the driving connection to the traction wheels and the method of steering still await solution.



# □ Latest News of the

## Plan Department of Aeronautics

### Senator New Introduces Bill Creating Secretary of Aeronautics at \$12,000

WASHINGTON, Aug. 2—The establishment of a Department of Aeronautics under the direction of a Cabinet officer, to be known as the Secretary of Aeronautics, is proposed in a bill offered to the Senate by Senator Harry New of Indiana.

The Secretary of Aeronautics would be similar to the Minister for Aeronautics as established in England. He would have authority over all the aircraft activities of the Government, direct and complete control of all matters pertaining to the design, purchase or manufacture of aircraft and aircraft equipment intended for the use of the Army, Navy or Marine Corps. The Cabinet member would be appointed by the President, confirmed by the Senate, and would receive a salary of \$12,000 a year.

The introduction of Senator New's bill is the result of the recent agitation for the creation of a department to assume complete control of the aircraft situation. It is reported that both Secretary of War Newton D. Baker and Secretary of the Navy Josephus Daniels are opposed to disturbing the present management of the aircraft problem.

The text of Senator New's bill follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled:

Section 1. That there is hereby created for the period of the present war, and for one year thereafter, an Executive Department of Aeronautics, the head of which shall be designated the Secretary of Aeronautics, who shall be appointed by the President and confirmed by the Senate. He shall be a member of the Cabinet and shall receive a salary of \$12,000 a year. The Secretary of Aeronautics shall have direct and complete control of all matters pertaining to the designing, purchase, manufacture and production of aircraft and aircraft equipment intended for the use of the Army, the Navy and the Marine Corps of the United States.

Section 2. The department shall also have an Assistant Secretary who shall be appointed by the President and confirmed by the Senate, who shall receive a salary of \$5,000 a year; and such other officers and employees as may be found necessary for the proper and efficient transaction of the business of the department.

Section 3. The unexpended balance of such appropriations as may have hitherto been made for the purchase and manufacture of aircraft and aircraft equipment and all appropriations which may hereafter be made for such purpose shall be available for the purposes of the department.

In introducing the bill Senator New explained: "I am satisfied that this is the best solution of the aircraft difficulties. It is based upon conclusions reached as a result of 3 months of careful investigation. It is in accord with the opinion expressed by practically all the officers we have examined, as well as the present and former officers of the aircraft management."

"England had to come to it long ago. I do not believe that it will ever be possible to bring about the highest efficiency necessary to the production of the great number of planes we need to win the war as long as there is divided authority, and there is no getting away from the fact that there still is divided authority in the handling of our aircraft program."

"I have become convinced that it is almost impossible to bring two great departments into co-ordination."

The Senate Aircraft Committee has practically completed its investigations. The report will be filed in the Senate shortly after Congress resumes its sessions. Four hundred Liberty engines were produced in July, and it is estimated that 500 will be turned out this month, according to a statement by John D. Ryan. The peak of production, he said, would probably be reached in November or December. Orders have been placed for 50,000 Liberty engines, 27,500 of which will be turned over to the Allied government.

### For Standard Petroleum Specifications

WASHINGTON, Aug. 6—Specifications of petroleum and its products, used by the different departments and bureaus of the Government, will be standardized. The plan is to have standard grades of petroleum and its products for the purpose of avoiding duplication of effort, and for economical reasons.

Standardization will be accomplished by a Committee on Standardization of Petroleum Specifications to be composed of a chairman appointed by the United States Fuel Administrator, a member appointed by the Secretary of War, a member to be appointed by the Secretary of the Navy, a member to be appointed by the chairman of the Shipping Board, a member to be appointed by the Railroad Administration, a member to be appointed by the Bureau of Mines and a member to be appointed by the Bureau of Standards.

The specifications adopted will be binding upon and govern all departments, bureaus, agencies and offices of the Government. The United States Fuel Administrator, acting through the committee, will also effect a standardization of petroleum specifications for the purchases in the United States of the allied governments.

## Bar Profiteering in Farm Implements

### Makers and Dealers Must Replace Stocks—Take Action to Prevent Hoarding

WASHINGTON, Aug. 6—Manufacturers, wholesalers, retailers or other dealers having a regular stock of farm equipment including tractors or tractor plows and who sell these out at replacement value during rising prices without replacing or intending to replace the stock and sell at replacement values when prices are falling, will be considered profiteers according to a statement made to-day by the Office of Farm Equipment Control of the U. S. Department of Agriculture.

Farm equipment held, contracted for, or arranged for, by manufacturers, wholesalers, retailers or other dealers in excess of the reasonable requirements of the business, for use or sale in a reasonable time will constitute hoarding.

The prices of farm equipment are more or less seasonal, but if the price should rise or fall during the season, then, to be consistent, a person who wishes to sell on the basis of replacement values would be obliged to sell at a loss if the price fell. Equipment carried over from one season to another—that is, the residual from a previous season's reasonable supply—should be considered in the same manner. Therefore, if persons have sold at replacement values, they must continue to do so when a drop in prices comes, and carry the same amount of stock as in the beginning throughout the period of the high prices in order not to profiteer.

In short, says the statement, it will not be considered profiteering if farm equipment is sold on the basis of replacement prices, provided the goods sold are replaced at once at replacement prices and this practice is continued during the period of high prices caused by the war.

It will be considered hoarding if any manufacturer, wholesaler, retailer, or other dealer, holds, contracts for, or arranges for a quantity of farm equipment in excess of the reasonable requirements of his business for sale by him over a reasonable time. Manufacturers, wholesalers, retailers, and other dealers finding themselves inadvertently in this position should sell at cost plus a fair usual profit.

### Start Hupp Industrial Wagon Production

DETROIT, Aug. 7—The Hupmobile "Industrial Wagon," which will have a rated capacity of 1000 lbs., will be put in production within the next 2 weeks, and it is expected that the vehicles will be ready for the market early in September. The vehicle will be mounted on the standard Hupmobile chassis and the body will be convertible into various types. No price has been decided on.

# Automotive Industries □

## Car Makers Unanimously Agree on 50% Cut in Production

National Automobile Chamber of Commerce Votes to Limit  
Output to Half That of Last Year—War Industries  
Board Sub-Committee Appointed

WASHINGTON, Aug. 8.—Eighty members of the National Automobile Chamber of Commerce met in Detroit Tuesday, Aug. 6, and voted unanimously in favor of a 50 per cent curtailment of passenger car manufacture. This means a 50 per cent reduction of the production of last year.

The meeting and the curtailment resolution were the direct result of a conference early in July in Washington between Hugh Chalmers and Alfred Reeves, representing the automobile industries, and the War Industries Board. At that meeting Bernard M. Baruch, chairman of the War Industries Board, suggested that the passenger car makers get together and determine what they thought would be a safe maximum curtailment. Mr. Baruch at that time made mention of a possible 75 per cent cut, but did not stipulate this figure.

In voting for a 50 per cent curtailment manufacturers reached what they believed is the largest cut in production compatible with industrial conditions. They believe that by cutting production 50 per cent, combined with the war work they have taken on, they will just be able to retain their organizations and operate their businesses efficiently to maintain them through the present emergency.

At the last meeting with the War Industries Board Mr. Chalmers pointed out the harmful effect of a considerable curtailment, telling that ruin would be brought to the state of Michigan and other passenger car manufacturing centers if a drastic curtailment were insisted upon.

Mr. Chalmers and Mr. Reeves arrived in Washington to-day and will immediately hold a conference with the War Industries Board.

Mr. Chalmers, Mr. Reeves and Charles C. Hanch of the Automobile Section of the War Industries Board conferred with J. Leonard Replogle and Mr. Baruch and presented to them the resolution together with a pledge from the manufacturers. No further discussion regarding curtailment was undertaken.

A sub-committee of the War Industries Board has been appointed consisting of Alexander Legg, chairman of the Requirements Division; Judge Edwin B. Parker, chief of Priorities; George N. Peek, director of Finished Products, and J. L. Replogle, director of the Steel Sec-

tion. This committee will confer further with Chalmers with regard to curtailment for the future.

### Car Production Reduced

DETROIT, Aug. 6.—The most marked change in this territory in the passenger car manufacturing field is the gradual reduction of production. As recently reported in AUTOMOTIVE INDUSTRIES, many manufacturers are nearing the 25 per cent line of production—some have already arrived at this figure.

Whether this output will be reduced still further is a matter of conjecture, and manufacturers are very reticent about making any prophecies regarding the future. They will continue production up to the limit of their ability to secure materials, many feeling optimistic about the situation and believing relief of the great strain under which they are laboring is close at hand.

Production of Willys-Overland, Inc., averages 400 daily; that of the Paige is 35; Reo has reduced its production 50 per cent compared with a month ago; it is now 40 cars per day, while the output of the speed wagon is 25 daily; Buick's production is in the neighborhood of 175 daily; Chalmers 50; Harroun is reported at 10; King averages also 10; Liberty produces 7, and Scripps-Booth 40. Ford passenger cars come out at the rate of 350 a day and the trucks at 400. Packard, Hupp, Briscoe and Columbia production figures are the same as reported a month ago,

### Copper Price Set at 26 Cents

WASHINGTON, Aug. 8.—The maximum price of copper will remain 26 cents per lb. until Nov. 1 through an agreement reached to-day between the Price Fixing Committee of the War Industries Board and the copper producers. This price is subject to approval by President Wilson.

### War Profits Tax In Controversy

WASHINGTON, Aug. 7.—A controversy between the Treasury Department and the Ways and Means Committee has developed as to the most effective method of taxing war profits. The Treasury asks for:

A straight tax of 80 per cent on all war profits and as an alternative the excess

profits tax left just as it is in the existing law which is from 20 to 60 per cent.

The Ways and Means Committee desires:

An excess profits tax running from 30 to 50 and 80 per cent on the net income of corporations. It is willing to provide as an alternative a war profits tax of 80 per cent so that the Treasury could exercise its option and apply the tax which would produce the most revenue.

Arguments by experts of the Treasury Department failed to move the Ways and Means Committee yesterday. Chairman Kitchin and others of the committee contended that large corporations would not pay a sufficient tax on non-war products and activities if the present excess profits tax is allowed to remain. It was stated that Henry Ford and other large passenger car manufacturers would "get off too easily."

Chairman Kitchin stated that \$200,000,000 would be lost by the Treasury plan. The Treasury Department contends that the Ways and Means Committee plans would cost the nation far more by driving out of business those corporations whose profits are only indirectly or not at all due to the war.

The following two examples were given by Mr. Kitchin to show how the two systems would work:

Take a \$100,000 corporation which made \$6000 before the war and now makes \$25,000. Under the Treasury's plan the corporation would be taxed \$15,200 while under the existing excess profits rates it would be taxed \$4400.

Another \$100,000 corporation which made \$25,000 before the war and is making \$25,000 now would pay nothing under the Treasury's war profits tax and would be taxed only \$4400 the same as the other corporation.

In other words the corporation which has for years enjoyed a steady income of \$25,000 would pay only \$4400 and the other which has a sudden increase due to the war will pay more than \$15,000. The committee's schedule of excess profits taxes would compel the second corporation to pay at least \$8000 instead of \$4400. We would equalize the burden at least to that extent.

### Cleveland Tractor to Be Made in Great Britain

LONDON, July 22—It is announced that the H. G. Burford Company, which formerly sold the Burford truck and has been handling the Cleveland tractor in Great Britain, has secured from the British Government a license to manufacture the Cleveland tractor in that country. It is said that 250 of them are being built and will be ready for delivery in September.

### War Revenue Tax Nets \$23,981,000

WASHINGTON, Aug. 7.—Automobile and motorcycle manufacturers and dealers paid into the Treasury Department \$23,981,000 under the war revenue bill for the year ended June 30, 1918, according to a statement issued yesterday by the Treasury Department.

## June Exports 28% Over May

But Show a Decided Drop  
from the Figures of a  
Year Ago

1918				
Cars	Value	Tr'ks	Value	Parts
June..3,098	\$2,808,463	829	\$2,001,488	\$3,195,353
May..2,801	2,907,390	866	1,958,603	2,859,496
1917				
June..7,582	5,712,677	1,245	2,965,254	2,902,862

WASHINGTON, Aug. 5—Exports of passenger cars, trucks and parts during June amounted to \$9,904,768. This is a gain of 28 per cent on the figures for May, but represents a loss of 30 per cent when compared with the exports for June, 1917. There is but little difference in the number of passenger cars shipped as between May and June, 1918, the totals being 2801 and 3098 respectively, whereas in June, 1917, 7582 cars were exported. The month's car exports of a year ago were valued at more than double the amount for June, 1918.

Commercial car exports for June show a slight decrease in number as compared with May, although their value is slightly higher. In June, 1917, when 1245 trucks, valued at \$2,965,254, were exported both number and value were approximately 50 per cent higher than during the same month this year.

The fact that only one airplane was exported during June indicates very clearly that planes for military use are not included in the published export figures. Airplane parts show a big increase from the figure of \$771,673 in May to \$1,-

609,503 in June, 1918. The total for June, 1917, was \$501,473 and the complete total for the twelve months ending June, 1918, was \$8,446,077 as against \$3,133,903 for the previous year.

Canada continues as the leading buyer of passenger cars and it is of interest to observe the relatively big figures representing Chile's purchases which tend to indicate that full use is being made of the return trips of nitrate ships to that country. France and the United Kingdom are the leading buyers of commercial cars, although Canada is a steady customer. The year's figures covering the export of tractor and creeper type engines show a great increase in comparison with the 1917 totals.

### Coal Committee Postpones Trip

DETROIT, Aug. 1—Due to Fuel Administrator Garfield's absence from Washington at this time the delegation of business men that was to see him regarding Detroit's supply of anthracite has been postponed for 2 weeks. The primary object of this committee is to lay before the fuel administrator the true condition of the fuel situation in Detroit with a plea that more anthracite be sent here. Unless more coal can be secured for this territory a great many Detroit homes of workers will be heatless this winter, which would probably result in a shortage of workmen.

### Patent Rights for Bevel-Edge Granted

DETROIT, Aug. 5—Joseph H. Bourgon, body engineer of the Studebaker Corp., was granted patent rights covering the use of a bevel-edge around the top of an automobile. The bevel-edge is one of the most outstanding features of the new series 19 Studebaker.

## Tractors Are Wanted in Mexico

250 Imported Recently; More  
Wanted—Government Is  
Paying for Them

LAREDO, TEX., Aug. 3—Information in regard to the revival of various lines of industry in Mexico is brought here by C. J. Boothroyd, general agent of the Constitutionalist Railways of Mexico, formerly called the National Railways of Mexico. Mr. Boothroyd makes his headquarters in the City of Mexico and has recently traveled extensively over that country. He says that special efforts are being directed by the Carranza government toward introducing modern American methods of agriculture upon the larger plantations.

One of the important steps in this direction has been the recent importation of 250 farm tractors from the United States. These tractors have been distributed among farmers of different sections and are now employed in breaking land and in other farm operations. The cost of these machines was borne by the government.

More than 100 additional tractors have been ordered and will likewise be distributed among the more progressive plantation owners as soon as they are received in this country. It is claimed that special advantages are offered for the use of tractors in agricultural work in Mexico on account of the large size of most of the cultivated tracts of land. In the Laguna district around Torreon, where an average annual yield of about

### Exports of Automotive Equipment for June and Twelve Previous Months

	Month of June				Twelve Months Ending June, 1918			
	1918		1917		1918		1917	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	1	\$3,500	78	\$450,895	20	\$206,420	135	\$1,001,542
Airplane parts		1,609,503		501,473		8,446,077		3,133,903
Commercial cars	829	2,001,488	1,245	2,965,254	12,199	31,845,828	15,977	42,343,502
Motorcycles	176	286,461	1,693	357,617	10,746	2,373,396	16,609	3,404,716
Passenger cars	3,098	2,808,463	7,582	5,712,677	52,308	45,327,671	64,808	48,612,632
Parts, not including engines and tires		3,195,353		2,902,862		32,933,006		27,420,913
Total		\$9,904,768		\$12,890,778		\$121,132,398		\$125,917,208
ENGINES								
Automobile gas	2,374	\$253,894	1,908	\$236,167	35,846	\$4,134,142	23,375	\$2,817,921
Marine gas	240	139,029	1,456	357,499	7,223	2,596,166	7,815	2,208,114
Stationary gas	1,912	206,341	3,322	452,581	27,475	3,121,532	32,002	3,319,393
Tractor and creeper type gas	1,189	1,528,658	1,175	1,719,007	23,306	23,665,323	7,985	10,540,639
Total Engines		\$2,127,922		\$2,665,254		\$33,517,163		\$18,886,067
EXPORT BY COUNTRIES JUNE, 1918								
	Passenger Cars		Trucks		Passenger Cars		Trucks	
Argentina	233	\$275,211			3,525	\$2,666,898		
Australia	304	260,275			4,307	3,410,557		
British India	14	13,450			73	53,428		
British South Africa	224	183,654			2,142	1,700,136		
Canada	478	435,522	107	134,137	12,981	10,186,170	1,108	\$1,381,542
Chile	299	362,054			3,399	3,576,571		
Cuba	177	210,642			2,961	3,029,813		
Denmark					2	4,100		
Dutch East Indies					73	53,428		
France	185	98,331	261	945,726	1,169	1,518,858	2,754	10,001,626
New Zealand					1,682	1,342,720		
Norway	5	18,444			97	115,810		
Philippine Islands	55	33,932			1,714	1,373,204		
Russia in Europe					492	1,136,400	406	1,562,303
Russia in Asia					5	8,425		
United Kingdom			205	456,757	892	1,929,677	5,202	14,642,309
Other Countries	988	788,357	256	464,868	15,459	11,855,573	2,679	4,258,048
Totals	2,962	\$2,679,872	829	\$2,001,488	50,973	\$43,961,768	12,149	\$31,845,828



100,000 bales of cotton is obtained, tractors have been in use for several years upon some of the plantations. They have proved highly successful.

Before Germany began the present war, practically all of the farm machinery and equipment, including tractors, in use in Mexico came from that country. This was due almost altogether to the fact that the hardware and farm implement and machinery business of Mexico was in the control of Germans. In nearly every town and city of any consequence in the country there were establishments of this kind owned by Germans. They patronized manufacturers in Germany exclusively and as a result nearly all of the farm implements and machinery up to the beginning of the war were of a German pattern.

There promises to be a rapid and large development of this character of trade with the United States. One cause is that German dealers in Mexico have been placed upon the black list by the American government under the Trading With the Enemy Act. All trade relations, of course, with Germany have been cut off, and now that they are unable to obtain stocks from the United States they are practically excluded from further doing business. Many new firms have entered the hardware and farm implement and machinery business in Mexico during the last several months. In most instances they are composed of either Americans or Mexicans. The new concerns are showing a progressive spirit in the matter of building up business, and it is believed that the Germans will find it difficult to recover the trade which they have already lost in Mexico.

#### New Return Loads Bureaus for New England

PROVIDENCE, R. I., Aug. 3.—Plans for a system of Return Loads Bureaus throughout New England were further advanced following a meeting held here on Thursday, which was attended by representatives from all the states in this group. F. W. Aldrich, who is chairman of the Rhode Island Commercial Economy Board, presided. Stoughton Bell, representing the Boston Chamber of Commerce, reported that his organization had decided to inaugurate a bureau, following the report of a committee which investigated and favored the plan. He stated that \$4,000 has been pledged to carry the work along for 6 months, after which it may be self-supporting or nearly so from fees received from those utilizing the bureau. Massachusetts state officials are in hearty co-operation with the plan, and the committee on Public Safety has pledged \$1,500 toward the expenses of the bureau, and has placed at its disposal all the facts and figures gathered by Francis Hurtubis, Jr., chairman of its motor car and truck division, on vehicles and highways in the state following a 6 months' investigation. The Chamber of Commerce will put up \$1,000 and the motor truck dealers have pledged another \$1,000. The remaining \$500 has been raised from teaming and manufacturing interests.

## Another Increase in Gasoline Output

More Than 10 Million Gal. a Day Produced During May—Crude Output Also Greater

Production		
	May, 1918	April, 1918
Crude oil (bbl.).....	28,510,698	26,201,554
Gasoline (gal.).....	319,391,202	293,396,160
Stocks on Hand		
	May 31, 1918	April 30, 1918
Crude oil (bbl.).....	11,824,633	12,600,062
Oil purchased to be re-run (bbl.).....	872,300	954,205
Gasoline (gal.).....	460,637,479	509,197,134
Kerosene (gal.).....	348,311,945	393,527,476
Gas and fuel (gal.).....	516,020,224	471,644,479
Lube (gal.).....	161,009,729	144,383,212
Wax (lb.).....	168,178,328	151,228,317
Coke (ton).....	15,583	13,109
Asphalt (ton).....	104,214	101,328
Miscellaneous (gal.).....	317,115,697	248,260,551

WASHINGTON, Aug. 5.—During May, 1918, the average daily production of gasoline was 10,302,942 gal., which was an increase of 523,070 gal. per day over the production of April. The total production for the month of May was 319,391,202 gal.

The stock of gasoline on hand, according to figures just issued by the Bureau of Mines, was, on the last day of May, 1918, 460,637,479 gal., which is less than was on hand on April 30, the figures for the latter date being 509,197,134 gal.

The production of crude oil in May totaled 28,510,698 bbls. for the month, which gives a daily average of 919,700 bbls. The stock of crude on hand on May 31 was 11,824,633 bbls. as against 12,600,062 bbls. for April 30.

The accompanying tables show the production of crude oil and gasoline for May as compared with April, and the stocks on hand of crude oil and its derivatives as of the last day of each of these two months.

#### Export Regulations Modified

WASHINGTON, Aug. 2.—A simplified procedure has been adopted for exports to the United Kingdom, France, Italy or Belgium, excluding their colonies, possessions and protectorates, and for goods destined to any colony by way of these countries excepting shipments to Switzerland by way of France or Italy.

After Aug. 12, 1918, applications for licenses to export any commodity to the above named countries will be refused if the applicant subsequent to that date and prior to the issuance of the license applied for shall purchase or otherwise acquire or commence to manufacture or produce or fit the articles specified in the application for the fulfillment of a specific export order. New forms have been devised by the War Trade Board, which will be given to shippers upon application to meet the new rulings. Applications for licenses to export to France must have attached thereto a copy of the French Government Attestation. Applications filled in the proper forms and mailed to the War Trade

Board will be referred by the board to the war mission of the allied country for which the shipment is intended. Export licenses under the new procedure will be valid 90 days, with extensions allowed for unusual cases.

#### The Government's Purchases of Motorcycles and Trucks

WASHINGTON, Aug. 2.—Twenty-seven thousand and five motorcycles and 25,874 side cars for motorcycles were purchased by the Motor Transport Service of the Quartermaster Corps from April 8, 1917, to July 1, 1918. This includes all the purchases made by the original Motor Transport Section which was under Brig.-Gen. Chauncy D. Baker and Christian Girl. During the same period 8809 motor truck ambulances were purchased.

On July 1 reports showed 4308 motor trucks of less than 1-ton capacity, 5703 1½-ton trucks, 7987 3 to 5-ton trucks and 3420 passenger cars overseas.

Prospective deliveries of motor trucks for July were 4797, for August 4355 and for September 4448.

#### Supplementary Priorities Issued

WASHINGTON, Aug. 1.—Supplementary to the recently announced priority regulations, the War Industries Board has given class B-4 priority to the maintenance of jobbers stocks of plates, sheets, bars, shapes, tubular products, wire and wire products, heavy hardware, farm implements, oil well supplies and similar products.

Class A-6 priority has been allowed for the operation and maintenance (not new construction expansion or replacement) of coke oven plants, smelters, furnaces, rolling mills, wire drawing mills, pipe and tool mills employed in the production of fuels, metals and metal products.

Class C priority has been allowed for materials, equipment or supplies for the maintenance of existing equipment, for the supply of light, heat, power and sanitation; the necessary supplies and essential repairs (not expansions or replacements) to existing buildings and manufacturing plants; the operation of machine shops and blacksmith shops; nails, screws, bolts and nuts used for any purpose.

#### For Fixed Price Contracts

WASHINGTON, Aug. 3.—Fixed price contracts will be used hereafter whenever possible in the purchase of supplies for the War Department. In exceptional cases, only where it is clearly to the advantage of the Government, a cost plus contract will be used. This will be a cost plus fixed compensation rather than a cost plus percentage contract. These decisions were made to-day by the Superior Board of Review of the General Staff. Decisions on contracts will not be left to individuals. All cost plus contracts will first be reviewed and approved by the particular supply bureau's board of review and must first be approved by the Superior Board of Review.

## Francis E. Stanley Is Dead

### Steam Car Pioneer Succumbs to Injuries Received in Automobile Accident

NEWTON, MASS., Aug. 1—Francis E. Stanley, one of the Stanley brothers of Newton, Mass., famous pioneers of the carriage industry, died as a result of an automobile accident near Ipswich, Mass., on July 31. Mr. Stanley was returning from a trip through Maine, and was in the car alone at the time.

Where the accident occurred the road is high crowned, and Stanley is reported to have driven at a considerable speed. The car slewed and overturned, and Stanley was pinned beneath it. Help was soon at hand and the injured man was rushed to the hospital at Beverly, but he died on the way.

The mention of Stanley's name carries with it memories of the early days of the automobile history. The Stanleys originally came from Maine, having been born (the brothers were twins) in Kingsfield, Franklin County, on June 1, 1849. At one time they lived in Lewiston, Me., where they learned of the works of an early steam vehicle experimenter, E. F. Fields.

During his youth F. E. Stanley worked as a carriage maker, portrait artist and photographer, and later the two brothers engaged in the manufacture of photographic dry plates at Newton, Mass.

Their attention was again directed to automobile development by an exhibition at the Brockton, Mass., fair in the fall of 1896. They set to work to build a steam runabout, and produced a machine light in weight, attractive in appearance, silent in operation and comparatively powerful.

The first machine was sold in August, 1898, and its success induced the Stanley brothers to make plans for manufacturing the vehicle on what was then regarded as a large scale. By the end of the year they had a lot of 100 cars going through the plant, and more than this number had been sold. Some of the major parts were being made by outside concerns, and the work at the Newton plant, which comprised a frame building at which the experimental work had been done, and a machine shop erected during the spring of 1898, was practically limited to their sampling. However, the various parts were all designed by or under the direction of the Stanley brothers, who also supervised the manufacturing operations.

In the spring of 1899 John Brisben Walker, at the time publisher of the Cosmopolitan magazine, and quite a prominent figure in national affairs, purchased from the Stanley brothers the right to their steam car, as well as the plant at Newton, Mass., and secured the services of the Stanleys for a period of one year. The deal, which involved a cash payment of \$250,000 to the Stan-



FRANCIS E. STANLEY

leys, occasioned much discussion at the time, partly on account of the large sum involved and partly because the Stanleys had as yet no basic patent on their vehicle.

Shortly after having acquired the Stanley rights Mr. Walker disposed of a half interest in them to Anzi Lorenzo Barber, an asphalt magnate. For a time Messrs. Walker and Barber managed the business jointly, but later two companies were organized to manufacture the little steamers, the Locomobile Company of America, of which Mr. Barber was president, and the Mobile Company of America, of which Mr. Walker was the head, and both began to manufacture runabouts of substantially identical design, known as the Locomobile and the Mobile respectively.

After their year's contract with the Locomobile company had expired, the Stanley brothers set to work to bring out a car of improved design, and eventually they bought back the factory plant in Newton, which had gone to the Locomobile company in the deal whereby they took over the Stanley business. Although there was a serious slump in the demand for steam cars not long after the Stanleys had started again under their own name, they made a success of their new venture, and the Stanley steamer is still being produced to-day, many improvements in its design having been introduced in the course of time.

About a year ago the Stanley Car Co. was reorganized, and the two brothers retired from its active management. Mr. Stanley is survived by his wife, by a son, Raymond Walker Stanley, now in France, and two daughters, Mrs. Edward M. Hallett and Mrs. Prescott Warren, both of Newton, Mass.

#### Indian Office Asks Bids on Passenger Car

WASHINGTON, Aug. 5—Bids are requested by the Indian Office, Washington, D. C., for one 6-cyl. automobile, two-passenger model, complete with top and usual equipment. Proposals for the bids will be received up to Aug. 15, 1918.

## Map Route for Tour by Airplane

### British and American Officers to Fly Over 14 Cities in Demonstrations

WASHINGTON, Aug. 5—Plans for the aviation tour by American and British aviators, recently announced in AUTOMOTIVE INDUSTRIES, have been completed. Major General William L. Kenly, Director of Military Aeronautics, has placed Major C. I. Rhinehart in command of the party. The guest of honor will be Brig. General C. F. Lee, head of the British Aviation Mission in this country. The party will comprise several American pilots with American planes, and General Lee, accompanied by several British pilots with British planes. The cities and states for the tour are as follows, subject to alteration in event of unfavorable weather conditions:

Cincinnati .....	Aug. 14
Dayton .....	Aug. 15
Columbus .....	Aug. 16
Cleveland .....	Aug. 17-18
Toledo .....	Aug. 19
Detroit .....	Aug. 20-21
Indianapolis .....	Aug. 22-23
St. Louis .....	Aug. 24-25
Kansas City .....	Aug. 26-27
Des Moines .....	Aug. 28-29
Omaha .....	Aug. 30-31
Minneapolis and St. Paul .....	Sept. 1-2-3
Milwaukee .....	Sept. 4
Chicago .....	Sept. 5-6

The visits to Des Moines and St. Paul will come at the time of the Iowa and Minnesota State Fairs. The visit to Chicago will come during the Allied War Exposition, which takes place there Sept. 1-15.

#### Chandler Profits to June 30, \$1,250,000

CLEVELAND, Aug. 5—After making a liberal provision for war taxes, the profits of the Chandler Motor Co. as of June 30 were somewhat in excess of \$1,250,000. When the books of the company were closed for the year 1917, the total was \$12,400,000. When the books of the company were closed for the year 1918, the total was \$12,500,000. The production of passenger cars by the company has fallen off to about the same extent as other big companies.

#### New Building for Accessory Manufacturer

DETROIT, Aug. 3—The Motors Metal Mfg. Co., makers of sheet metal parts for cars, trucks and tractors, is building an addition measuring 65 x 260 to its main factory plant. The company is at present devoting approximately 70 per cent of its output to Government work and is, in addition, manufacturing a line of fenders and streamline hoods for Fords.

## The S. E.-5A Fighting Plane

**T**HIS machine has been adopted by the U. S. Army authorities in place of the discarded Bristol design. The British model here illustrated made its appearance in June, 1917.



### July Air Mail Service Surpasses June

WASHINGTON, Aug. 6—The July record of the Air Mail Service, as shown in the monthly report of Second Assistant Postmaster General Praeger, surpasses that of June. Of 108 possible flights in July, 98 perfect flights were made, without interruption through forced landings or mechanical troubles. Only two of the 108 trips were cancelled on account of weather, and only eight forced landings were made. Four of the forced landings were by an officer new in the work and the route. The flights during the month covered a total of 11,855 miles.

The best performances made by aviators were in the order following:

Lt. J. C. Edgerton, 18 perfect trips with a total of 2430 miles, without a single interrupted flight.

Lt. Walter Miller, 19 perfect trips with an aggregate of 1710 miles, without a single interruption.

Lt. E. W. Killgore, 16 perfect trips, aggregating 2160 miles, and one interrupted flight and one uncompleted flight.

Lt. H. P. Culver, 14 perfect flights, aggregating 1080 miles, and one interrupted flight.

During the month all mail speed records were broken when on July 29 the mail was carried from Washington to New York in 2 hours and 5 minutes flying time.

Storm flying records were established when Lieuts. Edgerton, Bonsal and Killgore put their machines through driving rain and wind storms that practically shut out visibility, flying entirely by compass and making perfect landings. On the New York-Philadelphia end, several flights were made by Lieuts. Miller, Culver and Webb through fog, haze and rain.

### Tractor Import Restrictions Modified

LONDON, July 22—It is understood that the Government has agreed, although no official announcement of the

fact has been made up to the time of writing, that British importers and dealers in imported tractors may fix the price at which they are sold on a basis of cost plus 33 1/3 per cent. Under the conditions which have governed the importation of tractors into England up to this time the Government has found space on incoming ships for those tractors for which import licenses have been issued, with the understanding that the public selling price of the tractors should be calculated on the net landed cost in England plus 25 per cent. In other words, the selling price includes an available gross profit of 25 per cent to cover the importer and the dealer and all selling expenses. It has been found that this margin is too small, with the result in many cases that tractors have to be handled by dealers at a margin of 7 1/2 per cent gross discount.

The new arrangement will give the importer and dealer a margin to work upon sufficient under existing conditions.

### Federal Control of Oil

WASHINGTON, Aug. 1.—Federal control of the oil industry will probably be announced within the next few weeks, the plan being chiefly designed to eliminate competition and to fix prices. The control will be used, however, in the future, if occasion demands, to keep up the military supplies of this country and the Allies. It is now thought that it will be more or less of a voluntary nature, although the provisions of the Lever bill are available if needed. Competition will be eliminated by fixing prices of crude oil in the various fields and setting a maximum figure on bonuses. It is likely that a series of price differentials will be issued based on the price of crude oil.

### Packard and Dodge Salesrooms to Merge

BOSTON, Aug. 5—On September 15 the Packard and the Dodge Brothers motor cars and trucks will be sold under one roof in Boston, bringing about one of the biggest consolidations to cut down overhead in the country. A few weeks ago the announcement was made that they had consolidated at Worcester, and the present announcement will dissipate a lot of gossip about what Alvan T. Fuller intended to do in Boston, which comprised everything from running for governor to abandoning the motor industry all together.

Under the plan, the C. S. Henshaw Co., handling Dodge Brothers cars, will concentrate with the Packard forces in the big Packard building 1079 Commonwealth Avenue. It is not a merger of the two businesses, for each company will keep its working forces intact, with the same executives in charge of each department.

The Henshaw company has had to maintain three buildings to meet the growth of the sale of cars and trucks. Two of these will be vacated, the big salesrooms on Boylston Street, the largest on that thoroughfare, and the service station on Beacon Street. The newly opened service station on Commonwealth Avenue will be retained.

The Packard salesrooms will remain as they are, and the Dodge Brothers cars will be sold in the Easterly wing of the Packard plant where used Packard cars and trucks were sold. This building, rumor had it, was going to be turned over to the Government. The plan of consolidation worked so well at Worcester with these two firms that the Boston plan was the result, and it will save the Henshaw company some \$25,000 a year overhead expenses.



## Unskilled Labor Allotment

### Quota for Each State as Determined by Demand of War Industries Up to Oct. 1

WASHINGTON, Aug. 2—Quotas of unskilled labor to be furnished by the various states to war industries during the next two months were allotted yesterday. Immediate steps will be taken to find more unskilled workers for Government projects during the next few weeks. Following are the quotas allotted the different states. The United States Employment Service in each state will supply the numbers of men mentioned below as called upon for war work:

Alabama	2,070
Arizona	1,350
Arkansas	1,980
California	21,555
Colorado	5,175
Connecticut	8,460
Delaware	855
Florida	2,520
Georgia	3,105
Idaho	11,035
Illinois	40,230
Indiana	10,710
Iowa	5,805
Kansas	5,175
Kentucky	4,140
Louisiana	4,500
Maine	3,915
Maryland	7,335
Massachusetts	30,150
Michigan	12,330
Minnesota	9,405
Mississippi	1,125
Missouri	12,915
Montana	3,060
Nebraska	4,185
Nevada	810
New Hampshire	2,520
New Jersey	24,705
New Mexico	585
New York	86,490
North Carolina	2,205
North Dakota	1,945
Ohio	25,245
Oklahoma	3,870
Oregon	4,410
Pennsylvania	42,570
Rhode Island	4,815
South Carolina	1,440
South Dakota	1,350
Tennessee	3,465
Texas	7,290
Utah	2,115
Vermont	1,575
Virginia	4,590
Washington	11,340
West Virginia	3,870
Wisconsin	8,685
Wyoming	900

The total of the quotas represents the immediate and future unskilled labor requirements of war industries which had filed applications for workers up to July 31. Future needs are figured up to Oct. 1. Many war industries have not yet reported their requirements, but are expected to do so by Aug. 15, following which their needs will be tabulated and supplementary quotas will be issued.

It is now known that 451,000 unskilled workers are needed. It is expected this number will be doubled when the fall requirements are filed.

In the industrial states the present quotas average about 5 per cent of the estimated number of men who are not in military service or already engaged in war work, agriculture, mining or transportation. In Western and Southern agricultural states the average percentage is somewhat higher, as allow-

ance has been made for unfilled farm labor needs.

The primary purpose of the quota system is to protect any state or community from being drained of unskilled labor unfairly and to insure a fair contribution to the needs of war work from all parts of the country. It will operate to the advantage of the farmers of the country who, for the past year, have been the worst sufferers from unregulated independent labor recruiting.

#### Teach Packing to Save Space

WASHINGTON, Aug. 3—A school instructing officers and enlisted men in boxing and crating has been opened at Madison, Wis., to utilize cargo space to the best advantage. Instruction will be given to men from all departments that make overseas shipments. The course requires three weeks at the University of Wisconsin and one week in the box factory of two corporations.

#### Ben Hur Plant Acquired by Government

CLEVELAND, Aug. 2—The plant of the defunct Ben Hur Co. at Willoughby has been leased by the government for the duration of the war, and the factory is already being placed in readiness for the work. The Ben Hur plant is on a parcel of 8.66 acres, and the factory building is 150 by 400. In addition there is an office building containing 6000 sq. ft. of floor space; also a boiler house.

#### Government Wants Oil Experts

WASHINGTON, Aug. 3—The Bureau of Oil and Natural Gas Conservation, United States Fuel Administration, needs six field inspectors whose work will consist of visiting oil and gas-producing localities to ascertain the condition of wastage of oil and gas. The bureau also desires the services of eight fuel oil combustion engineers. As far as possible, all are desired to volunteer their services to the Government during the period of the war, but if this is not possible, a fair remuneration together with necessary expenses will be paid. Only men having had experience in these respective lines need make application.

## Europe Has 522,122 Passenger Cars

### Great Britain Leads with 171,607, but Monaco Has Highest Proportion

TURIN, ITALY, July 14—According to figures compiled and recently announced by the Fiat Press Bureau the number of passenger cars in Europe is 522,122, Great Britain leading with 171,607 in 1917. On the list, which is printed below, Germany stands second with 95,000 cars in 1914, which is the last year for which statistics are available. France with 98,400 and Italy with 35,500 are third and fourth respectively.

The returns for Great Britain show a decrease over those for 1914, the numbers used in the compilation being of passenger cars only. During the war period, as is well known, Great Britain has added very materially to the number of commercial vehicles of which she makes use. The number of privately owned motor cars in France before the war was about 115,000. It is estimated that approximately 80,000 cars to be used for war purposes have been imported since. In number of inhabitants per car the Principality of Monaco heads the list with one car for every 95.6 inhabitants which shows a higher proportion of cars to population than any other country. England comes second in this particular with one car to every 268.5 persons.

The list below shows the number of cars in service in European countries during the latest years for which returns are available.

#### Organize to Supply Engineers

MILWAUKEE, Aug. 5—To provide an organization which will devise ways and means of supplying the Government with competent engineers upon call, representatives of each of the Milwaukee chapters of national engineering associations have formed a council under the direction of John D. Ball, E.E., M.E., secretary of the department of public affairs, Mil-

### A Census of Europe's Passenger Cars

Countries	Number of cars.	Year	Population	No. of inhabitants per car.
Great Britain	171,607	1917	46,087,000	268.5
Germany	95,000	1914	65,000,000	684.0
France	98,400	1916	39,600,000	402.0
Italy	35,500	1918	35,587,784	1,002.0
Russia	27,900	1916	148,289,000	531.5
Austria Hungary	19,360	1916	52,608,000	2,671.7
Belgium	14,700	1916	7,580,000	515.6
Spain	10,263	1918	20,400,000	1,989.6
Holland	10,000	1917	6,583,226	658.0
Sweden	9,030	1916	5,638,500	626.5
Denmark	8,500	1917	2,919,000	343.0
Switzerland	6,157	1914	3,765,000	611.0
Portugal	3,211	1917	5,433,000	1,692.0
Norway	3,067	1918	2,240,000	730.0
Bulgaria	3,050	1916	4,330,000	1,419.6
Roumania	2,500	1913	7,248,061	2,899.0
Finland	2,000	1917	3,600,000	1,800.0
Greece	800	1917	3,912,000	4,890.0
Turkey	500	1913	.....	.....
Monaco	230	1916	22,000	95.6
Serbia	200	1914	4,450,000	22,450.0
Malta	100	1917	224,000	2,240.0
Gibraltar	45	1917	18,500	411.0
Cyprus	15	1917	273,857	18,267.0
Rhodes Islands	14	1917	30,000	2,142.8
Crete	3	1917	365,000	121,666.6

Wauke County Council of Defense. All engineers will be listed and their availability recorded so that when the Government needs technical men of a certain class recommendations can be made. The Milwaukee district draft board, the Council of Defense and each of the larger industries in Milwaukee county will each select a representative on the council. The plan is said to be original with Mr. Ball and much benefit is expected to result, in view of the present unsatisfactory situation with respect to supplying the Government with talent.

#### Avert Serious Machinists' Strike

MILWAUKEE, Aug. 5.—The combined efforts of seven Government labor conciliators averted a serious strike of union machinists in three large plants at Madison, Wis., on Aug. 1. Six hundred men walked out of the shops of the Four Lakes Ordnance Co., Steiner Turret Machine Co. and the Madison-Kipp Lubricator Co. at 11 o'clock a. m. to enforce various demands. As the result of conferences during the afternoon, all of the men returned to work on the following morning, having agreed to let the War Industries Board settle all disputes. Organized machinists in ten other plants at Madison remained on the job with the same provision. All of the shops affected are devoting all or the greater part of their facilities to Government business.

#### Michigan Names Labor Advisory Board

DETROIT, Aug. 3.—The organization committee for Michigan of the United States Employment Service and the Public Service Reserve has named the following advisory board for the state:

James V. Cunningham, director of the Employment Service, chairman; John A. Russell, director of the Public Service Reserve, vice-chairman, and Perry Ward, secretary of the Michigan Federation of Labor, W. G. Bailey, A. A. Templeton and T. Stuart Foote of Grand Rapids, with William B. Wreford, secretary ex-officio, will supervise the distribution of all unskilled labor in the state to manufacturing plants, particularly those engaged in war work.

The advisory committee has approved the appointment of forty-seven Community Labor Boards, which will assist in the mobilization and distribution of common labor for war industries.

#### Appoint Wisconsin Labor Representatives

MILWAUKEE, Aug. 5.—E. J. Kearney of the Kearney & Trecker Co., milling machines, Milwaukee, and F. H. Clausen, head of the Van Brunt Mfg. Co., Horicon, Wis., agricultural tools, have been appointed representatives of the employers of Wisconsin on the state advisory board under the new federal labor recruiting program. Arthur W. Berresford, general manager of the Cutler-Hammer Mfg. Co., Milwaukee, has been selected as employers' representative on the community board for the Milwaukee district.

## Cannot Do Business in Wisconsin

### Foreign Corporations With Non-Par Value Stock Cannot Continue

MILWAUKEE, Aug. 5.—Nearly a score of large manufacturing concerns in Milwaukee are affected by an opinion given by the attorney general of Wisconsin to the effect that foreign corporations with non-par value capital stock cannot be licensed to do business in Wisconsin. Under the opinion such corporations will lose their charters and close their plants in this State unless they reincorporate and place a fixed value upon their shares. However, before any drastic step is taken, the opinion will be printed as a brief and submitted to each company affected, with the suggestion that its attorneys file briefs at a general hearing to be held in about thirty days.

Among the concerns affected are: A. O. Smith Corp., Milwaukee; Allamer Truck Co., Chicago; Nash Motors Co., Kenosha, Wis.; Milwaukee Electric Crane & Mfg. Co., Milwaukee; Badger Mfg. Corp., Milwaukee; National Aniline & Chemical Co., New York; Globe Shipbuilding Co., Superior, Wis., and others.

The question of the validity of the Wisconsin charters of these and other corporations arose when the Railroad Commission, acting as administrator of the Wisconsin Blue Sky act, received an inquiry from the secretary of state as to the basis upon which the license fee of corporations with capital stock that has no nominal or par value is to be determined. Then it was found that the State laws prevent the issue of licenses to such corporations.

In some instances, corporations originally organized under the laws of Wisconsin, desiring to expand, reincorporated under the laws of Delaware or Maine, greatly increased the capitalization, but provided that shares be without par value, then applying for charters in Wisconsin as foreign corporations. The opinion of the attorney general means that this cannot be done legally.

#### Flint Has Federal Employment Office

FLINT, Aug. 1.—The United States Employment Service, Department of Labor, has established an agency at 119 East Kearsley Street, with J. B. Laing, formerly of the Buick Motor Co., the examiner in charge. The agency will take care of the placing of men and women in factories and concerns doing government work. Persons desiring work of this kind can apply at the office the same as for any factory position.

#### Metal Workers Get 8-Hour Day

MILWAUKEE, Aug. 5.—Nearly 40,000 men in the metal trades of Milwaukee county are affected by the voluntary in-

auguration of the basic 8-hour day by most of the large metalworking industries of the district, effective Aug. 1. All of the plants are engaged largely in executing Government contracts. The concession does not mean a reduction of actual working hours, because that would mean curtailment of output, but while the men will work on the same schedules as before they will receive time and a half for all overtime worked above eight hours. This will net the men an increase of about 5 per cent in wages. Most plants are working 54 to 55 hours a week.

#### Shortage of Skilled Labor Still Acute

WASHINGTON, Aug. 3.—Shortage of both skilled and common labor continues acute, according to reports from the various centers and trades of the country. Machinists are needed throughout the East and on the Pacific Coast. There is a general shortage of boilermakers. Toolmakers, lathe hands, blacksmiths and iron workers are wanted in New England, Pennsylvania and along the Great Lakes. Many hulks are reported lying in the river at Portland, Oregon, because of shortage of men to install the machinery.

Mechanics are in demand in New England, New York, Chicago, Atlanta, Georgia, Seattle, Washington and southern Wisconsin. Automobile workers and electrical workers are, however, by no means scarce, according to the reports which show a surplus of automobile workers in the West and Southwest, Missouri, West Virginia and other points, with the only demand coming from Seattle.

Munitions workers are needed at Wilmington, Del., and in northwestern Ohio.

A common labor shortage is reported from Pennsylvania, Connecticut, Virginia, Illinois, Iowa, Oregon and Washington. The only surplus of common labor is reported from the South.

Farm labor is needed throughout the country due to the scarcity of farm workers created by the high wages offered in the war industries and especially shipbuilding.

A surplus of inexperienced female workers and a shortage of experienced women workers is also reported.

#### Pants, Hair Nets and Low Heels for Women Machine Operators

ALBANY, N. Y., Aug. 3.—In the new "dangerous machinery" code of the New York State Industrial Commission, the fact that the number of women engaged in industrial pursuits has materially increased is taken into account and special provisions are recommended for their safeguarding as follows:

"It is recommended in relation to female operatives that where their hair is in danger of being caught in moving machinery, they shall wear caps or hair nets; that where their clothing is in danger of being caught in moving machinery they shall wear pants; that they wear shoes with low heels."

**Obenberger Leaves A. O. Smith**

MILWAUKEE, Aug. 5.—Frank P. Obenberger, for the last five years general superintendent of the A. O. Smith Corporation, Milwaukee, and superintendent of the forge works for four years, before that, resigned Aug. 1 to become associated with his father in the general management of the John Obenberger Forge Co., West Allis, Milwaukee, which is doubling its capacity for the manufacture of crankshafts, camshafts and other automotive forgings. Officers of the Smith company and eighty department heads tendered Mr. Obenberger a dinner, at which he was presented a diamond-studded scarf pin by the officers and a gold watch and chain on behalf of the working force.

L. H. Morrill, who has had charge of the engineering department of the Northway Motors Co. for the last 2 years, resigned, and has been appointed assistant engineer of the Buda Co., Harvey, Ill.

J. R. Harrison has been appointed sales and advertising manager of the Parrett Tractor Co., Chicago. He was formerly advertising manager of the Chalmers company.

Frank L. Wurl, who has been intimately connected with many new developments in automotive ignition, starting and lighting, has been promoted sales engineer of the Remy Electric Co. located at Detroit.

C. A. Spear has been appointed New York State Division sales manager for the Selden Truck Sales Co., Rochester, N. Y. He succeeds L. S. Hallowell, who is to become affiliated with the Philadelphia Selden Sales Agency.

G. M. Rockwell, recently connected with the sales department of the Republic Motor Truck Co., Alma, Mich., has been appointed district manager and special representative of the District of Columbia for the Acme Motor Truck Co. His territory will include Virginia, Maryland, Delaware and North Carolina. J. A. Bell, formerly connected with the White Co., Cleveland, has joined the Acme organization as district manager, with the Gulf States east of Texas as his territory. F. P. Walker will have charge of the western half of Iowa and the entire state of Nebraska.

H. D. W. Mackaye, who has been connected with B. F. Everitt in the receivership settlement of the affairs of the Ross Automobile Co., Detroit, has entered Government service in connection with munitions production, and is located now at Jackson, Mich., as a citizen representative of the Ordnance Department.

Howard C. Caldwell, assistant advertising manager of the Haynes Automobile Co., Kokomo, Ind., has resigned to enter the Great Lakes Naval Training Station.

## Men of the Industry

*Changes in Personnel and  
Position*

**Nash Men Dine Charles W. Nash**

KENOSHA, WIS., Aug. 5.—Department heads and foremen of the Nash Motors Co., Kenosha, Wis., tendered a banquet in honor of Charles W. Nash, president and general manager of the company, who left July 31 for Washington to assume his duties as assistant to John D. Ryan, director of aircraft production, in charge of engineering and production. While in the Government service, Mr. Nash has relinquished active connection with his company.

W. O. Kennington, who was assistant chief engineer of the Remy Electric Co., Detroit, at the time of the outbreak of the war, has returned to Detroit from the war front, where he is connected with the British Air Ministry. He will remain in this country for a month and then return.

H. H. Gildner, manager of the Flexite department of the F. R. Blair Co., New York, has been elected vice-president of the organization.

George L. East, who has been associated with the Oldsmobile interests for 11 years, has resigned his connection as assistant sales manager to join the Gulf Oldsmobile Co. at New Orleans, distributor of Oldsmobile cars for Louisiana.

**Athletic Building Dedicated to Dead Flyer**

MOUNT CLEMENS, MICH., Aug. 5.—The new athletic building which has just been completed at Selfridge Field was dedicated Saturday afternoon to the memory of Second Lieutenant John P. Boyle, an aviator and athlete, the first officer to meet death at the field. Local people assisted substantially in erecting the building, pledging more than \$2,200.

**Dividends Declared**

The Stewart-Warner Speedometer Corp. has declared a regular quarterly dividend of 1½ per cent, payable Aug. 15, to stock of record July 31.

The National Acme Co., Cleveland, has declared its quarterly dividend of three-quarters of 1 per cent, payable Aug. 31 to stockholders of record Aug. 15.

The Continental Motors Corp., Detroit, has declared a 1½ per cent dividend to stockholders owning common stock of record at the close of business Aug. 10, payable Aug. 20.

**Ayres Elected an Officer in D. A. D. A.**

DETROIT, Aug. 5.—J. C. Ayers, of the Towar-Ayres Co. and Denby Motor Truck Co., was elected vice-president of the Detroit Automobile Dealers' Association at a meeting of that organization last week. He replaces George W. Franklin on the board, the latter having resigned on disposing of his automobile interests.

**General Motors Holds Export Convention**

NEW YORK, Aug. 5.—The first annual convention of the General Motors Export Co.'s executives, field men and department heads began on Aug. 1 and will be continued to Aug. 10. The program is very comprehensive, covering a series of meetings at the New York offices and also including a tour of educational inspection through the various factories at Detroit, Pontiac, Flint, Lansing and Jackson.

**U. S. Air Accidents Are Lowest**

WASHINGTON, Aug. 5.—The United States air service schools have a record, it is officially reported here, of a lower percentage of accidents and fatalities than those of the Allies or the central powers. The average is one man killed for every 3300 hours of flying. Following is the list of fatalities in actual flying sustained in this country from Sept. 1, 1917, to July 20, 1918:

Rank	Number
Officers .....	74
Cadets .....	65
Enlisted men .....	9
Civilian instructors .....	7
Total .....	155

United States schools, in attaining the present rating, have proceeded on the theory that three out of four deaths in flying at the front have been due to lack of judgment, and that but one man of four has been killed in action. Further, that if a cadet is given all his instruction in the flying schools in the United States he will put his preliminary air training out of mind when he finally reaches the front and concentrate entirely on fighting. Because of the fact that he has been perfectly trained as a "stunt" flyer, he will be the more able to pick up his fighting tactics quickly.

**Farmers Use More Trucks**

AKRON, Aug. 5.—According to statistics furnished by the B. F. Goodrich Rubber Co. farmers are the largest users of trucks, heading the list with a total of 79,789 trucks during the year 1917. These are engaged in the haulage of grain, produce, truck and livestock in the rural districts. Manufacturers have a total of 65,928 and retailers operate 64,486. According to the figures there are 238 commercial vehicle manufacturers in the United States, 90,000 trucks having been made in 1917 and it is estimated that the 1918 production will go over the 200,000 mark.



**Wisconsin Truck Starts**

OSHKOSH, Aug. 5.—The Wisconsin Duplex Automobile Co., Oshkosh, Wis., on August 1 began quantity production of a single type of 1½-ton commercial car employing a quadruple drive transmission system, which has been undergoing exhaustive tests for more than 70 years. Five trucks are now coming rough and the next group will be ten, actual increases being made until the regular group reaches twenty-five cars. According to William A. Besserdich, general manager, the company has commercial orders which will require its capacity well into 1919.

**Reliance Getting Ready**

APPLETON, WIS., Aug. 5.—The Reliance Motor Truck Co., Appleton, Wis., has its new plant in operation and the middle of August will be turning commercial chassis in quantity. The tire equipment of the former works at Racine, Wis., has been transferred to the shops.

**Body Builder Gets Boat Contract**

RACINE, WIS., Aug. 5.—The Racine G. Co., Racine, Wis., a large manufacturer of motor car bodies, has taken a government contract to build 500 metallic boats, fully equipped, for transports and new vessels of the United States emergency fleet. About 30 per cent of capacity will be devoted to the contract, deliveries on which are to begin September 1. The lifeboats will be 24 long with accommodations for forty persons and will be equipped with oars and a sail. Seats will run fore and aft as well as crosswise and will contain air compartments and lockers for medical supplies, oil, food, etc.

**Forms New Die and Tool Company**

BOWLING GREEN, OHIO, July 31.—The Bowling Green Die & Tool Co., a new organization, has effected the following organization: President, Clyde Urschel; vice-president, W. M. Gray; secretary-treasurer, Philo S. Hankey; manager, R. L. Swartz. These officers, with P. M. Davidson, form the directorate.

**Enlarge Fordson Plant**

DEARBORN, MICH., Aug. 3.—The plant of Henry Ford & Son is being engaged steadily to aid production on a large scale. A new tool room and a large addition to the stock room are under construction.

**Halladay Gets Cameron Buildings**

LEXINGTON, OHIO, Aug. 3.—The Halladay Motor Car Co. has purchased factory buildings of the Cameron Car Co., Attica, Ohio, and will occupy them October 1.

**New Truck Cab for Columbia Truck**

ONTIAC, Aug. 3.—A new truck cab will be manufactured by the Columbia Motor Truck & Trailer Co., which will be sold at \$150 extra. One of the features

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

of the new device is that windows may be lowered, which eliminates the necessity for storing them. The window and the door drop out of sight, are securely fastened and do not rattle. If desired, the entire door can be taken off.

**Reorganize Derf Spark Plug**

NEW YORK, Aug. 3.—The Derf Mfg. Co. has been generally reorganized and W. Earl Clayton appointed general manager. Fred Gerken was named president of the company. The output is at present 1000 plugs a day and plans are being laid for increasing this during the next two months.

**Chicago Pneumatic Enlarges Plant**

CLEVELAND, Aug. 1.—The Chicago Pneumatic Tool Co. is erecting a three-story building adjoining its present plant at East Forty-ninth Street and Lakeside Avenue. The structure is to be 293 by 56, and will contain about 50,000 sq. ft. of floor space. The estimated cost of the addition is said to be \$150,000.

**State Fair to Include Automobile Show**

DETROIT, Aug. 3.—Detroit's dealers have purchased sufficient space to warrant the Michigan State Fair putting on its annual automobile show this fall. Secretary-Manager G. W. Dickinson announced that the show would be one of the features and will occupy the first floor of the Automobile Building. The second floor of the building has been taken over by the United States Government for a display of war materials, trophies from the European battlefields and other governmental exhibits that are of interest to the general public.

**Miller Sales at \$18,000,000 Rate**

AKRON, Aug. 4.—Sales of the Miller Rubber Co. are running at the rate of \$18,000,000 for 1918, compared with \$11,368,627 for 1917, \$7,583,606 for 1916, and \$3,150,595 for 1915. Earnings after war taxes were deducted for 1917 were equal to 24 per cent on the junior issue for preferred dividends.

**Detroit-Toledo Truck Line**

DETROIT, Aug. 3.—A motor truck freight and express line service between Detroit and Toledo is to be started by the H. C. Roberts Storage & Transfer Co., with daily service both ways. The service will start operation Oct. 1, and will carry freight to and from all cities and towns en route via the Rockwood and Monroe route.

**Milwaukee Home for Lavine**

MILWAUKEE, Aug. 5.—The Lavine Gear Co., Racine, which is erecting a complete new manufacturing group in Milwaukee, is completing arrangements for the transfer of its entire business from Racine to Milwaukee. The capital stock is being increased from \$100,000 to \$1,000,000 to provide for the general expansion of production and marketing of its line.

**Puritan Gets Argo Electric**

DETROIT, Aug. 3.—The Puritan Machine Co. has purchased the Service repair parts business of the Argo Electric Co., formerly of Saginaw, Mich. The entire stock of the Argo repair parts has been moved to Detroit.

**Cleveland Branch for Joliet**

JOLIET, ILL., Aug. 3.—The Joliet Oil Tractor Co. has opened a distributing office for Ohio at 1754 East 17th Street, Cleveland, which will do business under the style Bates-Steel-Mule Co. of Ohio. This office has been established to handle the new Model D Bates Steel Mule exclusively and will give factory service to all Ohio dealers and customers. A branch will be opened at Columbus to assist in distribution. It is the intention of the parent company to place a limited number of dealers in Ohio this year. Probably not more than twenty dealers will be appointed in 1918, as this number will take the entire quota for Ohio this season. Approximately one-half the quota has already been assigned.

**International Harvester to Dissolve**

WASHINGTON, Aug. 3.—The Department of Justice states that at the ensuing term of the Supreme Court the International Harvester Co. will dismiss its appeal from the decree of the District Court adjudging it a combination in restraint of trade and ordering its dissolution. The effect will be to leave the original decree of the District Court as the final decree in the case. In part the decree will compel the International Harvester Co. to dispose of the harvesting machine lines known under the trade names of "Osborne," "Milwaukee," "Champion," the trade names themselves, and all patterns, drawings, dies, blue prints, jigs and other machines and equipment used in the manufacture of those lines, to a responsible and independent manufacturer or manufacturers of agricultural implements. The company must also dispose of the plants and works at Springfield, Ohio, and Auburn, New York, where the Champion and Osborne lines are made.

If not otherwise disposed of in one year after the close of the existing war the above will be sold at public auction to the highest bidder. After December 31, 1919, the company will be prohibited from having more than one representative or agent selling agricultural implements in any city or town in this country.

## Hydro-airplane Base to Cost \$2,000,000

New Navy Department Training Base at Galveston Will Be Largest in U. S.

GALVESTON, Aug. 3—It is authoritatively announced that the hydro-airplane training base which the Navy Department will construct here will cost approximately \$2,000,000, and will be the largest in the United States. The proposed buildings, for which plans are now being drawn by L. B. Hyde, civil engineer in the Navy Department, will cover 60 acres.

Plans call for the erection of six hangars, built in two sections, and with accommodations for 24 hydro-airplanes. The hangars will be erected at the north-eastern part of the site fronting Galveston Bay. Each section will be 104 x 105 ft. in area and completely equipped for the housing of flying machines. Each section of the hangars will be provided with a landing pier 200 ft. in length. To the south of the hangars will be the machine-shops and repairshops.

A considerable portion of the site will be devoted to the ground school, where student aviators will receive preliminary training.

An observation tower, 120 ft. in height, will be erected, from which the officers in charge of training may have a good view of the flyers in training and observe the character of their work.

There will also be an office building and an administration building, each two stories high.

The building to be used as quarters for the officers and student aviators also will be a two-story structure, somewhat in the shape of a letter H. The ground floor of one side of the building will be devoted to the recreation room, dining room, kitchen, store room, refrigerators, etc. The remainder of the building will be quarters, with each bedroom 10 ft. 6 in. by 12 ft. 6 in.

Barracks for several hundred men, with mess hall and other necessary equipment, will be provided, as well as a dispensary.

### Dayton-Wright Ships 1000th Plane

DAYTON, Aug. 1—The Dayton-Wright Airplane Co. shipped yesterday its 1000th airplane, and commemorated the event by giving its employees a holiday to-day. The average daily production of the company is twenty.

### It's the "Air Service" Now

WASHINGTON, Aug. 2—Hereafter "Air Service" will be the general term used to denote either the Division of Military Aeronautics or the Bureau of Aircraft Production. Officers and enlisted men will be known as members of Air Service, Military Aeronautics or Air Service, Aircraft Production, as the may be. The chief of aircraft pro-

duction will hereafter be known as the Director of Aircraft Production. The chief of the Division of Military Aeronautics will be known as the Director of Military Aeronautics.

### Name Four New Flying Fields

WASHINGTON, Aug. 3—Four new flying fields in the neighborhood of Hazelhurst Field, Mineola, Long Island, have been completed and named after aviators who died in the service. They are under the command of Major C. K. Reinhart, J. M. A. The field at Wantagh, L. I., has been named Lufbury Field in memory of Major Raoul Lufbury. Field No. 2 at Mineola, L. I., is now known as Mitchel Field in honor of Major John Purroy Mitchel. The field near Babylon, L. I., is named the Henry J. Damm Field in memory of Lieut.-Col. Henry J. Damm. The field at Commack, L. I., is designated Brindley Field in memory of Major Oscar A. Brindley.

### Mail Flight Records Broken

WASHINGTON, Aug. 2—The air mail service records were broken yesterday. Major C. K. Phinehart flew from Mineola, L. I., to Washington in 2 hr. and 15 min. Another extraordinary flight was made when Lieut. Killgore left Philadelphia at 1.25 p. m. in a severe rainstorm and reached Washington on schedule time at 3 p. m. Lieut. Killgore broke his goggles and was compelled to fly the entire distance without protection for his eyes. He flew at a height of 1500 ft. entirely by compass. Thus far storms have not interfered with the air mail service.

### De Haviland "Scandal" Exploded

WASHINGTON, Aug. 1—Another airplane "scandal" rumor exploded harmlessly yesterday when Secretary Baker specifically denied newspaper reports that the De Haviland plane production was held up. There was no official foundation for the rumor. The rumors told that General Pershing had requested complete halt of the De Haviland production and pointed out many serious faults. There is apparently foundation for the statement that General Pershing recommended some changes in the De Haviland plane, but this is about all the truth which the reports contain.

### Tries Dropping from Moving Plane

PARIS, FRANCE, July 30—What is believed to be the first experiment of falling from a moving airplane with a parachute has been successfully carried out by Captain Sarret, a French aviator. He dropped 800 meters with a parachute 12 yards in diameter and landed safely.

### To Conserve Chains

WASHINGTON, Aug. 1—A campaign of education is planned by the War Service Committee of chain manufacturers for the conservation of chains. Members of the committee are: C. M. Power of the American Chain Co.; Staunton B. Peck, Link-Belt Co., and A. B. Way, Bridgeport Chain Co.

## Deaf Mutes Won't Make Good Fliers

Official Tests Show That They Lack the Necessary Qualifications

WASHINGTON, Aug. 3—Numerous reports that because of lack of dizziness deaf mutes would make good fliers are denied here to-day by the Division of Military Aeronautics. An erroneous idea persistently circulated about the country has led hundreds of deaf mutes to believe that they were desired as fliers in the Army and many have sought enlistment.

Two investigations were started three weeks ago because of these unauthorized reports, one to determine the source, and the other to make special tests of accuracy of deaf mutes in sensing motion.

The first investigation is not yet finished. The second investigation completed by the Medical Research Laboratory at Mineola, L. I., included tests in flights to ascertain what effect the absence of the delicate balancing apparatus that exists in normal inner ears has upon persons who are without them.

Normal men and deaf mutes were flown at different times blindfolded. The flights included level flying, climbing, left and right turns, dips and banks. The passengers were asked to record the directions. The deaf mutes failed completely. They could not even note changes of 90 degrees. Normal passengers reported changes as slight as 5 degrees. Consequently the individual with less sensitivity to a change of position is really less efficient in the air.

### Acme Motor Truck Enlarges Plant

CADILLAC, MICH., Aug. 3—The Acme Motor Truck Co. has increased the size of its plant considerably. The following additions have been built this summer: A woodworking and body shop, 65 by 80; an addition to the assembly building, 65 by 96; a heating and power-plant, 46 by 80; an office, 80 by 118; two washrooms, 12 by 30, and a dining room, 13 by 46. Another addition to the body department is contemplated in the very near future, which will be 65 by 80.

### Motor Trucks to Transport Hogs

WASHINGTON, Aug. 3—The number of hogs transported to the Omaha market by motor trucks during the first six months of 1918 has increased 180 per cent over the corresponding period in 1917. This furnishes an example of how motor trucks are relieving railroad transportation. The number carried in this way amounted to 92,780 for the period in 1918 as compared with 33,084 for the corresponding months last year. Estimating 70 hogs as an average carload in railroad shipments, the number delivered by motor trucks on the Omaha market during the first six months of 1918 aggregated more than 1300 carloads, or an average of more

than 8 carloads for every market day during the period.

The motor truck business is becoming so important that commercial organizations of Omaha are taking active measures to utilize the trucks on return trips to country points for hauling various kinds of freight. Experience has shown that motor truck marketing is as feasible in winter as in other seasons, as more than 26,000 hogs were delivered directly from farms to the Omaha market during January and February.

#### Dependable Gets a Building and Site

GALESBURG, ILL., Aug. 3—The Dependable Truck & Tractor Co., recently organized here, has purchased a 5-acre tract of land which has on it an abandoned factory building with 65,000 sq. ft. of floorspace. The old structure will be rebuilt and will be utilized for assembling trucks. In addition, a new building will be constructed with a floorspace capacity of 40,000 sq. ft.

#### Ordnance District for St. Louis

WASHINGTON, Aug. 1—The Ordnance Department has established a new production district to be known as the St. Louis Production District. Headquarters will be at St. Louis. M. E. Singleton of that city is the ordnance district chief. Division of the country into production districts was undertaken by the Ordnance Department as part of its plan of decentralization and in order to promote more rapid and efficient methods of carrying out the enormous ordnance program. Under this system the production work in each district is under its own responsible head, who is answerable directly to the Ordnance Department in Washington.

#### Harroun's Patent Allowed

WAYNE, MICH., Aug. 5—Ray Harroun, vice-president of the Harroun Motors Corp., has received notice from the patent office that his claim for exclusive rights to the shock absorbing steering wheel in use on all Harroun cars has been allowed. His patent has been transferred to the company.

#### Automobile Body Plant Burned

BOSTON, Aug. 5—The big plant of the Sargent & Ham Company, manufacturers of automobile and carriage bodies on Sudbury Street, was gutted by fire this morning, the loss being approximately \$60,000. There were a number of finished and nearly finished automobile bodies on the floors, and they will be practically a total loss. The structure was six stories and the upper floors were destroyed so that the roof fell in, carrying away the two upper floors. Several firemen had narrow escapes from injuries. The fire started about 1 in the morning, and so there were no workmen in the building. It is believed that it was caused by spontaneous combustion.

## Government Wants to Protect Labor

### Detroit Manufacturers Asked to Protect Skilled Help by Aiding in Obtaining Exemption

DETROIT, Aug. 5—At a meeting called by the ordnance and aircraft sections of this territory the government representatives emphasized again and again the necessity for manufacturers to protect their skilled men. Unless every manufacturer of munitions secures deferred industrial classification in the draft for every man in his employ necessary to production, he is acting unpatriotically, according to the Government representatives. Not only will the manufacturer suffer, but the Government will be injured in its prosecution of the war.

Eight hundred and seventy-five manufacturers of Detroit working on war material were present. The ordnance division was represented by Fred Robinson and the aircraft section by T. P. Myers. Judge James Murfin represented the district board of the selective service and R. K. Davis the adjutant general's office. Allan A. Templeton, advisor of the survey and conversion sections of the War Industries Board, presided at the meeting.

Mr. Templeton stated that the Government wants all manufacturers to give it every man that they can spare, but the Government does not want them to send a single man into the army whose loss to the manufacturer would delay the production of war materials. Rather, the Government wishes to help all manufacturers to save their important and necessary men. He expressed the thought that they would not be really patriotic unless they did as the Government directed them in this matter.

Mr. Robinson, in charge of the ordnance department production in this district, declared that there is in this country, at the present time, a shortage of skilled labor of more than 250,000. This is felt most acutely in the East and Detroit has not suffered greatly owing to the fact that men from automobile factories, which have curtailed production, have drifted into war industries. The time is coming, however, when the supply of these men will cease and Detroit manufacturers will be in the same extremely serious situation as is the East to-day. More finished products for the ordnance department are made in this district than in any district in the country, and the total output is greater than any district with the exception of Pittsburgh, with its large steel production.

It was announced at the meeting that an industrial relations department of the aircraft service is being perfected to handle the problems of securing labor, handling disputes, settling industrial unrest, etc. It is believed this section will be in operation within 30 days.

R. K. Davis, speaking as a representa-

tive of the adjutant general, said: "We want every manufacturer of war materials to get deferred classification on its skilled men—men necessary to their production. We also want the manufacturers to be reasonable in their demands, and not try to secure deferred classification for bookkeepers, stockkeepers and the like."

#### To Tabulate Results of Conservation Movement

DETROIT, Aug. 5—Many retailers are co-operating with the Wholesale Merchants' Bureau in the latter's campaign for conservation of truck time and man power. Over 125,000 cards and circulars requesting co-operation in every way possible to make this movement a success have been sent them. Placards on delivery trucks are now being used by a large number of wholesale merchants. The campaign was started by the Wholesale Merchants' Bureau in an effort to show the absolute necessity, under present war-time conditions, of conserving man power and truck time. In order that this may be accomplished it is essential that all avoidable delays in receipting for goods be eliminated. Efforts are now being made to arrive at some definite figures showing the actual truck time saved by each wholesaler as a result of this movement.

#### Gardner's Interest in St. Louis Chevrolet Sold

ST. LOUIS, Aug. 5—Russell E. Gardner has disposed of the interest of himself and two sons in the Chevrolet Motor Co. of St. Louis because his sons, Russell E. Gardner, Jr., sales manager for the company, and Frederick Gardner, production manager, had entered the service of the United States Navy. Gardner did not name the purchaser, but it has been understood here that the General Motors Co. had an option on the Gardner stock for \$1,000,000. The giving of the option was announced at the time of the purchase of 105 acres here for a body factory and assembly plant for the General Motors. The deeds for this land were completed last week. The Gardners became interested in the Chevrolet company when they turned their large buggy factory into a body building plant.

#### Conaphores on Pierce-Arrows

NEW YORK, Aug. 2—The Edward A. Cassidy Co. announces that the Pierce-Arrow Motor Car Co., Buffalo, has adopted the Conaphore headlight lens, manufactured by the Corning Glass Works, Corning, N. Y., as standard equipment on its passenger cars.

#### Moto-Meter Equipped Tractors at Salina

NEW YORK, Aug. 1—Eighty-two per cent of the tractors taking part in the demonstration held at Salina, Kan., were equipped with the Boyce Moto-Meter.



# Industrial Review of the Week

## A Summary of Major Developments in Other Fields

### Coal Output Drops Slightly; Alarming Shortage Not Likely

Production has dropped off slightly from the high records of the recent past. This diminution in the output is, however, not particularly serious and if the present rate can be maintained there can be no such suffering for want of coal as the country experienced last winter.

The coal supply problem is still one of transportation rather than production. It has been fairly well demonstrated that if the mines are supplied with cars they are, as a general rule, able to turn out a heavy output and one well up to the needs of the country. One or two roads have had such heavy traffic in coal that much congestion with some wrecks and derailments has resulted.

In the West and Middle West production is well up to the demand and certain grades and sizes are still selling below the Government schedule. In the East, however, particularly along the Atlantic Seaboard, demand is strong and dealers are unable to accumulate any stocks except of one or two of the smaller sizes. Of these there is now a slight surplus, but it is questionable if this would be maintained were bituminous coal available with which to mix the fine anthracite.

One incident of the week, small in itself but which may be far-reaching in its results, was the closing of four small mines in the Pittsburgh district because they shipped dirty coal. It is evidently the intention of the Fuel Administration to tolerate no such practices in this respect as caused such justifiably adverse criticism of the industry as was heard last winter.—*Coal Age*.

### Mix-up in Sunday Closing Plan

WASHINGTON, D. C., Aug. 6.—There is somewhat of a mix-up regarding the Sunday closing plans, which are part of the War Service Recommendations of the National Automobile Dealers' Association, because of a joint statement issued by the Fuel Administration and the War Industries Board to the effect that there has been no governmental order or recommendation against the sale of gasoline on Sunday.

Until further conference by the parties concerned it is not possible to make a definite statement as to the outcome.

The Sunday closing is a part of the dealers' recommendations as a means for conserving labor and not gasoline. Opposition was met in several towns on the part of the big oil companies which operate their own filling stations and have a large Sunday business.

The dealers' recommendations were outlined last winter after the dealers had been

called to Washington by Chairman A. W. Shaw of the Conservation Division of the War Industries Board, as were many other trades, and asked to make economies in the automobile trade. The recommendations followed, their chief object being the conservation of labor through reducing certain of the dealers' activities.

Following the statement of the Fuel Administration and the War Industries Board, which has upset the plans of the dealers in many sections, the Conservation Division has issued a statement which throws little light on the possible outcome of the matter.

President F. W. A. Vesper of the N. A. D. A., who is also chairman of the dealers' War Service Committee, is to confer with the Conservation and Fuel bodies this week in an effort to get a definite understanding as to whether the oil companies are willing to co-operate with such local associations of dealers as wish to conserve labor through Sunday closing.

### Wire Wheel Corp. Makes Government Agreement

NEW YORK, Aug. 3.—By virtue of a license agreement just entered into between the government and the Wire Wheel Corp. of America the whole ownership of the Pugh triple lacing patent is acknowledged by the former and the corporation grants the government the right and power to make, use and sell wire spoked wheels embodying the invention in the United States, its territories and dependencies during the present war and for a period of three months after peace is declared. The corporation has given the government the right to sub-license others to make for and sell to the government wire spoked wheels embodying this invention. These sub-licenses will be non-transferable and will not permit the manufacture of wheels except for the government. The government will pay the Wire Wheel Corp. a royalty on each wheel and will keep it informed of the names of the sub-licensees and details governing the issue of the sub-licenses.

### Jordan Pays Dividend on Preferred Stock

CLEVELAND, Aug. 5.—The Jordan Motor Car Co. on Aug. 1 paid a dividend of 8.6 per cent to the holders of the original preferred stock. It is stated that the company has been turning over its capital practically every 30 days and that in July its earnings were at the annual rate of 160 per cent on the capital invested.

### Frankfurter on Priorities Board

WASHINGTON, Aug. 7.—Felix Frankfurter, chairman of the War Labor Policies Board, has been appointed a member of the Priorities Committee of the War Industries Board, on which he will represent the Department of Labor.

### Coal, Coke and Labor Are Factors in Steel Production

In respect to steel supply and demand, the outcome of the week has been, first, a decision by the War Industries Board averse to creating the additional reservoir of ship steel asked for by Director-General Schwab; second, the gathering of data showing that the 33,000,000 tons of finished rolled steel which has been taken as the present annual capacity of the country is considerably too low. In one stretch of five weeks, chiefly in May, it is shown that the rate was close to 38,000,000 tons of finished products per year.

It appears that the ship steel in process or in stock at shipyards and fabricating plants amounts to about 1,000,000 tons. While the War Industries Board did not consent to increase the present shipments of 50,000 tons a week of ship plates by 20,000 tons a week through the next quarter, or even by the 10,000 tons a week later asked for, its members are confident there will be no break in the shipbuilding program for lack of steel.

### Steel Production Increase Studied

The deciding influence in the matter was the fear of members of the board that the impounding of additional definite tonnage for ship purposes might mean the suspension of small but in the aggregate important private industries.

Ways and means of increasing steel production have been carefully studied. But coal and coke labor are still the key, rather than extensions of rolling-mill capacity. So far as the latter is concerned, probably 1,000,000 tons more will be ready by Jan. 1, chiefly in plates, but partly in large rounds, the Steel Corporation now having a \$750,000 mill for this purpose under construction in the Pittsburgh district.

### Merchant Furnaces Increase Output

The statistics for last month show that to increase pig iron output is no easy matter. In the 31 days of July the make was 3,420,988 tons, or 110,354 tons a day, against 3,323,791 tons in June, or 110,793 tons a day. The merchant furnaces increased their output nearly 2000 tons a day as compared with June, while the steel works furnaces fell off nearly 2500 tons a day.

August humidity may bring down production, and probably will, but an increased rate would otherwise result from the blowing in of additional furnaces. The active list shows a net gain of 8 in July. The number in blast Aug. 1 was 364, with an estimated daily capacity of 112,600 tons against 356 on July 1 with a daily capacity of 111,130 tons.—*Iron Age*.

## AUTOMOTIVE MATERIALS MARKETS

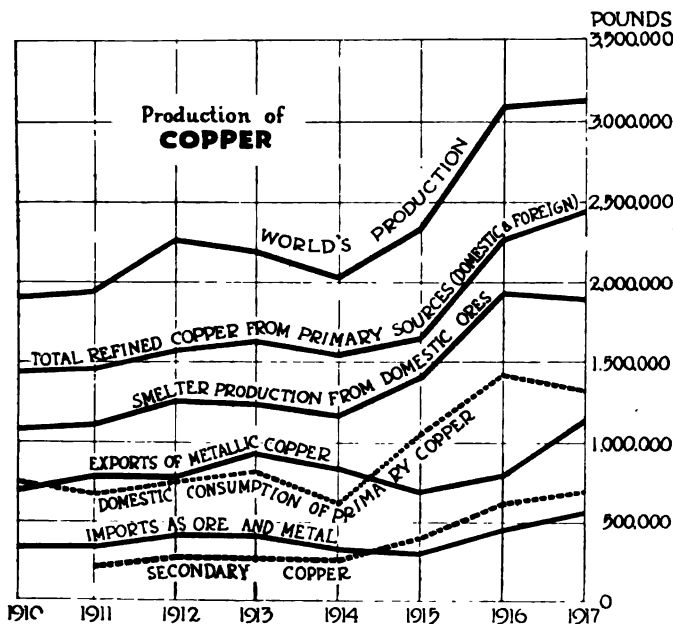
## Material Market Prices

<b>Acids:</b>	
Muriatic, lb. ....	.02-.03
Phosphoric, ct. ....	.35-.39
Sulphuric (60), lb. ....	.09
<b>Aluminum:</b>	
Ingots, lb. ....	.33
Sheets (18 gage or more), lb. ....	.40
Antimony, lb. ....	.13-.13½

<b>Burlap:</b>	
8 oz., yd. ....	.19
10 oz., yd. ....	.24½
<b>Copper:</b>	
Elec., lb. ....	.26
Lake, lb. ....	.26
<b>Fabric, Tire (17½ oz.):</b>	
Sea Is., combed, lb. ....	1.65-1.70
Egypt, combed, lb. ....	1.25-1.35

Egypt, carded, lb. ....	1.20-1.30
Peelers, combed, lb. ....	1.05-1.20
Peelers, carded, lb. ....	.95-1.05
<b>Fibre (¼ in. sheet base), lb. ....</b>	
50	
<b>Graphite:</b>	
Ceylon, lb. ....	.07½-.25
Madagascar, lb. ....	.10-.15
Mexican, lb. ....	.03½
Lead, lb. ....	.08½
<b>Leather:</b>	
Hides, lb. ....	.18-.35½
Nickel, lb. ....	.40-.43
<b>Oil:</b>	
Gasoline:	
Auto., gal. ....	.24½
68 to 70 gal. ....	.30½
<b>Lard:</b>	
Prime City, gal. ....	2.25
Ex. No. 1, gal. ....	1.55
Linseed, gal. ....	1.84
Menhaden, (Brown), gal. ....	1.20-1.22
<b>Petroleum (crude):</b>	
Kansas, bbl. ....	2.25
Pennsylvania, bbl. ....	4.00

<b>Rubber:</b>	
<b>Ceylon:</b>	
First latex pale crepe, lb. ....	.63
Brown, crepe, thin, clear, lb. ....	.60
Smoked, ribbed sheets, lb. ....	.62
<b>Para:</b>	
Up River, fine, lb. ....	.68
Up River, coarse, lb. ....	.40
Island, fine, lb. ....	.59
Island, coarse, lb. ....	.27
<b>Shellac (orange), gal. ....</b>	
.70-.76	
<b>Spelter ....</b>	
.08½	
<b>Steel:</b>	
Angle beams and channels, lb. ....	.03
Automobile sheet (see sp. table).	
Cold rolled, lb. ....	.06½
Hot rolled, lb. ....	.03½
<b>Tin ....</b>	
.94	
<b>Tungsten, lb. ....</b>	
2.40	
<b>Waste (cotton), lb. ....</b>	
12½-.17	



Copper production, domestic consumption, exports and imports for the past seven years. The curves since 1914 illustrate copper's vital importance in the production of war munitions

## AUTOMOBILE SHEET PRICES

(Based on No 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping.....	6.20	6.10
Automobile body stock, extra deep stamping.....	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 to 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
Black Sheet Extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co. ....	61	63	..
*J. I. Case T. M. Co., pfd. ....	80	86	..
Chalmers Motor Co., com. ....	3½	5½	-1
Chalmers Motor Co., pfd. ....	30	40	+10
*Chandler Motor Co. ....	85	87	+1½
Chevrolet Motor Co. ....	133	135	+2
*Fisher Body Corp., com. ....	37½	39½	+ ½
*Fisher Body Corp., pfd. ....	89	90	- ½
Fisk Rubber Co., com. ....	60	63	+5
Fisk Rubber Co., 1st pfd. ....	98	102	-1
Fisk Rubber Co., 2nd pfd. ....	78	83	..
Firestone Tire & Rubber Co., com. ....	103½	105½	-4½
Firestone Tire & Rubber Co., pfd. ....	92	94	-1
*General Motors Co., com. ....	135½	136½	-18
*General Motors Co., pfd. ....	81	83	+1
*B. F. Goodrich Co., com. ....	45¾	46¾	..
*B. F. Goodrich Co., pfd. ....	99½	101	+1
Goodyear Tire & Rubber Co., com. ....	165	167	-3
Goodyear Tire & Rubber Co., pfd. ....	97	97½	..
Grant Motor Car Corp. ....	2¼	3¼	..
Hupp Motor Car Corp., com. ....	3¼	4	..
Hupp Motor Car Corp., pfd. ....	79	82	..
International Motor Co., com. ....	25	..	..
International Motor Co., 1st pfd. ....	55	..	..
International Motor Co., 2nd pfd. ....	..	..	..
*Kelly-Springfield Tire Co., com. ....	50¾	51½	+ ½
*Kelly-Springfield Tire Co., 1st pfd. ....	79	87	..
*Lee Rubber & Tire Corp. ....	21¼	22½	+1
*Maxwell Motor Co., Inc., com. ....	27½	28½	..
*Maxwell Motor Co., Inc., 1st pfd. ....	54½	55½	-1½
*Maxwell Motor Co., Inc., 2nd pfd. ....	21¼	22¼	+ ½
Miller Rubber Co., com. ....	110½	112½	+ ½
Miller Rubber Co., pfd. ....	97½	99½	+3½
Packard Motor Car Co., com. ....	..	125	..
Packard Motor Car Co., pfd. ....	94	97	..
Paige-Detroit Motor Car Co. ....	18	20	..
Peerless Truck & Motor Corp. ....	13	17	+ ½
Portage Rubber Co., com. ....	..	120	-2
Regal Motor Car Co., pfd. ....	..	..	..

	Bid	Asked	Net Ch'ge
Reo Motor Car Co. ....	14¾	15¾	+ ½
*Saxon Motor Car Corp., com. ....	6½	8½	+1
Standard Motor Construction Co. ....	12	14	..
*Stewart-Warner Speed. Corp. ....	59½	60½	- ¼
*Studebaker Corp., com. ....	44	45	- ¼
*Studebaker Corp., pfd. ....	84	90	+5
Swinehart Tire & Rubber Co. ....	50	55	..
United Motors Corp. ....	31¼	32¼	- ¼
*U. S. Rubber Co., com. ....	61	62	+ ½
*U. S. Rubber Co., pfd. ....	104¼	105¾	+ ½
*White Motor Co. ....	41¾	43¾	+ ½
*Willys-Overland Co., com. ....	19½	20½	+ ½
*Willys-Overland Co., pfd. ....	81	83	-1
Standard Parts Co. ....	..	..	..

\*At close Aug. 3. Listed N. Y. Stock Exchange.

## OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	Bid	Asked	Net Ch'ge
<b>ACTIVE STOCKS</b>			
Auto Body Co. ....	..	7¾	..
Bower Roller Bearing Co. ....	16½	18½	..
Chevrolet Motor Co. ....	132	132	-2
Continental Motor Car Co., com. ....	5¾	5¾	..
Edmunds & Jones, com. ....	14	17	..
Edmunds & Jones, pfd. ....	75	90	..
Ford Motor Co. of Canada. ....	165	173	..
Hall Lamp Co. ....	..	14	..
Michigan Stamping Co., com. ....	12¾	..	..
Packard Motor Car Co., com. ....	..	124	-1
Packard Motor Car Co., pfd. ....	93	..	..
Paige-Detroit Motor Car Co. ....	18¾	..	..
Prudden Wheel Co. ....	..	12	..
Reo Motor Car Co. ....	14¼	15¼	+ ½
<b>INACTIVE STOCKS</b>			
Atlas Drop Forge ....	..	25	..
Kelsey Wheel Co. ....	..	..	..

## Aircraft Production Purchases

WASHINGTON, Aug. 2—The following is a list of purchases contracted for by the Air Service, Aircraft Production:

Dyneto Electric Corp., Syracuse, N. Y., 100 battery charging sets.

Eastman Kodak Co., Rochester, N. Y., 12,-600 dozen commercial plates.

Eastman Kodak Co., 750 gross process films.

Austin Mfg. Co., Harvey, Ill., 1 motor sweeper and supplies.

Dominion Asbestos & Rubber Co., 154 Nassau Street, New York City, 1380 sheets asbestos.

American Bleached Goods Co., New York City, N. Y., 90,000 yards balloon cloth.

Hawkeye Division, Eastman Kodak Co., Rochester, N. Y., 25 aerial lenses.

United States Lens Co., Geneva, N. Y., 1200 negative lenses.

July 5, 1918

Ward Leonard Electric Co., Mount Vernon, N. Y., 200 battery charging panels.

Brown & Sharpe Mfg. Co., Providence, R. I., 1 universal and tool-grinding machine.

American Bleached Goods Co., New York City, N. Y., 15,000 yards balloon cloth.

The Anderson Chemical Co., Wallington, N. J., 2000 gallons diacetone alcohol.

July 6, 1918

Brown & Sharpe Mfg. Co., Providence, R. I., 1 tool-grinding machine and attachments.

American Cellon Co., 887 Fifth Avenue, New York, N. Y., 50,000 gallons cellulose acetate dope.

Napier-Browning Co., 105 West Fortieth Street, Jersey City, N. J., 6100 connectors.

July 8, 1918

Bell & Howell Co., Candler Building, 220 West Forty-second Street, New York, N. Y., motion picture equipment, cameras, lenses, etc.

General Radio Co., 11 Windsor Street, Cambridge, Mass., 2500 receiving sets.

Geo. H. Amick, Clendenin, W. Va., 50,000 feet walnut lumber.

Guy Leonard, Baltimore, Md., services as supervisor of construction and operation of plants manufacturing acetate of lime and other chemicals.

July 9, 1918.

Western Electric Co., 463 West Street, New York City, 280 amplifiers, 300 transmitting sets.

Murray & Tregurtha Co., 340 West First Street, South Boston, Mass., 2 sealeads and motors.

Chemical Products Co., 30 Charles River Road, Cambridge, Mass., 42,000 pounds cellulose acetate.

Champion Ignition Co., Flint, Mich., 15,000 spark plugs.

Simmons Hardware Co., District National Bank Building, Washington, D. C., 5000 gunners' safety belts.

Lewis Thompson & Co., Colonial Trust Co. Building, Philadelphia, Pa., 25,000 feet Mexican mahogany lumber.

Canadian Aeroplanes (Ltd.), Toronto, Ontario, Canada, 150 planes for Curtiss Canadian airplanes.

Ericsson Mfg. Co., Buffalo, N. Y., 95 items, spares for Ferling magneto D-81, contact springs, screws, interrupter levers, etc.

American Proveler & Mfg. Co., Baltimore, Md., 1000 air fans.

July 12, 1918

Century Telephone & Construction Co., Buffalo, N. Y., 109 instruction buzzer sets.

Century Telephone & Construction Co., Buffalo, N. Y., 50 instruction buzzer sets.

Russell, Burdall & Ward Co., Port Chester, N. Y., 37,000 galvanized lag screws.

## Contracts

The Dow Chemicals Co., Midland, Mich., 15,000 pounds cellulose acetate.

The Celluloid Co., 30 Washington Place, New York City, 25,000 pounds triphenyl phosphate.

National Pneumatic Co., 50 Church Street, New York City, interrupter gear parts—Bowden wire controls, 300; copper pipe lines, 400 sets; trigger motors complete, 1200; generator pistons with plungers, 1800; reservoirs complete, 240.

Curtiss Aeroplane & Motor Corp., Buffalo, N. Y., spares for JN4-D planes, ailerons, 6; engine bed crossbars, 13; control wires complete, 50 sets; wing masts, landing gear struts, etc.

Curtiss Aeroplane & Motor Corp., Buffalo, N. Y., ailerons, control wires, windshield, wing masts, landing gear struts, turnbuckles, control pulleys, bolts and nuts, etc.

Phoenix Furniture Co., Grand Rapids, Mich., 500 Handley-Page propellers.

Goodyear Tire & Rubber Co., Akron, Ohio, tape, tubes, rubber cores, fabric rollers and stitchers.

July 17, 1918

Western Electric Co., 463 West Street, New York City, telephone material, extension bells, lamp caps, condensers, mouthpieces, plugs, receivers, etc.

Western Electric Co., 463 West Street, New York City, services development of two high power output amplifiers.

Western Electric Co., 463 West Street, New York City, telephone supplies, cords, resistance lamps, test boards, switchboard lamps, etc.

General Electric Co., Schenectady, N. Y., 868 tripods, 620 of same being 11 ft., 248 of same being 6 ft.

Singer Sewing Machine Co., New York, N. Y., 125 2-needle, 3/4-in. gauge sewing machines.

National Gauge & Equipment Co., La Crosse, Wis., 2500 oil-pressure gauges.

Cunningham Son & Co., Rochester, N. Y., 30 windlasses.

## Contracts for the Marine Corps

WASHINGTON, Aug. 2—Contracts have been placed by the Quartermaster of the United States Marine Corps as follows:

July 22, 1918

Packard Motor Car Co., Detroit, Mich., chassis and equipment.

Morris Truck & Wheel Co., Philadelphia, Pa., truck wheels.

July 23, 1918

Standard Oil Co. (N. J.), Baltimore, Md., gasoline and fuel oil.

July 24, 1918

The Holt Mfg. Co., Peoria, Ill., tractor.

July 26, 1918

Donovan Motor Car Co., Boston, Mass., truck.

## Not to Fix Minimum Wage Rate

WASHINGTON, Aug. 3—The National War Labor Board has decided not to establish a minimum wage rate to be applied to industry generally throughout the country.

## Ordnance Contracts

WASHINGTON, Aug. 3—Contracts were placed by the Ordnance Department of the U. S. Army, as follows:

Remington Typewriter Co., New York; models of bomb release mechanism.

Edward G. Budd Mfg. Co., Philadelphia; airplane flares.

Four-Wheel Drive Auto Co., Clintonville, Wis.; spare parts for 3-ton truck, equipment and main shaft for ammunition trucks.

B. F. Goodrich Co., Akron; rubber equipment for heavy artillery repair shop.

Cleveland Twist Drill Co., Cleveland; small tools for mobile repair shops.

Warner Auto Top Co., Cincinnati; pack carriers, breech lock mechanisms.

Nash Motors Co., Kenosha, Wis.; repair parts for Nash "Quad" trucks.

## To Encourage Rural Truck Routes

WASHINGTON, Aug. 3—Arrangements have been made whereby rural motor truck operators can co-operate with the Bureau of Markets in developing rural truck routes for farm products. Operators of trucks who comply with certain requirements of the bureau will receive assistance in building up business in farm produce, and will receive a sign to display on their machines stating that they are co-operating with the Department of Agriculture. Truck operators can get details of the plan by writing to the Bureau of Markets, Washington, D. C.

## To License Exports for Mexico

WASHINGTON, Aug. 3—The War Trade Board will now consider applications for licenses permitting the exportation to Mexico of numerous commodities. It will be especially liberal in granting licenses for Agricultural machinery, and will license freely articles of steel and iron manufacture which will be used in Mexico for producing war material for the United States.

## Transport Truck Elects Directors

MT. PLEASANT, MICH., Aug. 3—At the stockholders' meeting of the newly formed Transport Truck Co., the following board of directors was elected: H. E. Chatterton, chairman; A. E. Gorham, W. D. Hood, E. J. McCall, C. E. Hagan, Attorneys Warner and Milton A. Holmes. The new company will manufacture internal gear drive trucks immediately. Although the new factory will probably not be finished for 90 days or more, construction of 1½- and 2-ton models will begin immediately at another factory, with an output which will probably reach four or five a day by Sept. 1.

## Calendar

## RACING

Aug. 10—Providence, R. I.  
Aug. 17—Sheepshead Bay.  
Sept. 2—Uniontown. Uniontown Speedway Assn.  
Sept. 7—Chicago. Chicago Speedway.  
Sept. 21—Sheepshead Bay.  
Oct. 5—Cincinnati. Cincinnati Speedway.

## ASSOCIATIONS

Aug. 5-9—Atlantic City, N. J. Motorcycle and Allied Trades Assn., United Cycle

Trade, Cycle Jobbers of America, Cycle Parts and Accessories Manufacturers' Assn. and Bicycle Manufacturers' Assn. Hotel St. Charles.

Oct. 7-12—Milwaukee. American Foundrymen's Assn. and 5 allied organizations. Milwaukee Auditorium.

## SHOWS

Sept. 2-7—Indianapolis, Indiana. State Fair. Indianapolis Automobile Trade Assn.

Sept. 9-14—Milwaukee. Milwaukee Automobile Dealers, Inc. Fourth Annual Wisconsin State Fair. Hart J. Ruddle, Mgr.

Sept. 14-21—Chicago. Automotive and Accessories War Exposition. Municipal Pier.

Oct. 14-27—Dallas, Tex. Seventh Annual Texas Automobile Show. Texas State Fair.

Oct. 16-18—Ottawa, Ont., International Plowing Match.

Tractor and Farm Machinery Demonstration. Experimental Farm.

## ENGINEERING

Sept. 2—Cripple Creek, Colo. American Institute of Mining Engineers.

Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.



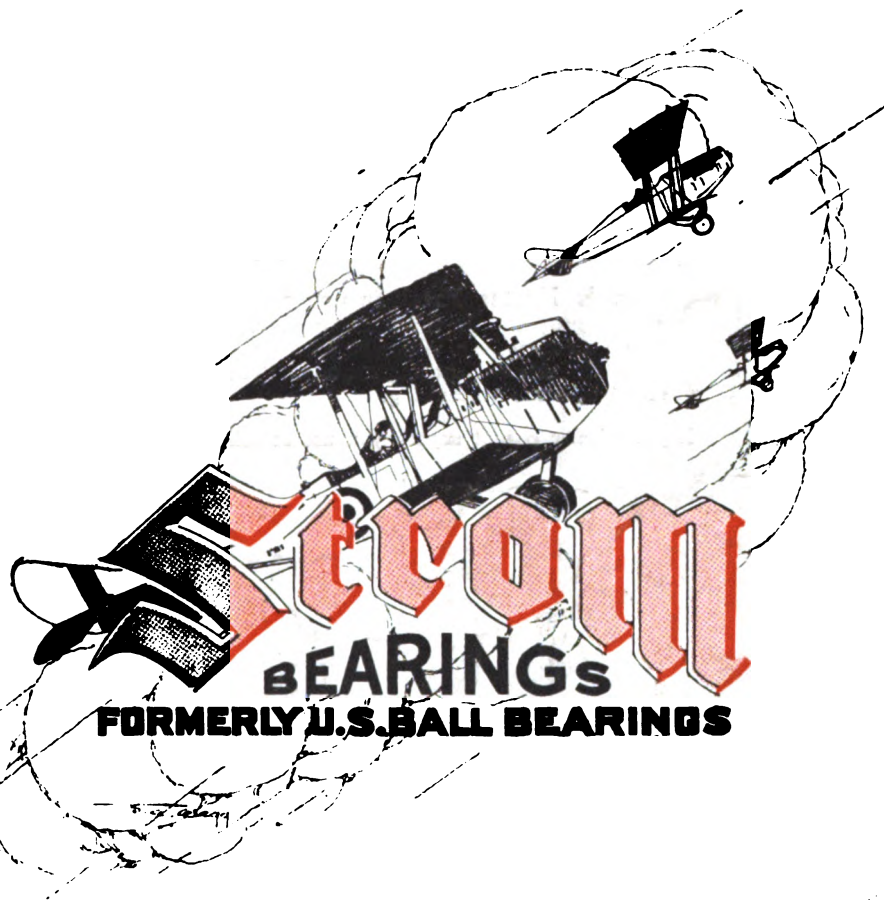
# AUTOMOTIVE INDUSTRIES

GENERAL LIBRARY *The* AUTOMOBILE

AUG 21 1918

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NEW YORK, AUG

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U. S. BALL BEARING MFG. CO., (Conrad Patent Licensee) CHICAGO, ILL., U. S. A.



# THIS 3 MINUTE PATCH CUTS TIRE COSTS

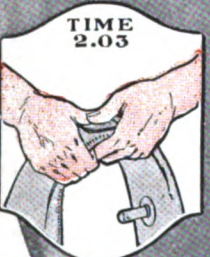
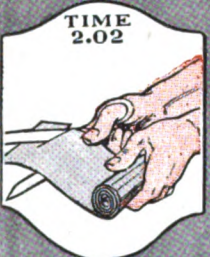
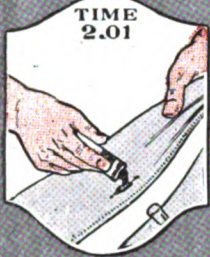
**I**f you'll carry a box of Johnson's Hastee Patch in your tool kit you can get away from the expense of a lot of spare tubes and casings which fast deteriorate during the hot motoring months. A box of Johnson's Hastee Patch in your car answers the same purpose as two or three extra tubes and casings. And there is a saving of 23c over garage vulcanizing on your smallest patch and much more on your large ones.

## JOHNSON'S HASTEE PATCH

Johnson's Hastee Patch gives equally good results on a pin hole puncture or on a large blow out. It is conveniently put up in strips so the user can cut just the right size patch for each repair. With it the most inexperienced motorist can easily, satisfactorily and inexpensively patch his own tires. No time, labor or heat required. The patch can be applied in three minutes—at a cost of 2c and the tire is ready for instant use at any speed.

Johnson's Hastee Patch is not a make-shift—it permanently mends tubes and casings. It is much more satisfactory than vulcanizing because there is no danger of burning and spoiling the tube. The heat from the road does the vulcanizing.

If your dealer cannot supply you use attached coupon.



AND IT'S ON TO STAY



**S. C. JOHNSON & SON**  
I enclose 50c for which please send me by prepaid Parcel Post a 50c package of Johnson's Hastee Patch which I understand is sufficient for 25 average size patches. Satisfaction guaranteed or my money back. Also send me free your booklet on "Keeping Cars Young".

Name .....

Address .....

City & State .....

Dept. A

**RACINE, WIS.**



# AUTOMOTIVE INDUSTRIES

## THE AUTOMOBILE

VOL. XXXIX

NEW YORK—THURSDAY, AUGUST 15, 1918—CHICAGO

No. 7

## Steel Decision Held Up By Delayed Inventories

Threatened 100 Per Cent War Program Apparently Due to  
Failure of Manufacturers to File Steel Inventories Promptly

### WAR BOARD REFUSES OFFER OF CAR MAKERS FOR 50 PER CENT REDUCTION FOR 1919

**W**ASHINGTON, D. C., Aug. 14—The offer of the automobile makers to cut passenger car production 50 per cent for the year beginning August 1, 1918, as agreed upon at the meeting of the N. A. C. C. members in Detroit August 6 was not accepted favorably by the War Industries Board, which Board has answered the offer of the automobile makers by declaring that at this time it can not make any promises whatsoever regarding the supplying of steel, rubber and other materials to the automobile industry covering any definite period in advance.

The reason given for this reply is that at present it looks as if there will be little if any of the principal materials needed in the construction of a passenger automobile available for non-war industries after the war requirements have been taken care of.

The War Industries Board in its reply to the N. A. C. C. intimated that it was disappointed in not having received from the automobile makers the sworn inventories showing the quantities of different grades of steel on hand, and with which the War Industries Board hoped to arrange some plan for a balancing of inventories as far as possible.

At present perhaps 50 per cent of these inventories have been forwarded by the companies and there have been some delays with the others. Because of this the War Industries Board in its letter to the N. A. C. C. stated that no steel will be furnished automobile makers until they have filed with the board these sworn statements coupled with an agreement that the makers will

furnish to the Board any such additional information from time to time as it may require.

The War Industries Board holds out a moiety of hope against the 100 per cent reduction which it urged automobile manufacturers to make when it adds in its letter that as soon as it receives the sworn statements regarding inventories it will take appropriate action on them and immediately advise the makers.

The shortage of steel, rubber and other materials seems to be so acute in the estimation of the War Industries Board that it has urged the automobile manufacturers to undertake to get on a 100 per cent war basis by January 1, 1919, and adds that in no other way can the makers be sure of the continuance of the industry and the preservation of the organization.

The complete text of the reply of the War Industries Board to the offer of the N. A. C. C. is published herewith.

This letter from the War Industries Board was a complete surprise to the automobile makers, as well as to Hugh Chalmers, who had represented the N. A. C. C. before the Board. Only two days before this urging of automobile makers to get on a 100 per cent war basis not later than January 1, 1919, was announced in the letter, Mr. Chalmers waited on the Board and laid before it the offer of the automobile makers to make a 50 per cent cut in production for the year beginning August 1, 1918, as compared with 1917 production. In his hearing before the Board there was no intimation that the Board was contemplating any further action until it passed on



the various sworn statements on inventories of the companies. The present announcement given generally to the press has created a great amount of unrest and uncertainty throughout the industry, particularly as there is nothing definite as to what the board will do until it receives the inventories, when, according to its letter, it will take appropriate action and advise the industry.

It seems most unfortunate that such a conflicting atmosphere should have surrounded this entire matter, and doubly unfortunate that any such drastic announcement should have been made before the inventories which were asked for on July 16 should have been passed upon. It was expected that nothing of this nature would take place—in fact, such was the general understanding on the subject.

When Mr. Chalmers left his meeting with the War Indus-

tries Board he was certain some aid would be given the industry in securing steel. On the other hand, the War Industries Board, following Mr. Chalmers' departure, issued a statement informing the industry that it can only be assured of its continuance by conforming to the board's desire and going on a 100 per cent war work program.

The board does not explain how the passenger car manufacturers can continue business if they take on 100 per cent war work leaving .000 per cent organization and facilities for car manufacture. Neither does it tell the manufacturers how to secure 100 per cent war work. Presumably it leaves these puzzles to be solved by the industry.

Mr. Chalmers came to Washington Thursday to inform the War Industries Board of the unanimous vote of the N. A. C. C. to curtail passenger car production 50 per cent as com-

## Full Text of War Industries Board Statement Regarding Steel Curtailment

**T**HE sub-committee appointed Thursday, August 8, with full power to act for the War Industries Board concerning the output of automobiles, makes known its position in the following letter to the National Automobile Chamber of Commerce:

NATIONAL AUTOMOBILE CHAMBER OF  
COMMERCE,

7 East 42d Street,  
New York City.

Gentlemen:

We are in receipt of and have given very careful consideration to your communication of August 8, embodying the resolutions passed at your meeting at Detroit, Tuesday, August 6. We note that the manufacturers have voluntarily agreed among themselves to curtail the production of passenger cars 50 per cent. While this is clearly a step in the right direction and furnishes a basis for each and all of the manufacturers, without further delay, to make appropriate reductions in selling, general and overhead expenses, still it is only a step, and further curtailment is inevitable. Fairness to your industry impels us to state frankly that the situation as it is presented to us to-day indicates very clearly that there will be little, if any, of the principal materials required in the construction of passenger cars available for non-war industries after the war requirements shall have been provided for, and the War Industries Board cannot at this time make any promise whatsoever regarding the supply to your industry of steel, rubber or other materials for any definite period in advance. We strongly believe that it is to the best interest of your members and all other manufacturers of passenger automobiles to undertake to get on 100 per cent war work as

rapidly as possible and not later than January 1, 1919, for in no other way can you be sure of the continuance of your industry and the preservation of your organization.

We regret that we are not in a position at this time to give you a more definite reply to your communication of the 8th instant due to the fact that the data and information which on July 16 we requested you to promptly furnish us have not yet been received. As soon as received prompt and appropriate action will be taken, of which you will be immediately advised.

No material will be furnished to any passenger automobile manufacturer until it has filed with this Board a sworn statement embodying the information requested on July 16 coupled with an agreement to furnish this Board with such additional information from time to time as it may require.

Yours very truly,  
WAR INDUSTRIES BOARD.

At a meeting of the War Industries Board on Thursday, representative of the National Automobile Chamber of Commerce presented resolutions adopted at Detroit in which the manufacturers of automobiles voluntarily agreed to cut their production 50 per cent beginning with August of this year. Reference in the above letter to the request made on July 16 for certain information from the automobile manufacturers relates to the inventories of the steel which each manufacturer had on hand at that date.

with 1917. He also presented a pledge which the manufacturers are willing to give. The N. A. C. C. meeting and the resolution were the result of a conference early in July between Mr. Chalmers and the War Industries Board, when Bernard Chalmers, chairman of the board, suggested that the manufacturers should get together and determine what would be the maximum curtailment. In voting a 50 per cent cut the manufacturers reached what they think is the largest curtailment compatible with industrial conditions and which they will allow retention of organizations and operation during the emergency.

#### Committee Appointed

Chalmers, after his arrival here, held four conferences with members of the War Industries Board. At the Thursday morning he presented the resolution of curtailment and the tentative pledge. At this meeting a committee was appointed by Mr. Baruch which comprises Alexander Legge, Requirements Division; Judge Ed-ward Parker, Priorities Board; George N. Peek, Finished Goods Section, and J. Leonard Replogle of the Steel Section of the War Industries Board, to deal completely with matters regarding the automobile industry.

During the two conferences of the first day, Mr. Chalmers stated that nothing definite had been done beyond the adoption of the resolution and curtailment. His statement contrasted with the rather noncommittal statement issued late in the day by the War Industries Board, as follows:

"Mr. Chalmers, representative of the National Chamber of Commerce, appeared to-day before the War Industries Board and presented resolutions adopted unanimously by the automobile manufacturers at a special meeting in Detroit. By these resolutions the manufacturers volunteered to curtail the production of passenger cars 50 per cent beginning Aug. 1. Mr. Chalmers also presented a form of pledge which the automobile manufacturers agreed to make concerning their output. The War Industries Board has appointed a committee with full power to act on the matter of automobile production."

On the second day here Mr. Chalmers stated that confer-

ences with the War Industries Board had been highly satisfactory. The board, he said, welcomed the co-operative spirit displayed by the manufacturers and was attempting to meet that spirit in turn. The 50 per cent curtailment figure was accepted by the board, said Mr. Chalmers, as a regulatory figure by which the manufacturers might guide themselves in making reductions in overhead, inventories and other similar expenses. However, he added, the board did not promise to provide steel to meet this figure. The situation, though, appeared optimistic. The meetings of Mr. Chalmers with the small sub-committee allowed for close, friendly and open discussion of the various problems connected with the curtailment. Such matters as the British complete curtailment of passenger car manufacture were brought up and discussed and explained. The difference between the Ford Motor Co., which has \$400,000,000 worth of war work and other smaller passenger car manufacturers unable to secure the war work was clearly defined.

#### Friendly Spirit Shown

When interviewed after his meeting with the board Mr. Chalmers said that no decision had been arrived at and that none would be until after all of the inventories of steel now being compiled by the manufacturers were received in Washington and checked by the War Industries Board, following which definite decisions regarding the allotment of steel to the industry would be made. Mr. Chalmers emphasized the exceedingly friendly spirit by which he had been met by the board, and was certain that all that could be done would be handled in a broad spirit by the board at the next conference, which is to take place in about 10 days. Asked if the board would issue any further statement, Mr. Chalmers said that this was answered in the negative, saying that there was nothing further that the War Industries Board could say at this time.

After Mr. Chalmers left Washington the War Industries Board addressed a letter to the New York office of the N. A. C. C. urging that the industry get on a 100 per cent war work basis. This letter, together with comment, was issued to the general press.

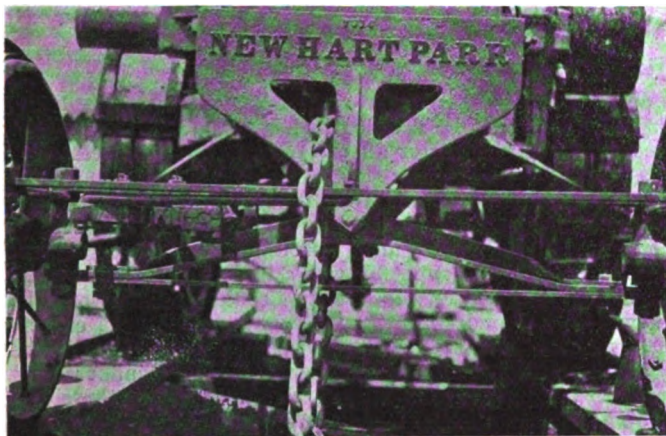
## Fighting Motor Trucks on the Italian Front



An Italian anti-aircraft battery operating on the Corso. The Italians, from the very beginning of their participation in the war, have been extensive users of motor-propelled apparatus, and because of the mountainous character of the country through which their battle lines run they have benefited greatly thereby.

# Possibilities for Standardization in Tractor Front Axles

Each Manufacturer Now Compelled to Design and Make His Own, With Resulting Variety of Type and Increased Cost of Production—A Few Standard Designs Would Meet All Requirements



*Arch type of built-up axle*



*Bolster bracket carried on axle*



*High bracket between axle and frame to give height for the rear end*

**W**HAT should be one of the easiest tractor problems to solve is the design of the front axle, and of all the components of a tractor there is hardly one which lends itself more to standardized or specialized manufacture. However, there are no signs as yet that tractor makers are getting their front axle designs from axle manufacturers, for hardly any two tractor front axles are similar in shape, and much less in dimensions.

The divided or Ackerman steering axle is now used on the great majority of tractors, though a few makers still stick to fifth wheel steering, the axle being turned by means of heavy chains wound around a drum which the operator turns through a worm and wheel mechanism. This latter is the accepted steering gear for heavy steam tractors, and those makers of gas tractors whose previous experience has been with steam tractors somewhat materially cling to this practice.

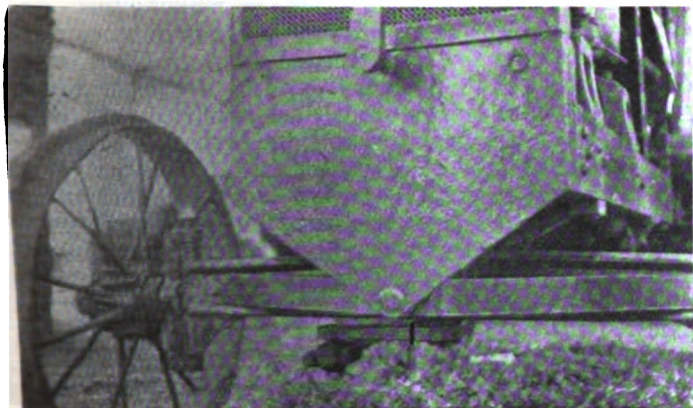
Of the Ackerman type axles practically all carry the load at the middle through a pivot support. To take up the horizontal shock on the axle when one road wheel strikes an obstruction, diagonal radius rods are run from points on the axle close to the steering heads to points on the frame at or close to the fore and aft axes. In a few instances the need for these radius rods is obviated by providing two bearings for the central pivot support a considerable distance apart or by providing a vertical disk at the forward end of the frame against which the axle rests.

In practically all tractors the frame is considerably higher than the front axle, because it lies on top of the rear axle, which is higher than the front axle, as the rear wheels are of greater diameter than the front. To make front axle and frame join up, some makers kink the axle up at the middle, others provide the frame with a downwardly extending bracket, while still others secure a sort of pedestal to the axle to which the frame is pivoted.

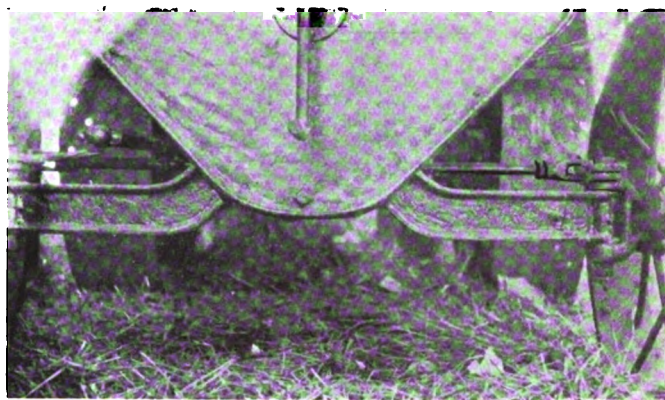


*High pivot together with Lemoine pivots to give front end height*

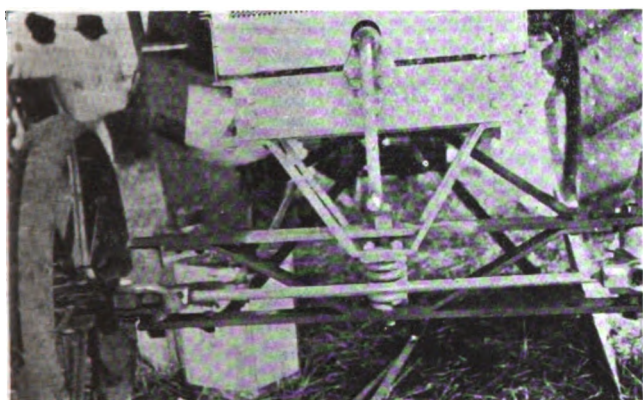




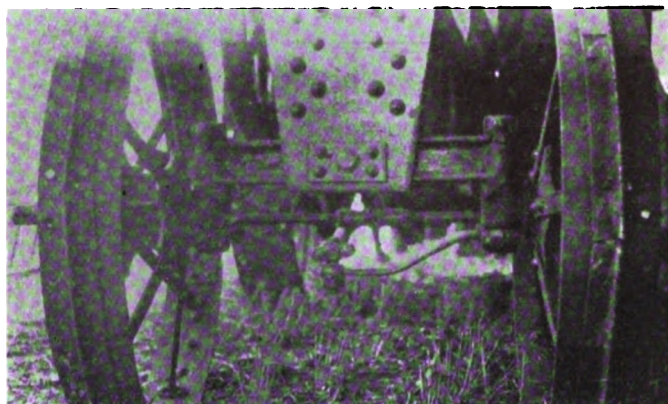
*Axle with inverted Elliott steering knuckles*



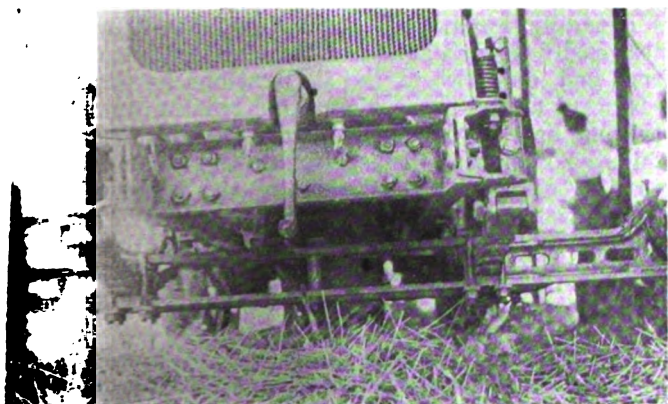
*Axle with center kick-up*



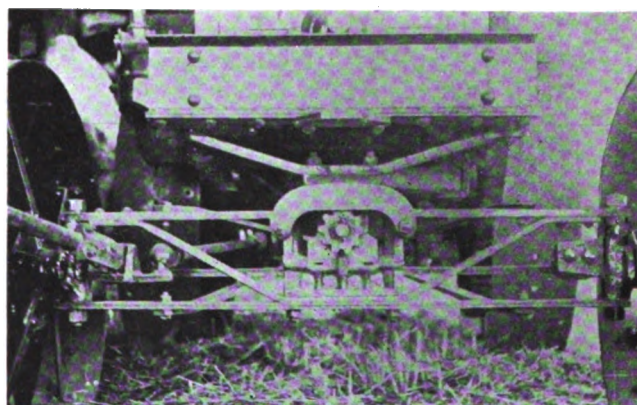
*Built-up axle with spring support*



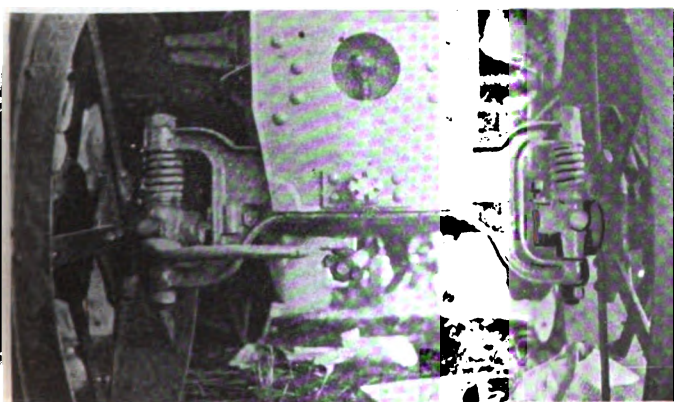
*Short axle and high center bracket raising frame above front wheels*



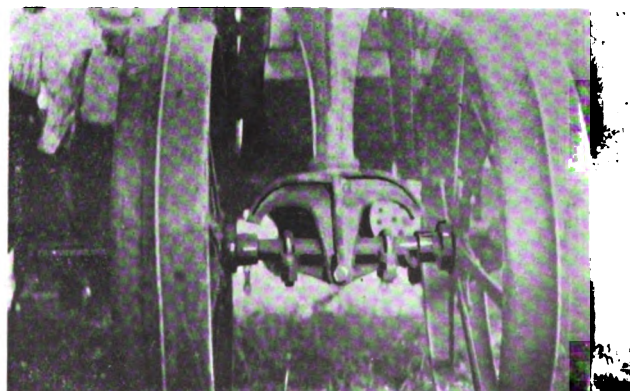
*Built-up axle with  $\frac{1}{2}$  ell*



*Axle with transverse adjustment for furrows*



*Spring support on steering knuckle*

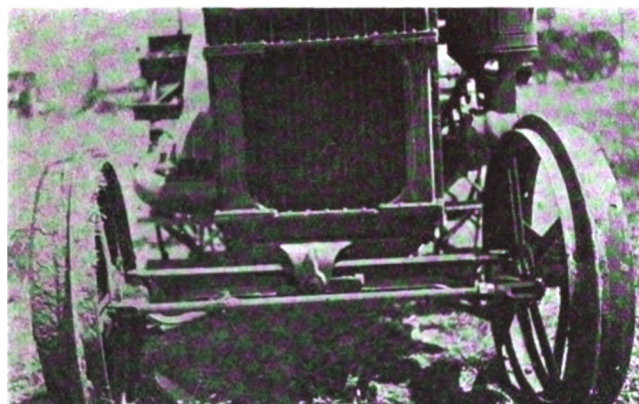


*Extremely narrow tread front end*

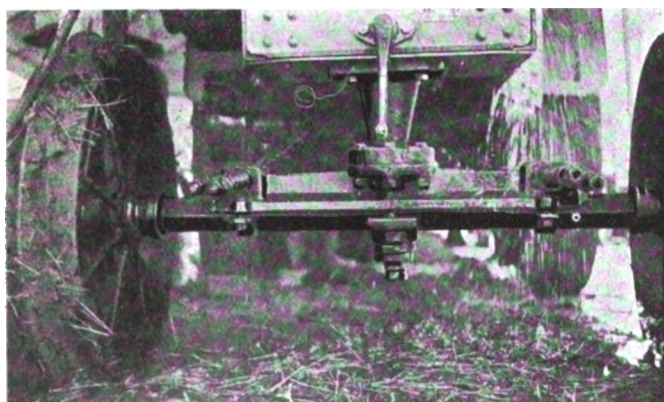




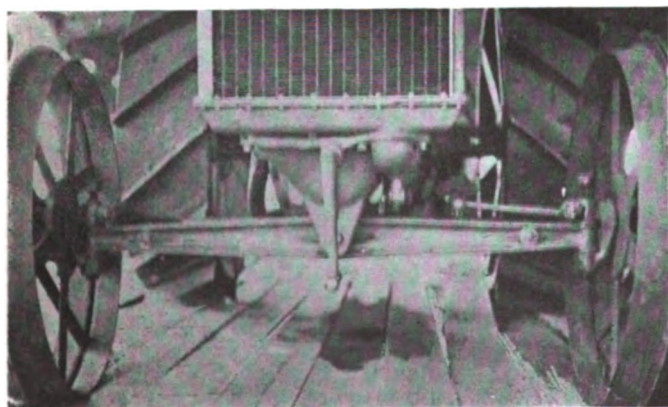
*Arched axle with diagonal radius rods*



*Straight axle with inverted heads*



*Fifth wheel steering design*



*Axle section varies in proportion to bending moment*

From the standpoint of ease in manufacture the straight axle seems to be preferable. It is quite evident that as yet only few drop forged front axles are used on tractors, or, to be more explicit, a comparatively small number of tractor models are equipped with drop forged axles. The drop forged axle is generally regarded as the highest type of axle construction, and that it is not used more extensively is due to the fact that many makes of tractors are not turned out on a sufficiently large scale to warrant the comparatively heavy investment in dies necessary. Those tractors which are produced in the largest numbers generally have drop-forged axles. Others employ cast steel axles and built-up axles of strip steel or partly of strip steel and partly of castings. The built-up axle is certainly not the tractor axle of the future. Its use may be fully warranted, however, at the present time because its manufacture may be within the capacity of the truck manufacturers' own works, and independence of outside shops is quite an advantage in these strenuous times, even though the tractor has a high priority rating.

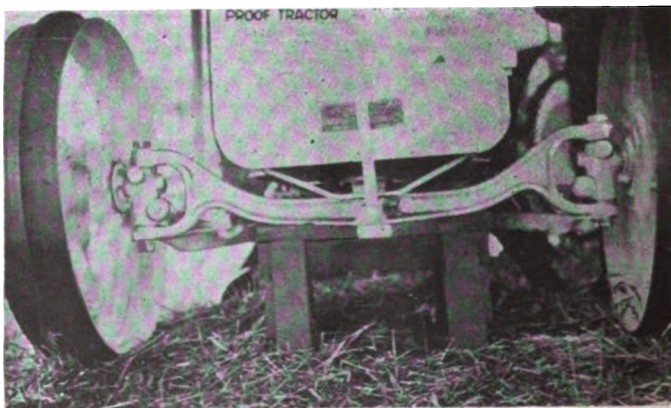
#### Variety in Steering Heads

As regards type of steering heads and knuckles, all of the three well known designs are in evidence—the Elliott, the inverted Elliott and the Lemoine. The Elliott appears, however, to be in the lead, and it would not be surprising if it won out in tractor work the same as it has in automobile work.

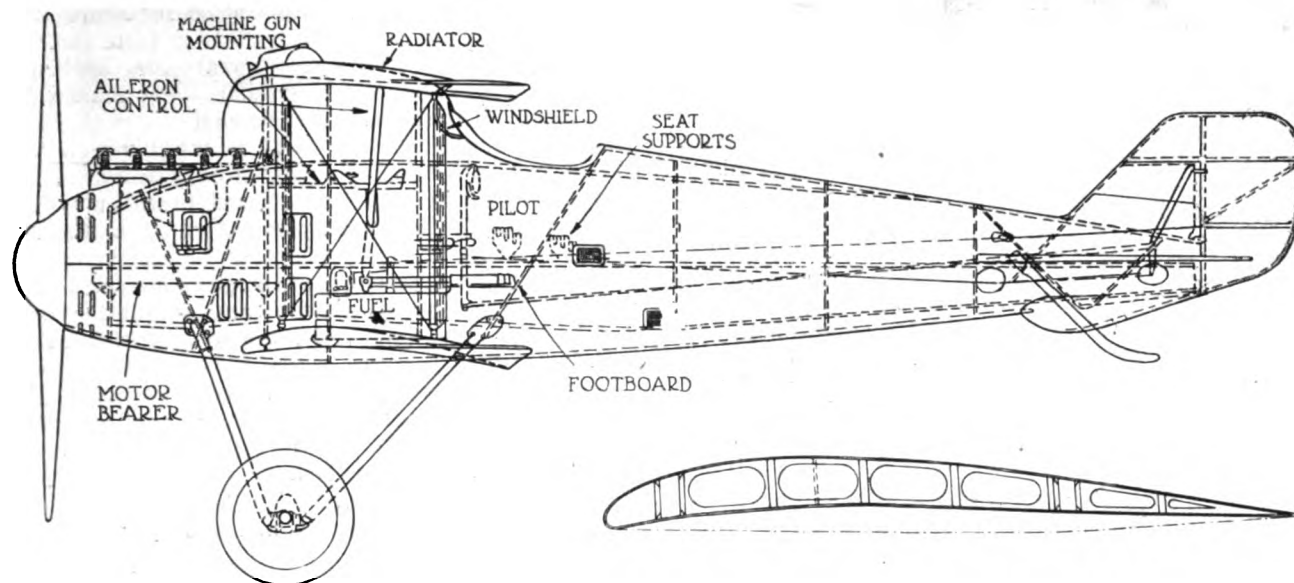
In examining tractor front axle designs one misses that nice distribution of material in accordance with variation of load as may be found in the more developed automobile axle. For instance, if the load is supported at the middle of the axle the vertical bending moment will be greatest at that point and the height of the section can decrease toward the steering heads.

Although the advantage of spring-mounting a tractor is generally recognized, and spring mounting can be most easily effected and is of the greatest benefit at the front end, only two of the illustrations herewith show a forward spring suspension. One tractor has the conventional half elliptic springs under each frame side rail, while the other has coiled springs on the steering knuckle pins, through which the weight of the tractor forward part is transferred to the stub axles. This latter construction looks very simple and attractive, though some difficulty might be anticipated with the lubrication of the pins.

**EXPERIMENTS** recently carried out are said to have shown that the inner tube of pneumatic tires keeps its elasticity for a long time when lying in a solution of 10 per cent glycerine and 1 per cent soda in water.



*Axle with drop effect and rather prominent steering yokes*



# The Roland Single Seater Fighter

Mechanical Details of a Fast Machine of Very Light Construction—Fuselage Built of Plywood Covered with Fabric

**A** SOMEWHAT detailed description of the Roland single seater biplane, one of the fast German machines, appeared in a recent issue of *L'Aerophile*. We have redrawn the illustrations accompanying the article and reproduce the following from the description.

The single seater Roland biplane D-II, which first made its appearance at the front in March, 1917, is again frequently met with by French pilots, especially in the eastern sectors. The principal dimensions of this machine are as follows: Span of upper plane, 29.2 ft.; span of lower plane, 27.9 ft.; length, 22.8 ft.; height, 9.7 ft. The weight of the machine, 1820 lb., is slightly greater than that of the Albatross D-III. As it has a lifting surface of 248 sq. ft., the load carried per square foot is about 7.3 lb.

The construction of the fuselage is noteworthy. It is built entirely of plywood, covered with fabric, monocoque fashion, and it has an oval section which ends in a vertical knife-edge at the stern post. The construction is very light, the framework consisting of very thin longerons extending the whole length of the fuselage. Rigidity is secured by means of plywood partitions uniting the middle of the top half with the middle of the bottom half. The total thickness of the six layers of the plywood is only 1/16 in. At the rear of the pilot's seat there are only four thin layers. Between the pilot's seat and the engine there is a superstructure to the fuselage which thins out at the top to a fin 4.4 in. thick, to which are attached the radiator and the upper plane.

The central section of the upper plane is hollowed out to provide space for the radiator. In this way the cabane is eliminated. On the lower part of the fuselage there are two shoulders, one on either side, to which the lower planes are secured. At the rear the tail skid, built of timber and shod with metal, penetrates the fuselage through a kind of swelling, which reminds one of the Nieuport construction. The pilot is seated high up, his vision being assured by two windshields placed one on each side of the central ridge. The field of vision is

very obstructed and visibility is not so good as in other machines.

The planes are trapezoidal in plan, unequal in span, without stagger or dihedral, but swept back  $1\frac{1}{2}$  deg. Their chord is uniformly 57 in., and their gap 53 in. Their ribs are perpendicular to the leading edge, and, as each strut of a pair is attached to a common rib and the wings are swept back, the struts are not exactly one behind the other.

The upper planes are formed on two spruce spars placed 32.6 in. apart, the front one being 5.12 in. from the leading edge. There are 12 ribs, which are placed 14.6 in. apart and are interspaced with laths 0.4 in. wide, running from the leading edge to the rear spar. The distance between the main spars is maintained by four compression members consisting of steel tubes. These are 1 in. in diameter and are placed at equal intervals of 5.4 in.; they are cross-braced by  $\frac{1}{8}$ -in. piano wire. Two fabric strips between the leading edge and the front spar and two others between the front and rear spars alternately pass from one rib to another, over and under it. Some angles in the wing frame are kept rigid by plywood angle pieces.

The ailerons, which are fitted to the upper plane, do not project and are unbalanced. A strip of plywood placed over the fabric protects the aileron hinge at its attachment to the rear spar. Along this line the aileron measures 71.6 in. It is 16.5 in. wide. Its pivot consists of a 1.2-in. tube. The aileron cranks are operated by two vertical tubes, Nieuport fashion.

In the upper left-hand wing there is a gravity feed fuel tank. The upper planes are attached directly to the highest part of the fuselage, with the aid of a special bolt which recalls the system of attachment used on the R.V.G. CIV.

The structure of the lower wings is like that of the upper wings. The spars are disposed in the same way and, consequently, maintain the same distance between one another. There are ten ribs to each wing, of which



nine are 0.4 in. and the last is 1 in. thick. Between any two of them there is also a light lath 0.4 in. thick. The bracing is the same as in the upper wings, except that the struts, made of four steel tubes, are slightly different, the first being of 0.8 in. and the three others of 1 in. diameter. From the first to the second is 46 in., from the second to the third, 44.5 in., and from the third to the fourth, 43.7 in.

The lower wings are secured to the stub planes on each side of the base of the fuselage. The angle of incidence is 4 deg. at the second rib and 3 deg. at the seventh. The inter-plane struts are of 1 in. diameter, placed inside a stream line of wood which gives them a depth of 3.6 in.

The whole tail unit is of a trapezium form, with a large triangular piece of small depth cut out of the base. The fixed tail plane is of wood and the two balanced members forming the elevator are entirely of metallic construction. The leading edge of the fixed tail plane is of wood, hollowed on the inside. A piece of wood, which traverses the fuselage and sticks out 20 in. on each side of it, is embedded in the hollow part of this leading edge and thus insures absolute rigidity. Two struts of stream line tubes running from the top of the fin to the angle of the elevator further add to the rigidity. The rudder is almost rectangular in form, with rounded corners. It is balanced by a triangular part surrounding the pin, of which the leading edge is similarly oblique. The rudder

is tubing and the pin is of 3-ply wood forming part of the fuselage.

The control cables of the elevator are concealed inside the fuselage and those of the rudder only come out of the fuselage about 40 in. from the end.

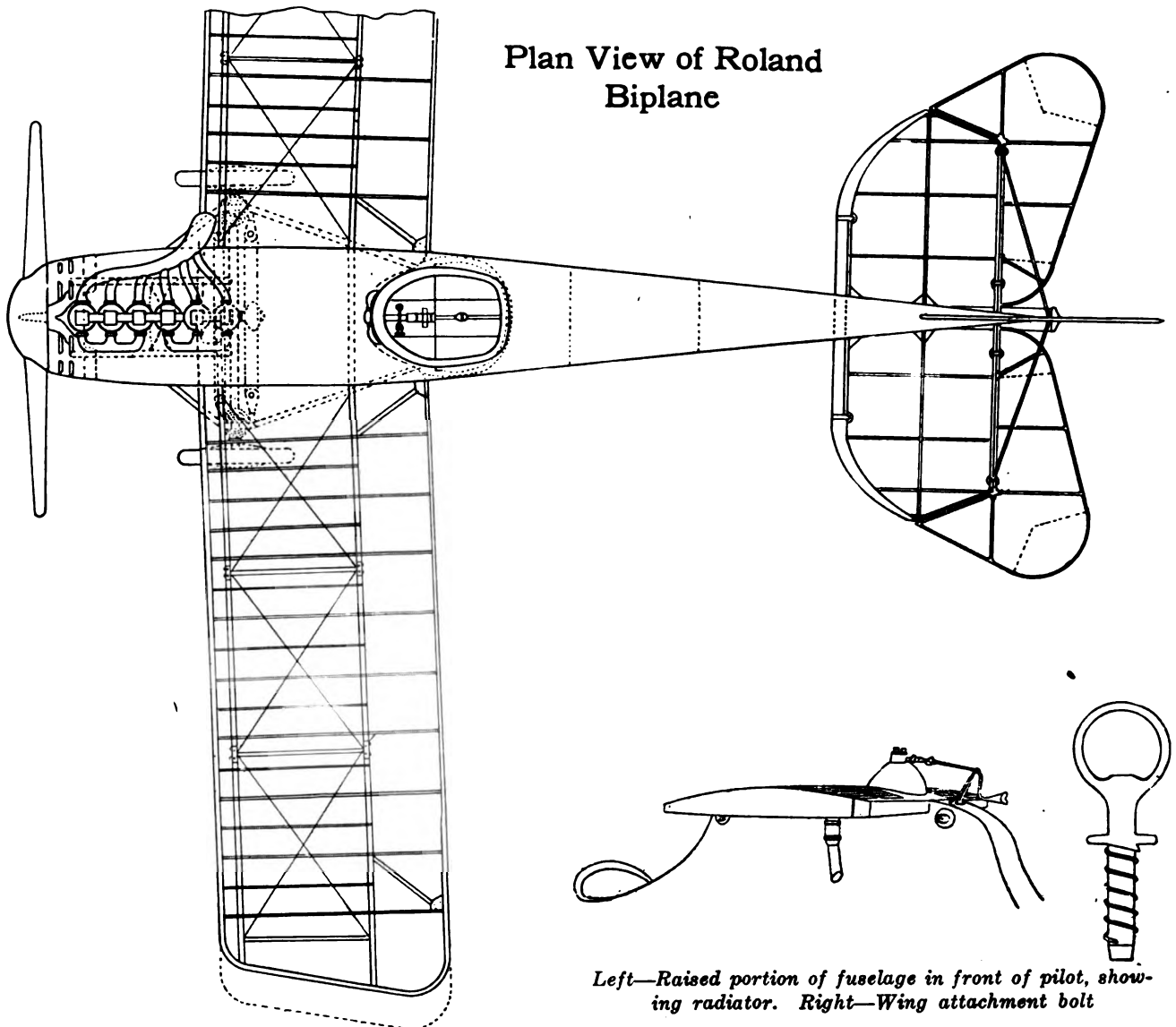
The single-seater Roland D-II is fitted with a Mercedes engine of 160 hp. of a type already described. Besides the supplementary tank placed in the upper left plane it has a tank measuring 28 x 28 x 10 in. under the rudder bar.

There are two Spandau machine guns operated by the motor. They are placed one on each side of the engine inside the fuselage, from which they only protrude at the front.

The undercarriage is formed by two tubular V's held together by two cross cables. Their point of attachment corresponds to the base of a partition of the fuselage. The axle is placed between two tubes and is enclosed in a streamline casing. The wheel track is 70 in. The wheels are 30 x 3.94 in. and the springing is of rubber cords.

It has been said that the D-II Roland, owing to its light construction, often suffers from a deformation of its fuselage and is very apt to spin. It is, however, certain that this machine, which was quite a new idea at the time of its creation, has been among the best of the German chaser machines.

Plan View of Roland  
Biplane



Left—Raised portion of fuselage in front of pilot, showing radiator. Right—Wing attachment bolt

# Steering Creeper and Two-Wheeled Tractors

An Outline of Various Plans for Steering Tractors by Other Methods Than That Involved in the Ackerman Steering Axle

By A. C. Woodbury

**I**N tractors of the most familiar type there are two rear driving wheels and two front steering wheels, just as in a motor car. It is necessary that the steering wheels carry a portion of the weight of the tractor, as else they cannot serve to guide the machine, especially where rough ground, unequal traction or other unfavorable conditions make it difficult to follow the desired course. This weight on the steering wheels must be a net weight, after deducting from the dead weight the lifting tendency due to the torque reaction at the driving wheels and correcting for the effect of any change of the center of gravity due to grade. Three-wheeled tractors and even some creeper or track-laying tractors also have

ing axle, engine and all, pivoted to a backwardly extending member which is attached to the plow or other implement which is being drawn. The driver sits on the implement seat and the tractor controls are brought back to a position where he can conveniently reach them. Thus the combination of the tractor with a two-wheeled implement forms a four-wheeled unit, of which the front two are both the driving and the steering wheels. Steering is accomplished by a pinion and a large sector, the former connected to the steering hand-wheel, the operation of which pivots the whole front unit almost as the front wheels of a wagon pivot on the "fifth wheel." As the front unit is so heavy, an independent brake is provided on each side to assist in making a turn. The drive is through a differential of a type which is not free and therefore tends to make the tractor follow a straight course.

## Electrical Steering

Since electrical equipment is beginning to make its way among tractor builders, it would not be a long step to introduce electrical control for this type of steering. An irreversible worm and sector might be substituted for the pinion and sector, the worm to be driven by a small electric motor attached to the backwardly extending tongue of the tractor. A controller for such a device is illustrated in diagram in Fig. 1. The sector, made of insulating material, is mounted on the tractor, A being concentric with the pivot of the tongue. The four strips shown are connected to the battery terminals, as indicated by the + and - signs. The two full circles represent brushes which are connected to the terminals of the steering motor and mounted on a swinging arm attached to the tongue at A and connected to the steering hand-wheel or lever. When the tongue is at right angles to the axle, as in straight ahead driving, and the arm is in middle position, the brushes will be in the positions shown by the full circles. If it is desired to turn to the left the arm is moved so the brushes make contact with the right strips as shown by the dotted circles. This starts the steering motor in the direction required to turn the tractor toward the left, and as the tractor turns the sector is carried with it till the relative positions of sector and brushes are as shown by the full circles. When this position is reached the motor is disconnected from the battery and stops. When it is desired to straighten out again it is only necessary to return the arm with its brushes to its middle position and the tractor will follow.

A popular way of steering creeper tractors is by merely applying a brake to the side toward which the tractor is to turn, the tracks being driven through a differential. A creeper tractor generally tends to run in a straight line unless the resistance is considerably greater on one side than on the other, but a differential lock is sometimes added to make the control more posi-

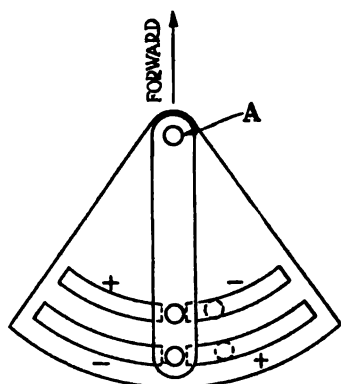


Fig. 1—Controller for electric steering gear

a steering wheel which must similarly bear a portion of the weight of the tractor in order to be effective.

When compared with a four-wheel drive tractor or a creeper tractor whose whole weight is carried on its tracks, any weight carried on the steering wheels is wasted so far as producing traction is concerned. In other words, this loss is a part of the price paid for avoiding the complications of the types in which all of the weight is carried on the drivers. Without discussing the comparative merits of the various types, we may say that large numbers of the creeper type tractors are sure to be built, and if problems connected with the two-wheeled type, such as those of steering, attachment to implements, and transportation when not attached to any implement, are worked out to the complete satisfaction of the users, this type may prove to be the most practical of all for many farmers.

The problem of steering a tractor by its driving wheels has been solved in various ways, all more or less practical but none altogether ideal, and it seems to offer a profitable field for improvement. Following is a description of some of the possible solutions, some of which are in commercial use, while others are only possibilities.

The method used for steering one of the most popular two-wheeled tractors is to have the tractor unit, includ-

tive. This is probably the simplest steering control that can be found for the creeper type tractors, and on that account it may be the ultimate, but it certainly is not ideal for delicacy. The brakes are controlled by turning the steering hand-wheel to one side or the other enough to obtain the required amount of friction, and the amount required for a certain turn depends upon the nature of the ground and other conditions. A driver who is experienced with this sort of steering can control the tractor well, but to a novice at least it seems to leave something to be desired when compared with the direct and positive steering of a motor car. Of course, there is also some loss of power resulting from the application of the brake, but this is quite negligible under ordinary conditions.

It seems to the writer that a real improvement can be made on this type of steering by developing other means than brakes for controlling the differential. One device

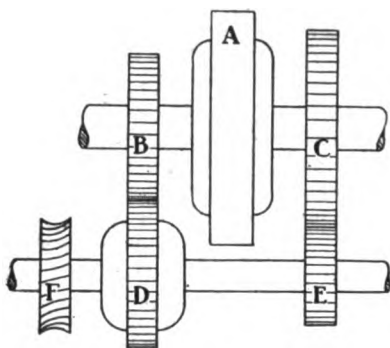


Fig. 2—Steering through the differential

for this purpose has been described in the trade press and is perhaps covered by patents but has not been commercially applied to creeper type tractors. It is diagrammatically shown in Fig. 2.

The differential and drive gear through which power is transmitted to the axle, bull pinion shaft or sprocket shaft (for brevity we will call this the axle) are represented by A. Beside the differential are two gears, B and C, one of which is attached to the axle shaft and the other either to the differential case or the other axle shaft. These two gears mesh with gears D and E on a parallel shaft. Gear D is mounted on a second differential, while gear E is attached to one of the shafts projecting from the second differential. The gear ratios are such that when gears B and C are rotating at the same speed, as they do when the tractor is following a straight course, gear E turns twice as fast as gear D. Under these conditions the other shaft projecting from the second differential, with the worm gear F mounted upon it, remains stationary. This is due to the properties of a differential which cause one wheel of a car to rotate at twice the speed of the drive gear when the other rear wheel is held stationary. This worm gear F therefore gives us absolute control of the action of the main differential and through it of the direction of the tractor. So long as it is held stationary the two drive wheels or tracks can turn only at the same speed and the tractor can go only in a straight line either ahead or backward, while turning the worm wheel in either direction causes one wheel or track to advance ahead of the other, thus changing the direction of the tractor. The worm wheel may be turned by a worm either connected directly to a steering hand-wheel or to a shaft that can be power driven in either direction at will.

Another method of controlling the differential would require a shaft parallel to the axle as in the last described device. This shaft would be solid and would be connected

to the axle at one side of the differential by a chain and at the other side by a belt with variable pulleys, or by some other variable speed drive. The sprocket ratio should be the mean of the variable drive ratios, and the greater the variation possible in the drive the greater would be the available turning angle. The turning angle could be increased by connecting one of the drives to the differential case instead of to the axle shaft, or by replacing the chain connection with a duplicate variable speed drive, the controls of the two being interconnected.

A simpler arrangement is available if the drive is such as to make it possible. This would consist merely of a variable drive to one side of the differential from the same shaft from which the main drive is taken. It might be a belt on variable pulleys beside a chain drive, a friction disk and chain beside a worm or bevel gear drive, or some form of hydraulic drive. Of course, no drive for controlling the differential as suggested would need anything like the capacity that would be required if the whole or even half of the power of the engine were to be transmitted through it. Therefore variable speed devices that would be out of the question for driving the tractor might be quite practical for controlling its direction.

One of the simplest ways of controlling the direction of a creeper type tractor is to omit the differential and provide instead a clutch between each track and some common point in the drive. Releasing one clutch transfers all the driving effort to one of the tracks, which then naturally runs ahead of the other and causes a turn. The nature of the ground and the amount of draw-bar pull being exerted effect the sharpness of the turn and we believe brakes are provided as a further means of regulation.

#### Application of Hydraulic Drive

An ideal drive which would include steering and gear changing as well could certainly be obtained by hydraulic means if hydraulic drives were all their most enthusiastic friends would have us believe. Two variable displacement pumps and two hydraulic motors would be required, together with a method of control which would make it convenient to vary the displacements of the two pumps either simultaneously or independently. The last would not be difficult, but the whole thing has a rather expensive sound and there is some question whether durability and freedom from leakage could be secured in the gritty, dusty conditions in which agricultural tractors work.

A variation of this drive would be to provide a change gear and a gear drive to one track or wheel and a variable hydraulic drive between the change gear and the other track or wheel. This would probably reduce the cost at a sacrifice of some of the ideal qualities of the purely hydraulic drive.

Of course, other variable speed drives are also available, including friction and variable belt drives. Friction drives have already been used to some extent for propulsion of small tractors at least. It remains for those who are commercially interested in these various drives to show how they can be advantageously applied to this steering problem.

To the writer it seems that some one of the methods outlined for controlling the differential other than by brakes, or some simpler means of accomplishing the same result as effectively, would prove a very desirable method of steering either a creeper type of tractor or one carrying practically all its weight on two drive wheels. It should be easier to control than the steering now generally provided, and might prove a convenience in getting the latter type from one implement to another.



# Official Guide for Airplane Inventors

## Possibilities for Inventions and Improvement in Aircraft Design as Stated by Naval Consulting Board and War Committee of Technical Societies—New Ideas Solicited

**S**UGGESTIONS for the improvement of existing aeronautical devices and new aeronautical inventions are solicited by the Army and Navy in a bulletin issued with the approval of Josephus Daniels, Secretary of the Navy. The bulletin compiled by the Naval Consulting Board and the War Committee of Technical Societies tells in detail the possibilities of airplane motor power improvement, problems in aeronautics, aircraft problems and contains a working bibliography for airplane design and aero motors.

Many great improvements, it is pointed out, have been made by men with little practical experience or technical training, and every citizen with a "free brain, clear insight and fresh enthusiasm" is invited to submit inventions and ideas to Thomas Robins, Secretary, Naval Consulting Board, 15 Park Row, New York City.

At present, adds the introduction, the Government is concentrating all energy on speedy production of the best design secured from present engine development. Consequently the Government is not just now in a position to consider improved engines and systems of power and will defer this until after the pressing needs of the moment have been met. Minor improvements applicable to the present engine will be considered at any time, however.

Possibilities for radical advances in motive power are shown by the following outline. Cost of power, it is stated, is immaterial for war uses. The important objects are:

To secure steady, reliable operation.

To obtain lighter weights than the 2 to 2.5 lb. per horsepower now attained. (1.75 lb. without radiator, water, piping, propeller, etc.)

To obtain more work per pound of fuel carried.

The average airplane engine operates under the following approximate conditions, showing the possible improvements for all new power cycles and gas turbines:

Energy of fuel delivered by engine shaft to propeller (thermal efficiency). For the indicated horsepower .....	30 per cent
For the brake horsepower .....	25 per cent
Energy consumed by engine friction .....	5 per cent
Energy lost by cooling .....	30 per cent
Energy escaping in exhaust (including that of unburned fuel .....	40 per cent

Total fuel contents .....	100 per cent
Mechanical efficiency of propeller .....	75 per cent
Net energy of fuel delivered by propeller and available for flight ( $0.75 \times 0.25$ ) .....	19 per cent

Conservative airplane engine improvements discussed by E. H. Sherbondy, U. S. Airplane Engineering Department of the Bureau of Aircraft Production, deal with carburetion, precompression of air supply for engine, ignition, engine parts, self-starters, exhaust mufflers, cooling radiators, fuel system, fuel, propellers, machine gun synchronizers and instruments. Suggestion is made by Mr. Sherbondy that those interested in these problems should read back issues of the American, English and French periodicals devoted to aeronautics and automobile engineering, and the works listed in the bibliography attached.

The chief problems refer to improvements in motor power apparatus, its specific weight, and its thermal efficiency referred to brake horsepower and the reliability of its mechanical construction. Many helpful suggestions, it is stated, may be obtained from studies of experiments which have failed for reasons that may not now be operative because of the existence of better materials and increased experience. This point is illustrated in the history of automobile rear axle drives.

For many years straight bevel gears were used. The helical bevel gear, known many years, did not come into practical use until 1912 because economical production had not been devised.

The present state of aircraft engine design is summarized as follows:

Engine types are practically standardized and include two principal types, one having 6 or 8 vertical cylinders all in line, the other being the "V" type with 8 or 12 cylinders. Aluminum has greatly increased the possibilities of radial types of engines in moderate powers, these being designed with either fixed or rotating cylinders and either air or water cooling. To be useful for aircraft work an engine must not weigh more than 2.4 lb. per brake horsepower (1.7 lb. without radiator, water, piping, propeller, etc.). It must be composed of parts that can be readily produced by American manufacturers. The thermal efficiency of current types of aircraft engines referred to brake horsepower ranges from 25

### The Government Asks for Ideas for the Improvement of:

Engines  
Planes  
Carbureters  
Ignition

Fuel Systems  
Propellers  
Instruments  
Compasses

Materials  
Production  
Self-Starters  
Spark Plugs

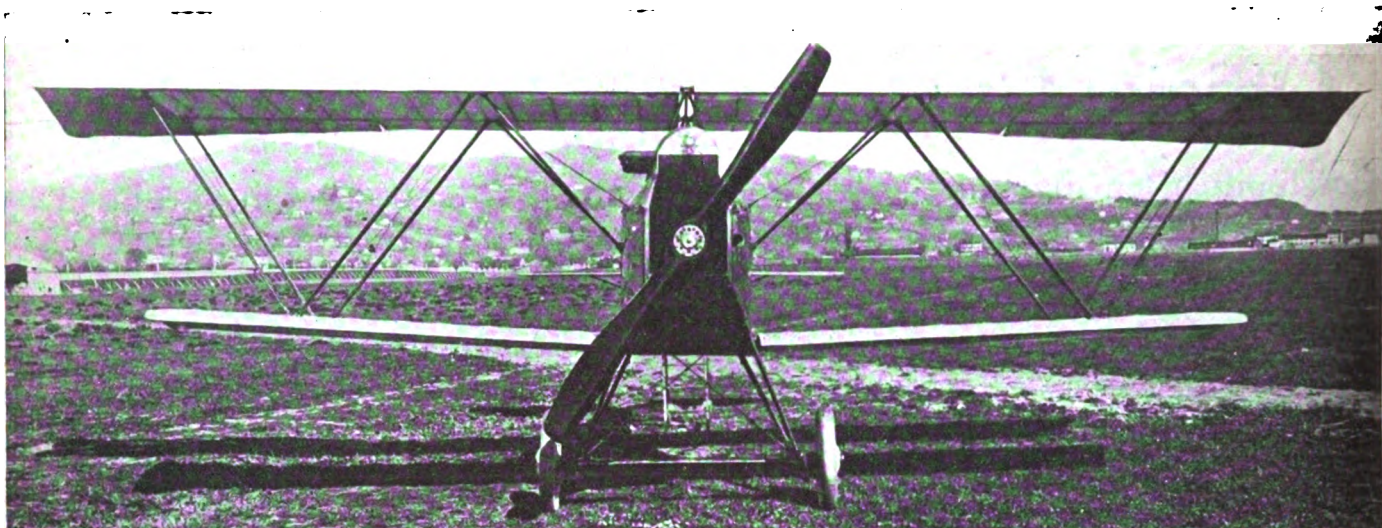
per cent to 32 per cent, this being the proportion of the original heat content of the fuel consumed which appears in shaft horsepower. While the efficiency of these engines is higher than any other type of prime mover, including commercial Diesel engines within the output range of aircraft engines, their economy is rather low at less than maximum horsepower, and every effort should be made to improve economy at part load. The economy varies but little for considerable changes in altitude, so that in this matter the effective altitude is not often of importance.

Improvements suggested for the present system of motive power should be of a nature allowing development to a practical stage within about 6 months; that is, the apparatus should be experimentally proved and ready for production at the end of this period.

Improvement of carburetor regulation for varying altitudes is sought. In a given engine operating successfully at two different altitudes under identical conditions, i.e., at the same speed and with the same carburetor adjustment (the same sectional areas for the passage of air, gasoline and mixture) the amounts of air (by weight) drawn into the engine in the same time are proportional to the barometric pressures at the two altitudes. The volume of air drawn in remains the same. The density of the gasoline does not vary with the altitude and the effect of changes in altitude upon the mixture quality is a resulting increased richness of carburetor mixture in higher altitudes, which varies inversely as the square root of the ratio of barometric pressures (assuming the engine speed and throttle position to remain constant). While this is approximately correct for ordinary elevations it is decidedly true at altitudes over 15,000 ft.

This causes the need for carburetor regulation for varying altitudes. This regulation is now effected by a device called an altimeter, which controls the gasoline flow through the carburetor nozzles. This may be accomplished either by re-

(Continued on page 286)



*The S. V. A., which is equipped with a Spa engine of 240 hp. This is a one-seater airplane used for low fire, pursuit and fast reconnaissance. Note the tubular, inclined braces*

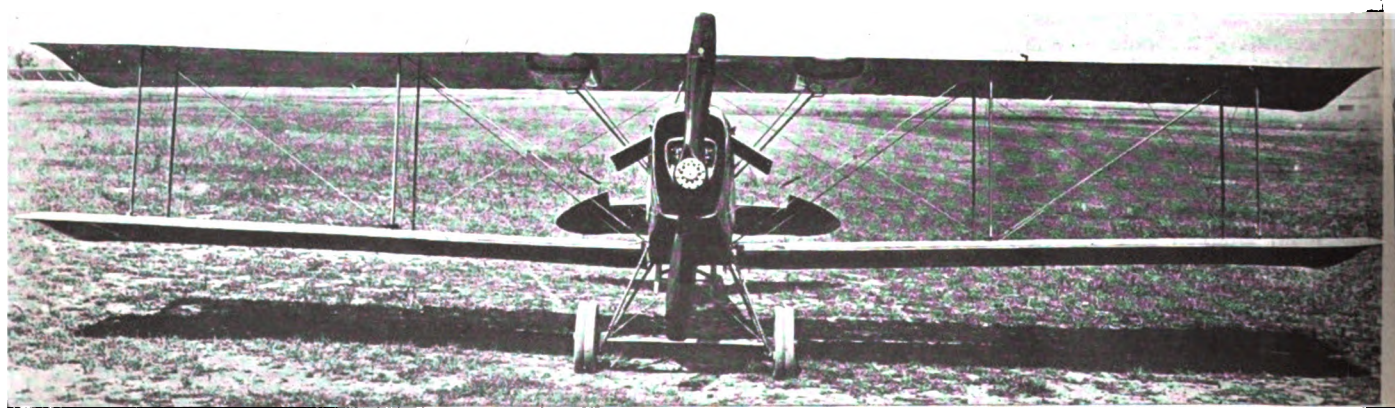
## Plans and Accomplishments of the Italian Air Service

**Italy Is To-Day Supplying All Its Own Needs in Motors and Planes—  
Must Have American Raw Materials—Types of  
Machines That Have Been Developed**

**I**F the Allies can increase their air forces by 10,000 more planes than the Germans can gather within the next eight months the war will be quickly won. This is the opinion of Captain Giuseppe Bevione, Chief of the Italian Military Mission of Aeronautics in this country. Italy, said Captain Bevione, is now producing 1500 airplane engines per month, and will produce more than 2000 engines per month before the end of this year. The most important engines used for fighting airplanes are the A-1, sometimes called the Balilla, developed from the S. V. A., and the Pe Gamma, which is an adaptation from the original planes of the Pomilio. Numerous first class scouting and day bombing machines have been built. Foremost among the Italian factories is the Fiat, building the A-12 engine, developing 300 hp., and the



*Side view of the S.I.A.-9B. This machine is used for day bombing*



*The S.I.A.-9B, equipped with the largest engine in the world, the Fiat 700 hp. Note the gasoline tanks on the under side of the upper planes*



-14, developing 700 hp., the latter being the latest powerful engine now used at the front.

Following is a statement by Captain Bevione on the aviation work of the Italian Air Service, together with the raw-material needs of Italy, for which she looks to this country:

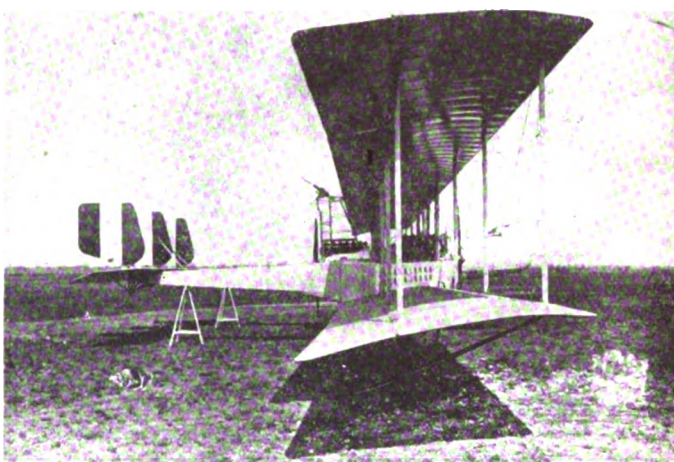
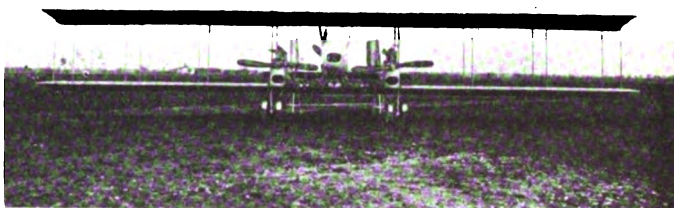
"Everybody knows that the war industries of all the Allied nations, and particularly the industries of aviation, draw from America the essential part of the raw materials they use.

The magnificent victories of the allied armies in the last few days, which have added so much glory to the American name, make us wonder at the splendid results that might be obtained were we able to realize what we most need now, a supremacy of the air, to pursue the retreating foe with our squadron of bombers, spreading terror and disorder among his lines and destroying and closing railway junctions, roads, and bridges and trestles.

#### Can Produce Air Fleet Ten Times That of Enemy

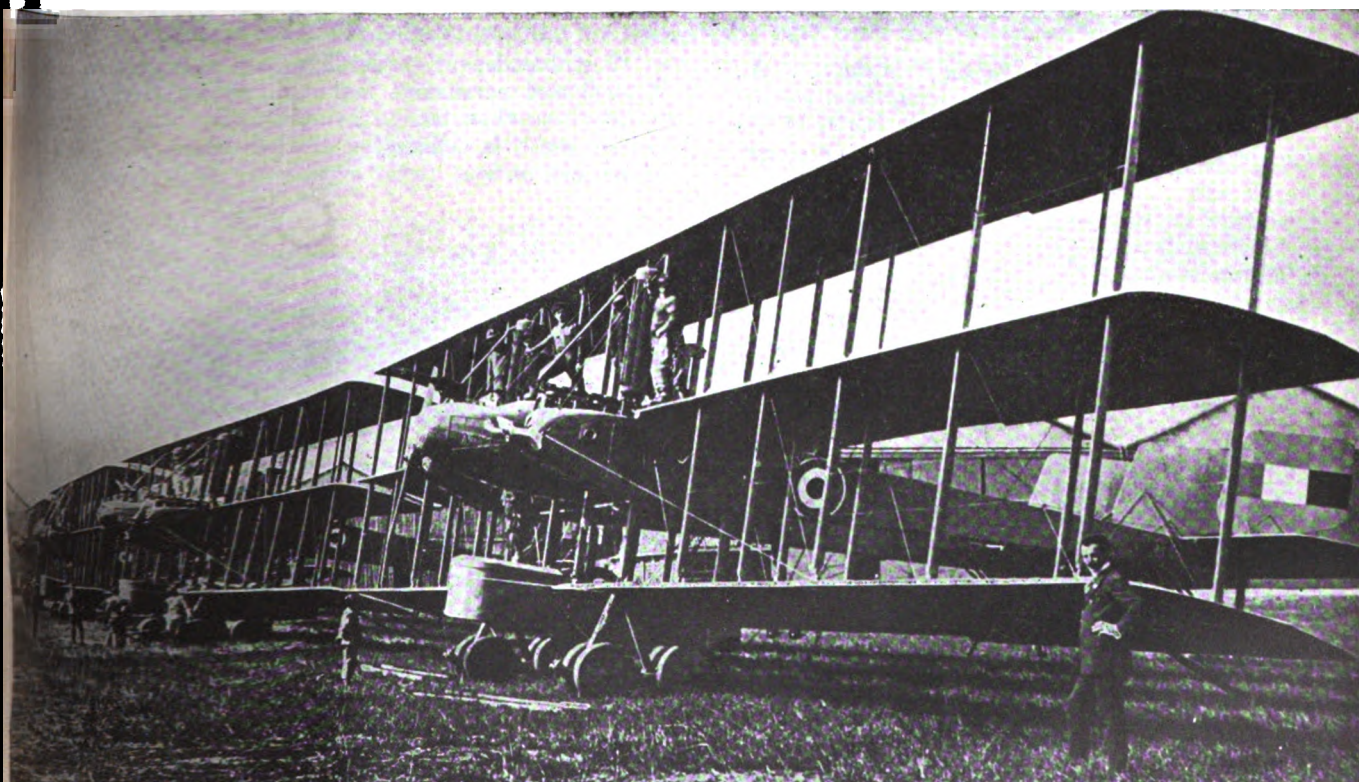
"As far as raw materials, industrial organization and man power are concerned, the Allies can produce and equip an aerial fleet at least ten times larger than that of the Central Powers. If this result can be obtained in 1919, if within eight months the Allies, with this country, can count on having in Europe 10,000 aeroplanes more than the enemy and will make them serve their purpose skillfully and inexorably, the war will be won. The foe's power of resistance would be struck at its very vital source, at its center of supplies, at the great factories of arms and ammunition, and bridges, railways and roads through which the armies at the front are kept in fighting trim.

"But in order to carry out this simple plan in its entirety (as nothing decisive could be attained unless it was developed fully), all of us, governments and peoples, must be aware of the absolute and obvious fact that the army is of the greatest import, and that aviation



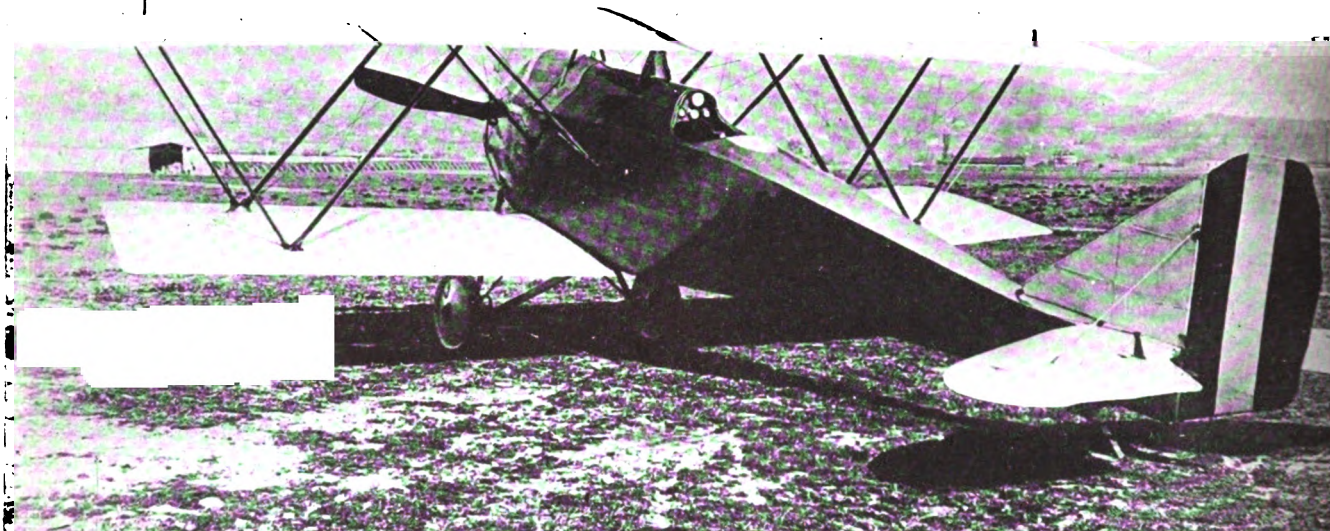
Two views of the Caproni biplane which is equipped with three 300-hp. Fiat engines and is considered the best bombing machine. It is used for day and night service on all of the allied fronts. America has adopted it and is building it equipped with the Liberty engine. This plane is known as model C.A. 5

can give us a formidable contribution toward the refusal of any peace compromise that Germany and Austria



A group of Caproni triplanes equipped with three Fiat engines each of 300 hp. They are used for night bombing

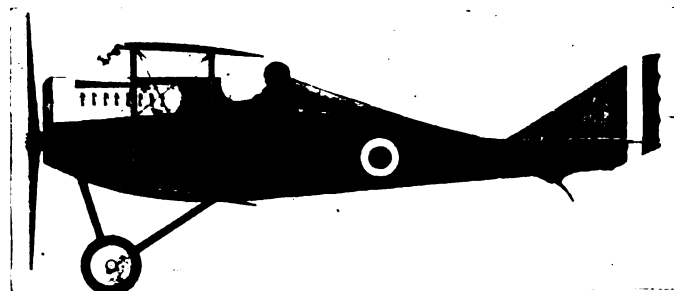




*A view from the rear of a S. V. A. pursuit plane, showing the cockpit of this unique Italian product*

may try to impose on us. Aviation is a sure means of victory, and to it we must devote without hesitation and without reserve all of our efforts and best resources.

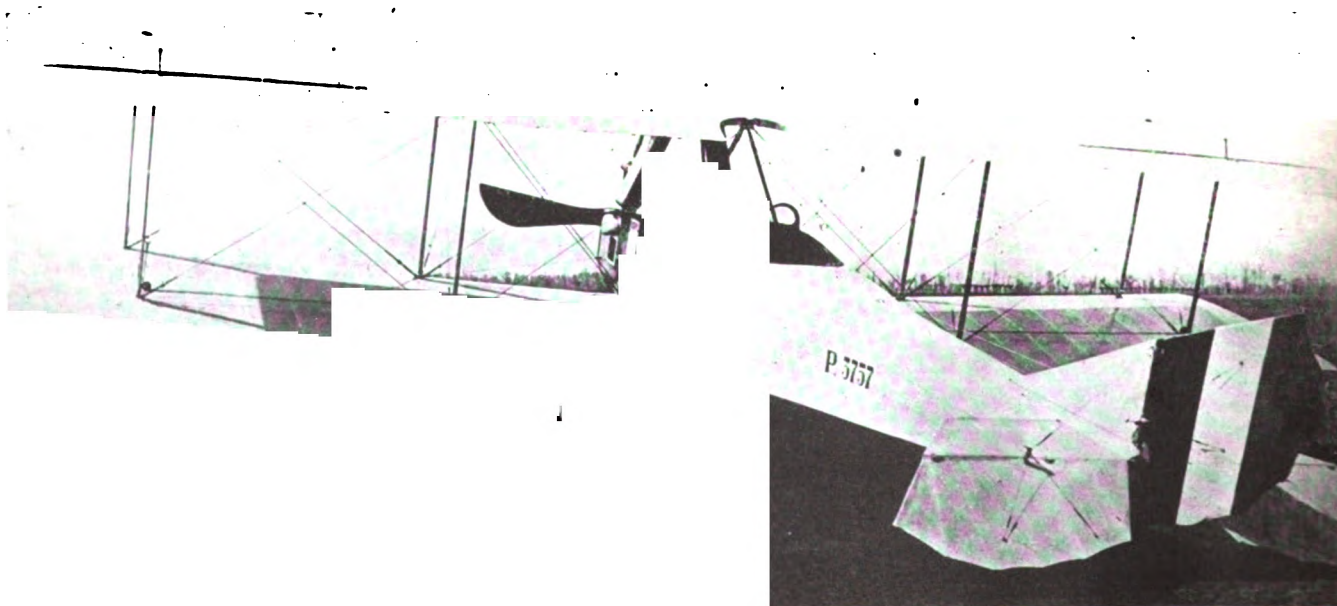
"I am betraying no secret in assuming that the closest



*The Ansaldo, a special adaptation from the S. V. A., a very speedy Italian plane with exceptional maneuverability. It is equipped with a Spa engine of 240 hp. and attains a speed of 147 m.p.h. It is a single-seater*

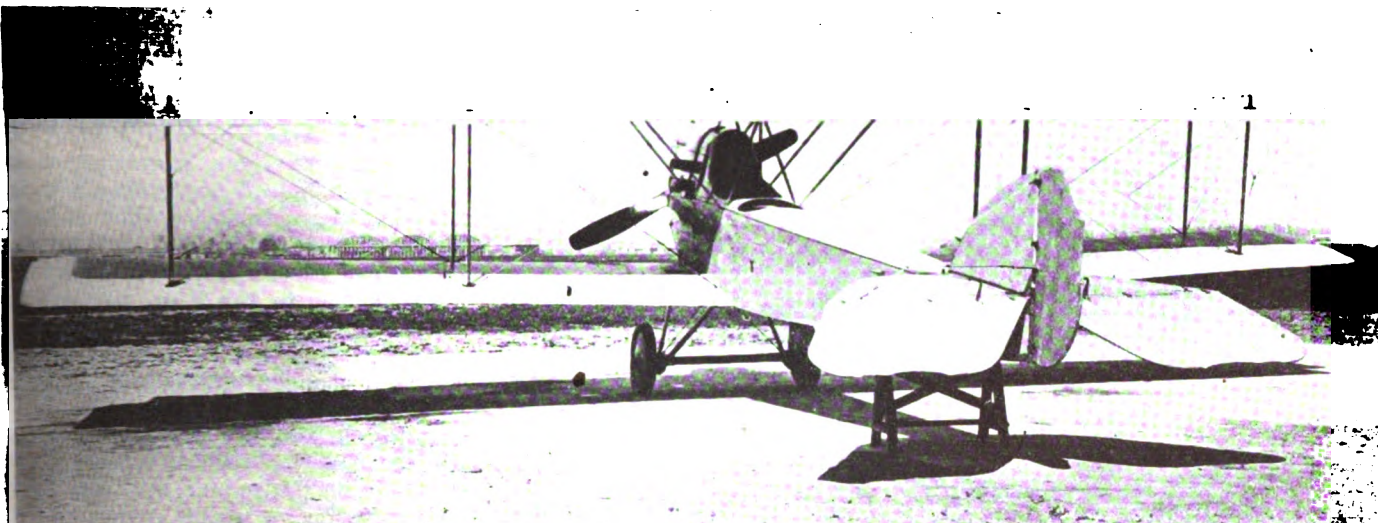
agreement has been reached on this fundamental point between the American authorities in charge of the industrial and technical development of aviation and Italian Commissioner for Aeronautics. The latter has been such a vigorous incentive to our aviation industry that he has brought it within a few months to its magnificent development, well deserving of far-reaching results. But in order to have an unlimited output of powers of production, Italy is obliged to seek from our country an adequate and continually increasing quantity of raw materials, metals, wood and textile matter. It is an absolute necessity that we obtain such assistance from the American government, in perfect harmony of course, with the need of our allies, and for this purpose I was sent to Washington and appointed chief of Italian military mission for aeronautics.

"I will endeavor to develop my program in the most logical and persuasive manner, proving to the Federal authorities that Italian aviation is well worthy of the assistance it is demanding of the generous and powerful American nation.



*The Pomilio, one of Italy's reconnaissance machines which is equipped with a Fiat 300-hp. engine*





*The S.I.A.-7B, equipped with a Fiat 300-hp. engine. This is another of the reconnaissance machines being used by the Italian armies*

"I will show how efficiently raw materials that have been provided us are being utilized, and I shall keep the men in charge of American aviation in close contact with every progress and acquainted with the great expectations that are in store for our Italian aircraft production.

"This progress is indeed remarkable, and every Italian can justly be proud of it. Italy to-day has overreached the critical period of experimental research and of uncertainties, always to be overcome at the beginning of new enterprises.

"To-day Italy is supplying its own needs in motors and planes entirely, besides using its own original types of planes; and within a few months all the planes flying at the Italian front will be of Italian manufacture and design and equipped with Italian motors.

"It is generally known that military aviation needs four types of planes—fighting, scouting, day bombing and night bombing. As to fighting aeroplanes, we now turn out two splendid types—the A-1 (so-called "Basililla"), developed from the S. V. A. of the Ansaldo factory, and the "Pe-Gamma," from the original plans of the Pomilio works (recently taken over by the Ansaldo factory).

"As to the other types of planes for warfare, Italy is well provided with models of her own, which are pro-

duced in large quantities. We have, in fact, two types of scouting craft of high value—the S. I. A.-8B (developed from the former 7B type), made by the S. I. A. factory, which is a branch of the Fiat, and the P. F. of the Pomilio factory, which, as previously stated, has been incorporated into the Ansaldo works.

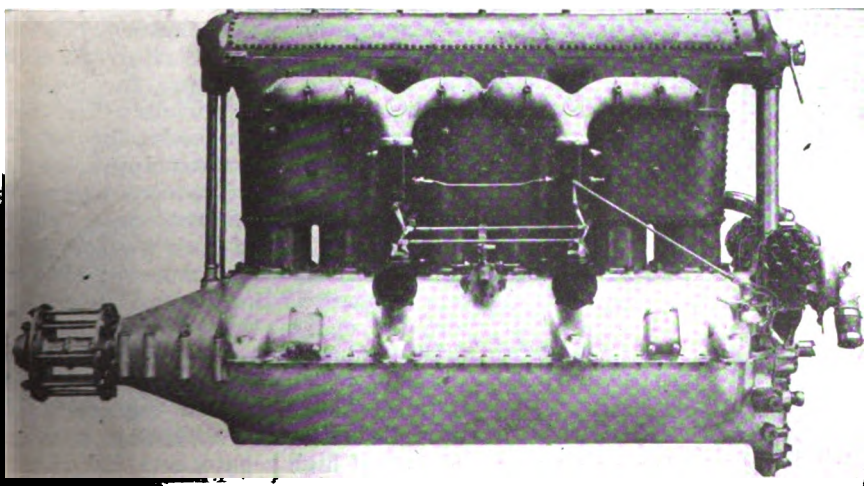
"Two important raids were performed last year by the S. I. A.-7B aeroplane; that is, the flight from Turin to Naples and return, 1,004 miles, without landing, and the Turin-London flight, 700 miles, with the crossing of the Alps.

"For day bombing, where speed and great power are essential, two Italian planes are ready to-day that already have undergone the most severe tests. One is the S. V. A. built by the Ansaldo factory, which can be used also for fighting and scouting, and already has accomplished the bombing of Innsbruck, besides performing the raid on Friedrichshafen. The second plane is the S. I. A.-9B, equipped with a Fiat engine of 700 hp. This, owing to its speed and great power, can be flown over long distances and can be used in broad daylight bombing.

"For night bombing there are the biplane and triplane Caproni, now of international fame. The larger model of Caproni biplane, CA-5, equipped in Italy with three Fiat motors of 300 hp. each, is without doubt superior to all similar types in existence, so much so that all of our allies—American, British and French—have adopted it, and at the French front several Italian squadrons of Caproni are in active service, adding new records to their well-established reputation. It is known to-day also that at Mineola, Long Island, the first Caproni built in the United States, equipped with Liberty engines, has gone through its tests with the greatest success and that the Federal authorities have placed with American firms large orders for Caproni-Liberty aeroplanes.

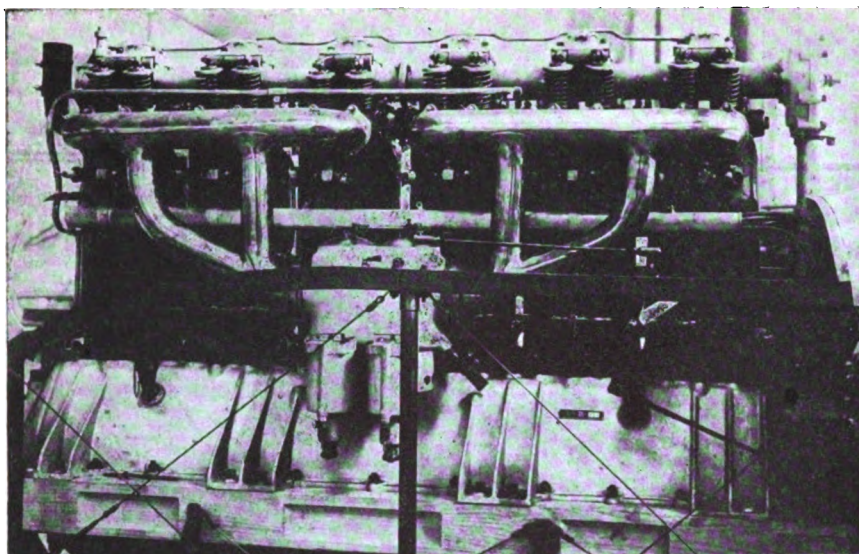
"I firmly believe that Italy can be proud of its aviation achievements and victories, as on the sixteenth of last June, the first day of the ill-fated Austrian drive on the Piave, 34 Austrian airplanes were downed, and only two of our planes were reported missing.

"But no aeroplane, perfect as may



*Plane Engines—The new Isotta Fraschini, known as type V-6. This engine has 300 hp.*

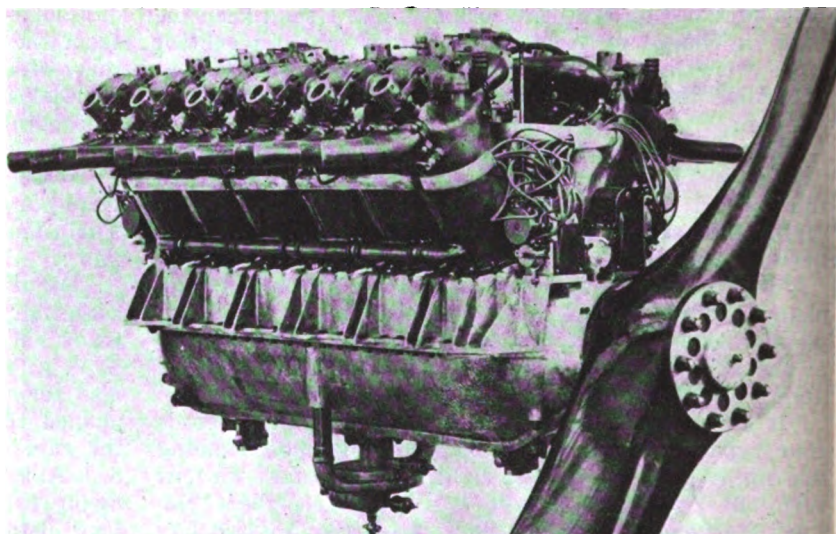




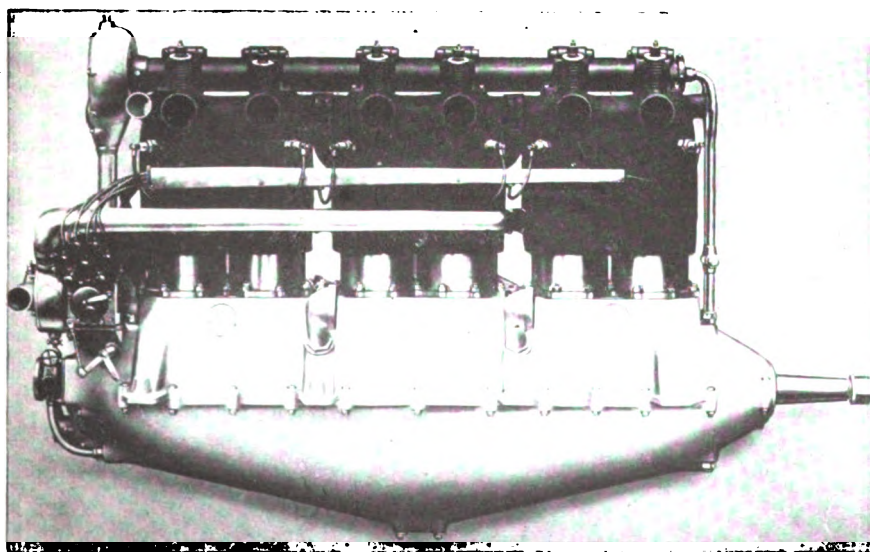
*Italian Airplane Engines—The Fiat 300-hp. engine; six-cylinders*

be its design and construction, could be of any service if not equipped with the best and most reliable motor. The capacity for production of the factories connected with the manufacture of aircraft must be equal to cope with the demands for the keeping up of the full efficiency of the aerial force. And here, again, Italy's efforts have met with success.

"The Fiat factory stands first as one of our largest manufacturers of aviation motors, with her two well-known engines, the A-12 and the A-14. The A-12 develops 300 hp., and the A-14 700 hp., this being the most powerful motor used at the front for aviation by any of the Allies. The Fiat has a remarkably large output of these engines, and I regret that for obvious reasons I cannot give the exact figures concerning it. But I can say that our aeronautical department which buys all this production, after having met with all of our own requirements, can afford to supply



*Italian Airplane Engines—The Fiat 700-hp. engine, twelve-cylinders, the most powerful airplane engine in the world*



*Italian Airplane Engines—The Spa engine; 240 hp.*

the Allies with an important number of these motors daily, in compliance with their urgent demands. Besides this, the Fiat now has ready a new model, which will be produced soon in large quantities. This is the A-15, of 450 hp., greatly reduced in size from previous models, light, accessible and possessing new and important characteristics that undoubtedly will cause a further and greater development of our military aviation.

"In addition to the Fiat, we have the Spa, of the well-known automobile factory of that name, which, with some important changes and only a slight increase in weight, has been able to develop its old 220 hp. motor into a new 300 hp. motor, without being obliged to change its equipment and machinery, thus achieving a great technical and industrial success and producing a new engine of slight weight and great power. These motors already are being turned

out in large numbers, and will be of the greatest value to aviation, especially fitted to fighting planes.

"Another important factory, the Isotta-Fraschini, produces high-grade planes that have won reputation for their reliability and perfect workmanship. Here again a new motor is ready, the I-F V-6, developing 300 hp., greatly appreciated by both airplane manufacturers and pilots.

"The following figures may give a more correct idea of Italy's effort in the production of aviation motors: 1500 motors a month is the present output; before the end of the year we certainly shall produce more than 2000 motors monthly, which means the astonishing figure of 24,000 aviation engines a year, all of Italian design, of Italian construction, all of high repute, established after the severest tests. Yet at the beginning of the war Italy possessed not more than 100 aeroplanes and less than 100 pilots."



# Training 150 Operators Per Week

How the Vestibule School of the Remington Arms Co. Is Meeting the Demand for Skilled Workers of Both Sexes—How Operatives Are Routed Through the Plant

UP to the first of July 565 student employees had been instructed in the training department or vestibule school of the Remington Arms Union Metallic Cartridge Company at Bridgeport, Conn. Of these student employees 390 were male, and 175 were female operatives. The school is now training approximately 150 students a week, starting 50 each Monday, another lot of 50 each Wednesday and as many more each Friday. It requires two days on the average to train these students. Some of the very simple operations can, however, be taught in a day, while in the case of certain others it takes several days to give the operatives a sufficiently high degree of skill.

There are fourteen regular instructors in the school, but as the work is to be materially extended and new machines are to be installed, it is estimated that twice as many will be required within a short time.

The company has a reserve list of instructors who are either expert operators or adjusters. These men are posted at various points throughout the shop and are ordinarily to be found at their regular occupations, but when it happens that there is an overflow in the school, the extra students are sent to these instructors for training.

The instructors themselves are carefully trained so that they may be thoroughly competent to teach, and they are selected for this work because of a natural aptitude for imparting knowledge.

Except in a few special cases, male student employees receive 35 cents per hour flat rate for 8 hours' work. This means that they get \$3.85 for a 10-hour day, as they are paid at over-time rates for time work over 8 hours.

The work of the school is supervised by the Educational Director, who looks after all educational work in the plant. Besides the vestibule school, the company also conducts a toolmaker apprentice 4-year course and a machinist apprentice 3-year course. Apprentice courses are conducted according to the well known corporation school plan.

## The School Lay-Out

The department set aside for this school covers a floor space 62 feet wide by 128 feet long, and is layed out as shown on the accompanying sketch.

Machines are set up on both sides as one enters. There is sufficient room around each machine to allow a group of about 6 students to stand without interference. This is necessary because each instructor usually has 5 or 6 students under instruction.

In the center of the room is an inspection crib where the finished work is brought and inspected by students. At the left is the office where the Supervisor and his clerks are stationed. At present, 2 clerks are required besides a timekeeper.

In the far corner is a lecture room, separated from the machine department by a double partition to eliminate as much noise as possible. The lecture room is

fitted with a platform and lecture room chairs of most approved type. Here the students are introduced before starting to work, the policy of the company is explained to them and a general talk on safety, health and responsibility is given them. They are then divided into

## How the Remington Company Introduces Itself to New Employees

**Y**OU have offered to sell your services to the Remington Armory, at Bridgeport.

The policy of this Company is one of great value to you, it is one in which **FAIR DEAL** plays an important part. Reduced to its simplest form it amounts to this, "The Company is anxious to help those who will help themselves," and in return expects good **SERVICE** and **LOYALTY**.

We want to educate you to do your work in the best manner possible so that it will be easier for you, give you better financial returns, and moreover, it will cease to be drudgery and eventually its faithful performance will become an inspiration to accomplish bigger and better things.

So frame your mind that you will look upon your employer as your friend, be determined to use your head at least as well as your hands, to always use your head first, and then do your work after you know the **WHY** of everything about it that concerns you.

Instruction sheets will be given you to study carefully. If any of this information is already familiar to you, it will only be necessary for you to read it over carefully. Information that you are not acquainted with, must be studied carefully, so that you may eventually be able to answer questions on any topic contained in these instruction sheets.

Your rating will be greatly influenced by your ability to answer questions relating to your work and these instructions.

If, after working at any job, you find that it is not to your liking or that you are not capable to do the work, do not lay down on it, but make the best of it you can, and speak to your superior about your case. If you "throw up hands" you not only make yourself unfit for your present job, but you lessen your chances of being given another job on the ground of incompetency.

Before transferring to another job, it will be necessary for you to qualify for the new work that you expect to take up.

To many workers, the other fellow's job looks better to them than their own. Do not allow this feeling to make a slave of you, as you cannot be highly efficient while under this influence. Stick to your job and master it well, then the bigger job will find you.

A hard day's work is not necessarily a good day's work. Knowing how to do the work well, will convert a hard day's work of ordinary success into an easier day's work of better success, because you will become **EFFICIENT** by reducing lost time and lost motions all you can.



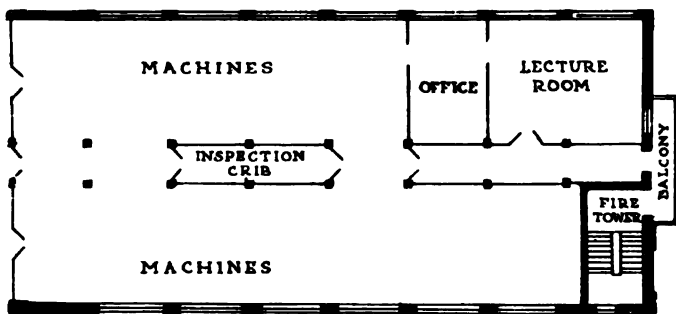
structor's satisfaction and can operate the machine properly, he is competent to be sent to the production department.

Men learning to become adjusters must first go through practically the same course as operators, especially if they are not acquainted with the operation of the machine which they are to adjust. But they must become much more competent to operate and then they are taught how to make adjustments of the machine parts and groups, also those of the tools and fixtures.

They must become able to make any adjustment required to change the dimensions of the component when these do not match the gages. They must also be able to answer the instructor's questions satisfactorily before being released. Records of their performance, both in and out of the school, are kept in the same manner as those of the operators.

When machine operators are needed, the foreman or supervisor must issue help requisitions for them on the school. These requisitions must not be made for more than two operators. Therefore, if ten operators are required, five separate tickets must be made out.

If men are already trained, the requisitions will be



Plan view of the Remington training school, showing the inspection crib, office and lecture room

immediately filled, either in part or entirely. When there are not a sufficient number of operators already in the school, the unfilled part of the total requisition will be sent to the Employment Office for material to be trained. As soon as these men are trained, they are supplied to the department which asked for them.

The machines that are in the school represent only such kinds as are used in large numbers in the shop, and can be isolated for instruction purposes.

The operations for which the school is now fitted are:

Milling—Hand	Shaving
Milling—Power	Tapping
Milling—Thread	
Profiling	Press—Foot
Polishing	Press—Power
Barrel Drilling	Hand Screw Machine
Barrel Turning	Bench Work
Barrel Chambering	Inspection
Barrel Grinding	Adjusting
Drilling	

The instructors keep a daily record of the students' performance, on a  $\frac{5}{8}$ -in. card form for that purpose. When the student is transferred to the shop, a permanent record is made on an 8½ in. x 11 in. card for that purpose. After twelve weeks, a report is made by the foreman of the employee's performance, which is also incorporated on the permanent record sheet, this being kept in a file for reference. This record also has other information which may be useful in placing the employee properly and determining the ultimate result of training operators.

The routing of employees between departments and to and from the school is handled in the following manner:

1.—Ordinarily, transfers are effected in accordance with instructions, using the form "Transfer Recom-

DAILY REPORT					
NAME _____				NO. _____	
DATE	ADAPTABILITY	SPEED	QUALITY	CONDUCT	ATTENDANCE

Form used by instructors to keep record of students' performance while in school

mendations," provided for the purpose. This is made out in the department from which the operator is going, is signed by the section supervisor or superintendent, and is forwarded to the employment office with the transferring operator.

2.—This operator is then assigned to any department whose "Requisition for Help" may be on hand at the employment office. If possible, the operator should be put at work similar to that which he had been doing, to avoid the necessity of training again.

3.—The transfer from one department to another of an operator requiring training in the school.

If the operator cannot be put at work for which he is trained, he will be sent to the school for training. He will be on the payroll of the department to which he is transferred and not on that of the school.

4.—Transfer of an operator from the school to a shop department.

An operator who is on the school payroll must be transferred from the school to another department in the regular way, as described in paragraphs 1 and 2.

5.—The assignment by the employment office of an

FROM: Operators Training School, HSE. DATE \_\_\_\_\_  
TO: \_\_\_\_\_  
SUBJECT: Report of Operator's performance.

Please fill out the blank below, using the key as a guide, and return promptly to HSE in order to enable that department to keep a record of the employee whose name appears here.

Operator \_\_\_\_\_ No. \_\_\_\_\_  
Shift \_\_\_\_\_

was released from the school and sent to you on (date) \_\_\_\_\_

Adaptability	Speed	Quality	Conduct	Attendance

Key:— Excellent 95 to 100% Fair 80 to 85%  
Very good 90 to 95% Passable 70 to 80%  
Good 85 to 90% Cannot pass Below 70%

If for any reason, you place this employee at different work other than that for which he was trained, please give reason and all particulars here:

Foreman's Signature \_\_\_\_\_

EO Form-405

The foreman's report made out for each trained employee after 12 weeks in the production department.



operator who has been requisitioned by a shop department to the school.

This can be effected as described in paragraph 3. As soon as the operator is trained for the work he is to do, or has proven that he can already do his work properly, he is then released to his department of assignment without formality.

6.—*The assignment by the employment office of an operator to the school who had not been requisitioned by a shop department.*

If the Employment Office wishes to hire a person who shows decided aptitudes to become an operator, yet has no place to send this person at the time, that person may be assigned to the school for instruction. In this case the employee is hired for the school outright and is on that payroll until transferred to a shop department.

7.—*Training of an operator already working in a department who will return to the same department after training.*

An operator requiring instructions may be sent to school for additional or different training, and then again to his department without formality, except by phone or ordinary written notice from the foreman to the instructors in the school. This operator remains on the shop department payroll.

8.—*Emergencies.*

In an emergency, one or more operators (partly trained or otherwise) may be hired or transferred from department to another, or from the school to shop departments without formality, but this should be only when it possibly cannot be avoided, and the necessary regular routine forms should be made out.

## An Improved Chain Track for Tractors

Employing a Guided Rocking Joint with Dust Excluder and Inclosed Track Carrier—A Chain of Sheet Steel Sections

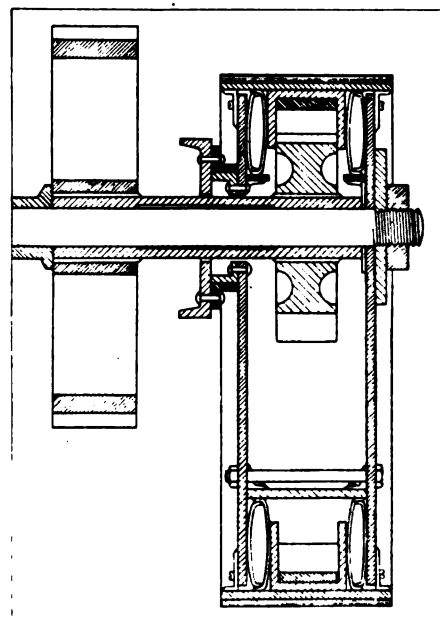
**A**N improved design of chain track for tractors has been developed by Ralph Wishon of 730 Eddy Street, San Francisco, Cal. Knowing the effect of dust and grit on the usual link and pin type of chain, Mr. Wishon set out to do away with pins. He achieved this object by the use of a properly guided rocking joint with dust excluder and of an inclosed track carrier. The chain is composed of sheet steel sections each built up of three pieces interlocking with each other and securely riveted together as the chain is assembled, bolts being used at the master links. The tread piece is made with an overlap to exclude dust. The shroud piece prevents lateral movement and bending movement, except from a straight line inward; it acts as a guide for the rocking joint and a smooth contact and guide for the rollers.

The hook piece has a small hook at one end for engaging the next or following section and a larger U-shaped hook at the other or forward end which also acts as a tooth for engaging the driving sprocket. The track is mounted on two rows of pressed steel rollers running on a raceway of sheet steel secured to two angle iron frames, except at the forward end, which is free to act as a chain tightener and spring, supported after passing through the angle iron frames as shown. This plate is also slotted to pass the driving sprocket. The raceway plate is held in place by two outside plates just clearing the tread all round and secured by through bolts as shown.

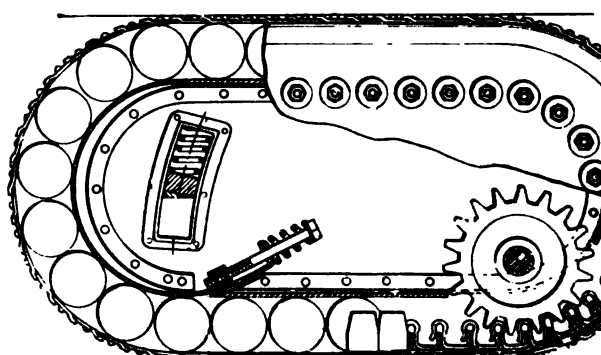
An arc-shaped casting is let into these plates and when the track carrier is mounted on the frame it is slipped over the end of a heavy rectangular bar which is bolted across the frame, and springs are inserted under the bar to take the weight of the main frame and permit the track carrier to oscillate on the trunnions. The track carrier is further guided in its vertical movement between two hard wood blocks as shown. The rear end of the track carrier has a trunnion ring riveted concentrically with the driving sprocket and fitting inside another ring which is riveted to the main frame. A heavy through shaft is threaded at each end for a nut and passes through both track carriers, the main frame holding the carriers securely in place, although allowing an oscillating movement. This shaft also acts as a bearing for two bronze sleeves, each of which carries a driving sprocket and a main drive gear, both being fitted to the sleeves by six loose fitting keys acting as splines. The sleeves are held in place by a spacer in the middle and by washers in each outside end.

The whole assembly may be dismantled by removing a nut from one end of the "through" shaft and withdrawing the same from the other side. The track, as shown, can be modified by change of pitch, width and supporting contact, as in

the case of the truck wheel type of track carrier, the wheels of which may travel on the upturned edge of the shroud piece, which may overlap if necessary.



Vertical section through chain track



Showing self-adjusting track for chain rollers

# Diffusion of Manufacturing Will Solve Many Industrial Problems

Breaking Up Centralization and Congestion in Urban Communities Will Benefit Labor Conditions—More Work for the Motor Truck

**A** MOST alluring picture of the benefits to be derived from a diffusion of manufacturing from the cities where it has become centralized to the rural sections of the country is drawn in a statement just issued by C. C. McChord of the Interstate Commerce Commission, who has been named by President Wilson as one of the umpires of the National War Labor Board. The benefits which the commissioner foresees as coming from such a readjustment are not only industrial but also national through a raised standard of citizenship.

Mr. McChord offers his suggestion as a plan calculated to go far in solving the many problems of labor, the distribution of materials and the cost of living after the war. And in the accomplishment of the plan, although Mr. McChord does not emphasize the fact as strongly as he might, the motor truck will play a most important part. Scatter our manufacturing evenly over the country and throughout the rural regions to the greatest practical extent and the need for motor trucks will be greater than ever before. We give an abstract of the commissioner's statement in the following paragraphs.

## A Radical Change Needed

What is needed in this country is a wider diffusion of manufacturing industries and the local supply of the necessities of life. Products of our factories are distributed throughout the land, but under circumstances of such economic waste as to demand a radical change. In the development of manufacturing many elements have conspired to confine factories to limited territories or particular cities. Among the chief of these was the fact that the railroads favored certain manufacturing centers in the way of facilities and rates.

While the payment of rebates that found their way into carriers' accounts ceased on the passage of the amendment to the Act to Regulate Commerce of 1906, and many carriers had ceased to make such payments previously, the matter of preferential rates and the furnishing of superior facilities to competitive centers continued with unabated vigor until the taking over of the railroads by the President on Dec. 28, 1917. That event was intended to bring about a complete change. Railroad managers were at first reluctant, and in fact some have not yet fully accepted the fact that each road is no longer a competitor of the other, but all are engaged under Federal control as a great unified system in the business of transporting the necessities of war and the commerce of the country. The change was as startling as sudden. Preconceived notions of the rights of each carrier as against the other, and their relation to the public, were changed over night.

It seems to be conceded by every one that, no matter what is done with respect to the great transportation systems of the country after the war is over, certain condemned practices and the unbridled competition of past years are at an end, and that by some means the carriers of the future will be under such regulations as will insure the largest and most effective use of the facilities they have for the conduct of the transportation business of the land without favor to one shipper or prejudice to another.

## Railroads Must Help

The most important matter just now, however, is the part that the railroads should play in the readjustment that must be made in our industrial and economic conditions. As be-

fore noted, it has come about that the large part of our manufacturing is done in our cities. The greatest manufacturing cities of the nation, considering the variety and quantity of production, are Chicago, Ill., and Philadelphia, Pa. Southern New England has developed into a succession of manufacturing cities. Pittsburgh dominates the iron and steel industry and controls prices wherever sales may be made in this country, as Chicago dominates and controls the prices of meats and their products. New York City produces immense quantities of ready-made clothing, employing thousands in sweatshops of unsavory surroundings. The result is that workmen and women in largest numbers live under conditions that are not sanitary, wholesome nor conducive to good morals. This has happened in a country that is less densely populated than any of the great nations of earth, and where there is room enough for every citizen and resident to enjoy his full share of pure air and sunlight, and to live under conditions conducive to health, morality and happiness. It would also enable him to secure a home at moderate cost, or at reasonable rental, with an area of ground sufficient to permit him to cultivate a garden where fresh vegetables may be grown for his own use.

There are many other considerations that dictate a re-location of our manufacturing industries. In the first place it costs more to do business in a city than in the country. Land values and costs of construction of plants, taxes, etc., constitute charges that must be met from earnings. It costs more to live in a city than in the country. A lower wage payment in the country than in the city would enable the workman to secure more comforts of life, to clothe his family better, and educate them more adequately. If the factory is located near the raw product there is saving in transportation costs which will be reflected in net earnings.

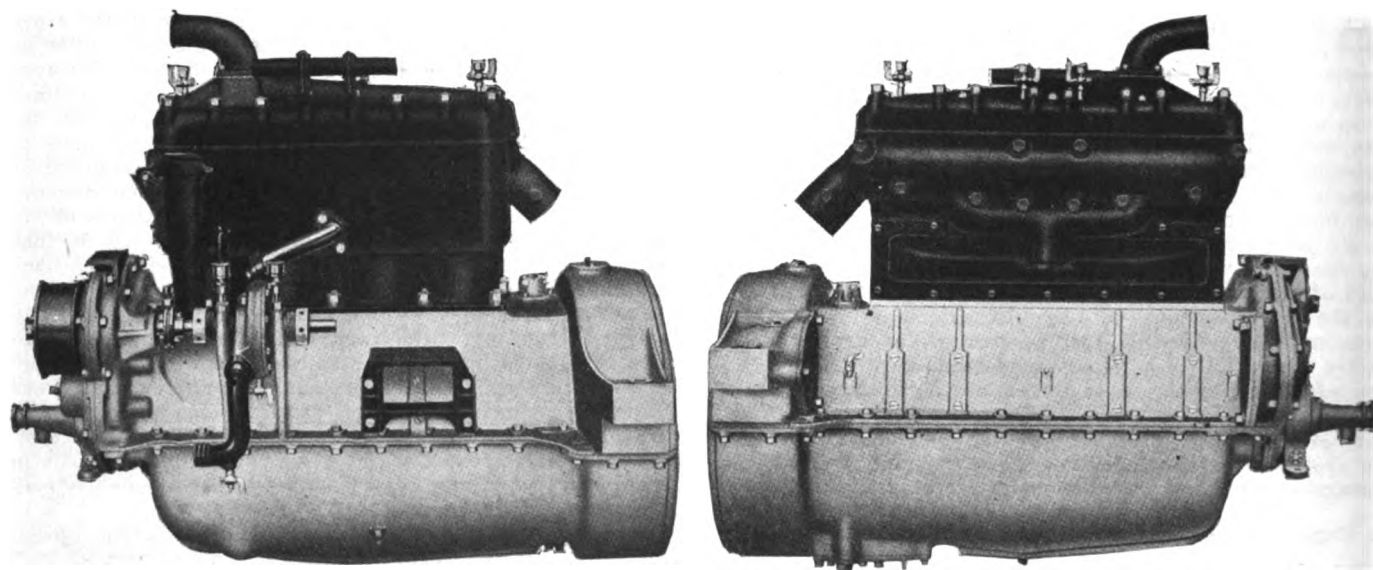
## Recent Developments

In very recent years there has been here and there a man whose vision has been broad enough to see what it is the consuming public demands, and has attempted to meet it. One concern has in recent years by co-operation with residents induced the building by local capital of hundreds of flour mills at country points in the Middle West and South, which supply consumers in the region round about each mill with flour, meal and feed. Another man owns in his own right many branch houses for distribution of groceries, merchandise and general household necessities. He ships to the branch houses in carload lots and distributes to his customers in motor trucks. He is doing a large and thriving business. Both of these institutions are representative of a class that has recently come into existence.

Does not the public demand which these institutions seek to meet point the way to a solution, in part, of the reconstruction problem that now confronts us? If wage scales are to be readjusted downward to meet conditions in times of peace, the wider diffusion of factories presents an alluring way out. What the workman desires, and what he has the right to demand, is opportunity to live in comfort. Reduction in the rate of his daily wage means, as he now sees it, lessened opportunity to secure to himself and his family those necessities which go to make comfort in daily life. In most any country town of 1500 or more population that might be named in the Middle West or the South there is opportunity to live better and enjoy more of the real comforts of life, at materially lower wages, than even an approach to the same state of livelihood can be secured in any congested manufacturing center.

# Buda Model "HTU" Engine

Designed for Truck and Tractor Service—Has Detachable Cylinder Head and Force Feed Lubrication—Special Crank Base Construction and Heavier Flywheel for Tractor Use—Vaporizing Manifold for Burning Kerosene



*The Buda model "HTU" is designed to operate on low-grade gasoline and kerosene*

**A**N engine specially designed for heavy duty service has just been brought out by the Buda Company of Harvey, Ill. It embodies some of the features evolved by the Buda Company for its automobile engines, but is designed to take care of the severe working conditions in tractor service. The Buda Company has been supplying engines to tractor manufacturers for several years, and has made a thorough study of the requirements in this exacting service. The situation in the fuel market has been taken into account, and the engine has been designed to operate successfully on the present low-grade gasoline, but where desired it can be furnished with a specially constructed manifold for operation on kerosene.

The new model HTU is a four-cylinder block-cast engine of 4½ in. bore and 5½ in. stroke. No power rating is given, but it may be stated that this size of engine (312 cubic inches piston displacement) is about that usually employed on three plow tractors.

The cylinders are cast in a block, with detachable heads, and are finished by grinding. Voluminous water jackets surround the entire combustion chambers, and the water space is baffled so as to compel the water to flow over every part of the flame-swept surfaces and cause it to be discharged directly beneath the valves. In the cylinder head provision is made for a large number (21) of closely spaced studs, to insure uniform pressure on the copper asbestos gasket and thus prevent leakage. Particularly large water spaces are provided on top of the cylinders. The spark plugs are screwed into the cylinder heads, and their bosses are completely surrounded by water. S. A. E. standard ⅞-in. plugs are used. The water outlets on the cylinder head are fitted with removable outlet-elbows, which can be located at four different angles.

The cylinder base flange is extended to carry the valve lifter guides, which construction permits of completely enclosing the guides, valve lifters and push rods, and of making provision for oiling these parts by means of communication with the crankcase. The exhaust and inlet pipes are located

on the same side of the cylinder block, which facilitates the making of hot air connections for burning low-grade fuel.

The crankcase consists of two gray iron castings, with a horizontal joint through the crankshaft axis. All bearings are supported by the upper half, the lower half serving only as an oil pan. Lugs are provided on the crankcase for attaching a sod pan, thus eliminating the need for supports on the main frame. The crankcase and oil pan form a bell housing over the flywheel and will take any standard transmission suitable for No. 3 S. A. E. bell housing.

Special interest attaches to the oiling system employed. For truck purposes a single piece oil pan is employed, which is divided into an upper and lower compartment by means of an easily removable plate. This feature enables the oil reservoir to be thoroughly cleaned when required, with a minimum of effort. For tractor purposes a two part oil pan is provided, which gives easy access to the bearings for adjustment. Upon taking out a few bolts, the lower half of the oil pan can be removed. This part is provided with a settling chamber in which all abrasion from the bearings or any other solid particles may settle, and at the lowest point of this settling chamber there is a drain plug. A feature that will be readily recognized as of great value in a tractor engine is that the connecting rods and pistons may be removed from the engine without taking it out of the frame or disturbing any other parts.

The engine is designed for three-point support. There are two rear supporting arms cast integral with the bell housing, designed for main frame support. The forward end of the engine is supported by a trunnion, intended to rest upon a drop cross piece of the frame.

The engine being of the "L" head type, all valves are operated from a single camshaft, and the whole valve mechanism is enclosed. Valves of liberal size are employed, both sets having an effective diameter of 1½ in. The ends of the stems are hardened, and oil tempered valve springs are used. Valve stems and push rods work in separate removable bushings. A



removable cylinder sideplate covers the valves. Mushroom type cam followers are used.

The pistons are of cast iron, ground to size and provided with recesses and drilled with oil relief holes to prevent smoking. A balancing pad is provided in the piston casting, by means of which the weights of all pistons can be equalized. The piston rings are ground on the circumference and on both sides, and they have a diagonal cut. I-beam section connecting rods are used, of open hearth steel, drop forged and heat treated. The upper end of the rod is bushed with phosphor bronze and the lower end is fitted with a bearing consisting of a bronze shell and babbitt lining. Each connecting rod cap is held in place by four bolts, and the weights of all connecting rods are equalized.

Camshafts and cams are forged in a single piece of open hearth steel and are casehardened and ground. At one end of the shaft there is a flange to which the timing gear is bolted. The crankshaft is forged from open hearth steel, heat treated, machined and balanced on a Norton crankshaft balancing machine and drilled for the force feed oiling system. By means of the heat treatment to which the crankshaft is subjected, an elastic limit of 85,000 lbs. per square inch and an ultimate strength of 120,000 lbs. per square inch are obtained. The crankshaft has three main bearings, of the following dimensions: (front to rear)  $2\frac{1}{2} \times 3\frac{1}{4}$ ,  $2\frac{1}{4} \times 2\frac{1}{4}$ ,  $2\frac{1}{4} \times 4$  in. The connecting rod bearings are  $2\frac{1}{4} \times 2\frac{1}{4}$ . Characteristic of the principles of design of this engine is the fact that the connecting rod's center to center length is  $12\frac{1}{4}$  in., or considerably more than twice the stroke.

The set of timing gears, composed of four gears, one cam, one idler, one pump shaft and one generator gear, are made with extra wide faces ( $1\frac{1}{2}$  in.) and are cut with helical teeth, a refinement which is usually considered unnecessary in tractor engines. The gears are hobbled and great pains are taken to assure accurate centers, so their operation should be practically noiseless. The gears are easily accessible upon removal of the gearcase cover.

All main bearings are of the bronze-shell, babbitt-lined type, while the camshaft bearings, three in number, are die cast babbitt bearings. All bearings are accurately reamed and scraped to a perfect fit. A centrifugal type of water pump is provided, having a large bronze runner. The water pipes are short and of simple form, and are so arranged that it is unnecessary to bend the hose. A fan bracket is cast integral with the gearcase cover and is designed for mounting a radiator fan driven by a 2-in. flat belt.

A cast iron exhaust manifold is used and is provided with an expansion joint at the outer end. The intake manifold is cast integral with the exhaust manifold, thus insuring the proper heat supply for burning low-grade fuel. A special

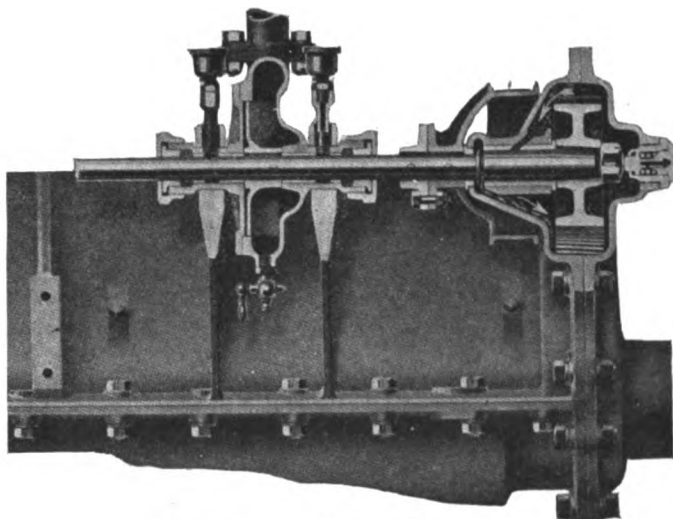
design of combination exhaust and intake manifold is furnished where it is desired to burn kerosene. Both manifolds of course are located on the same side of the engine block, and the inlet manifold is designed to take a  $1\frac{1}{4}$ -in. vertical outlet carbureter.

The flywheel is secured to the crankshaft by means of six steel bolts passing through a flange integral with the crankshaft. The flywheel regularly furnished with the engine will accommodate any of the standard clutches used in connection with a No. 3 S. A. E. bell housing.

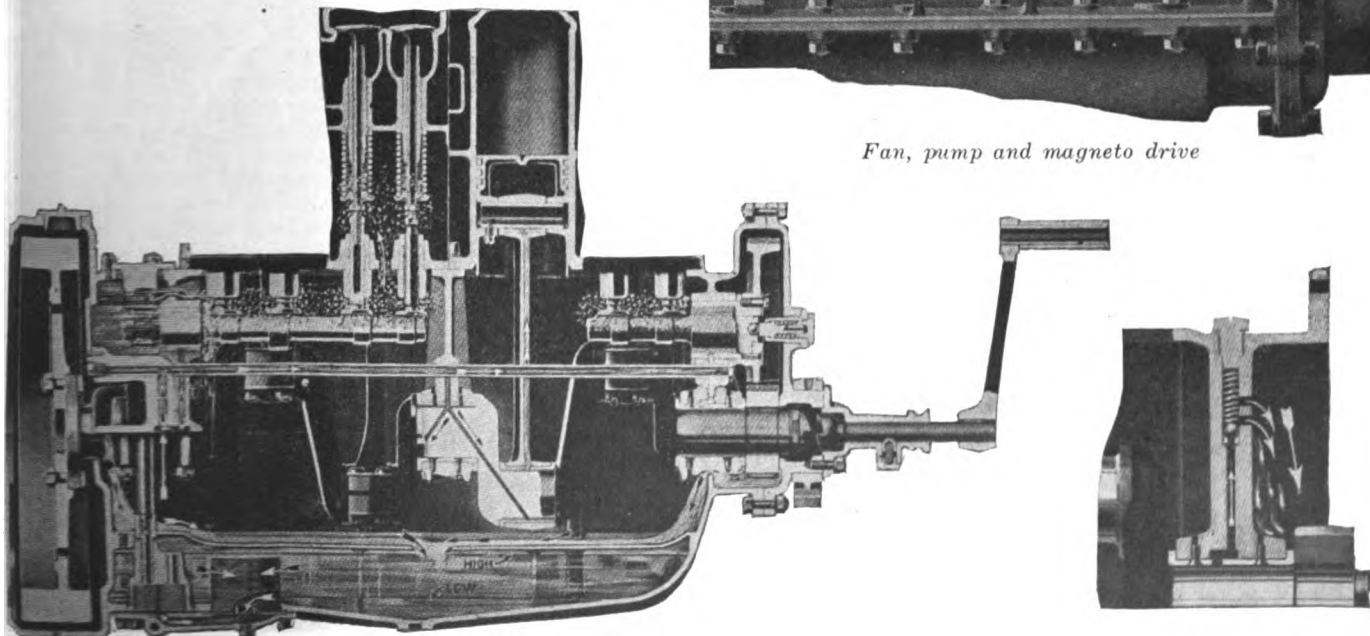
Lubrication is by full force feed to all bearings through a drilled crankshaft. This system is of the self-contained positive pressure feed type, with a pressure regulating valve, the oil being pumped from the oil reservoir, which is located underneath the crankcase, by a geared type pump and forced through a pipe to the main bearings, and from these through passages in the crankshaft to the connecting rod bearings. The camshaft bearings and piston pins are also lubricated through passages connected with the pressure feed system. The cylinder walls are lubricated by oil thrown off from the lower ends of the connecting rods. A special lead from the pressure system extends into the timing gear housing.

Almost any make of ignition, starting and lighting outfit can be readily mounted on the engine. The crankcase is arranged for No. 2 S. A. E. starting motor and lighting generator flanges on the left-hand side, while the water pump and magneto may be located on the right-hand side, looking at the engine from the front end.

The flywheel is 17 in. in diameter and has a rim  $3\frac{1}{4}$  in. wide. Different rim sections, however, are used, according to the purpose for which the engine is to be employed. For truck work a 76-lbs. flywheel is provided, while for tractor work a flywheel weighing 115 lbs. is fitted. The weight of the complete engine, with regular equipment, is about 800 lbs.



*Fan, pump and magneto drive*



*Diagrammatical illustrations showing method of operation of Buda lubricating system*

# High Altitude Airplane Photographs

*Of Some Interesting War Happenings*



*Zeebrugge Mole on the Belgian coast. The photograph, taken by the pilot in a Handley-Page machine, shows the result of his work. Lying in the water may be seen a destroyer on its side, sunk by a bomb from the airplanes. The photograph also shows a series of German destroyers in the water at the edge of the dock and four seaplane sheds with seaplanes in the air over the water*



*Zeebrugge Harbor. This picture, taken at low tide, shows clearly the two British ships sunk across the channel, blocking it so that German submarines could not get to sea. A German dredge may be noticed working alongside one of the sunken vessels. All four of these photographs were taken at altitudes of from 17,000 to 20,000 ft.*





*City of Metz attacked by airplanes. Direct hits made on the Metz railroad stations and railroad line. In this photograph clouds must not be confused with the smoke of the airplane bombs. The airplane bombs exploded directly on the railroads and near them, and are shown by the small light puffs of smoke, of which there are eight in number*



*The City of Cologne, while being bombed by a Handley-Page airplane. The smoke denotes the explosion of the bombs. The heaviest smoke marks the bomb which exploded as the photograph was snapped. Near the center of the photograph and toward the railroad line may be seen a bomb falling*



## Official Guide for Airplane Inventors

(Continued from page 271)

ducing the size of the orifice through which the liquid flows or by reducing the equivalent head of the orifice, which latter can be reduced by making the pressure in the float chamber dependent upon the pressure above the carbureter throttle or by adding more air to the carbureted mixture above the mixing chamber. These functions are carried out automatically in two types of carbureters so far developed. One of these, made by the Zenith Carbureter Co., Lyons, France, comprises a barometric capsule which through a linkage operates a valve regulating the pressure in the float chamber. The other was developed by the Panhard-Levassor Co., Paris, France, and has a diaphragm acted upon by atmospheric pressure and by the pressure within the carbureter. The motion of this diaphragm controls an auxiliary air valve above the primary mixing chamber of the carbureter.

The temperature of the air and the density decrease at high altitudes, but the decrease follows no regular law. A change in temperature affects the quality of the mixture, since the viscosity of the fuel changes with the temperature and the quantity flowing through a fixed size orifice varies accordingly. The variation, however, of the mixture quality as a result of temperature changes is small compared with variation due to barometric pressure changes, and complication of any thermostatic arrangement for correcting the rate of gasoline flow or of air admission might outweigh the practical advantages gained. The value of any such apparatus would depend entirely on the practicability of the form in which it appeared.

Precompression of air supply for the engine is one of the chief existing problems. Apparatus for this purpose must operate reliably and be light in weight. It must have a very high mechanical and volumetric efficiency.

There is considerable room for experimental investigations in ignition. Spark plugs offer a problem, due to the fact that modern engines develop explosion pressures of 400 to 600 pounds per square inch and m.e.p. of 120 to 135 pounds.

Insulation must be capable of withstanding great temperatures and the plug must not leak. Spark points of the plugs must be maintained at a high enough temperature to prevent carbon accumulation on them and yet their temperature must not be high enough to cause pre-ignition of the combustible charge. Consequently, spark points must be maintained within a definite temperature zone. Spark points in plugs now used have so low a temperature at low engine power that the points carbonize and short-circuit the plug. This carbonizing can be corrected by a better system of lubrication. Heating and expansion of the insulated electrode causes cracking of the insulator and the fact that all good electric insulators are poor heat conductors makes it difficult to keep the temperature of the insulator down. The chief difficulty in the present ignition systems is too high weight.

Engine parts are now considered reliable. Failures of parts of French aircraft engines 1915-16 were less than 2 per cent of the total number and 30 per cent of these were due to hits by projectiles.

Efficient self-starting systems, either of air, electric or powder shell types, are sought. The starters are usually applied to the engines on seaplanes, which do not operate at high speeds or high elevations, and are separate from the engines in all other planes. The weight is a serious factor. An air starter has in some instances been used, fitted to the engines in fighting planes which make use of an air bottle for supplying the necessary air under proper pressure. This air is either led through a distributor to the engine cylinders or operates a multiple cylinder air engine connected with the crankshaft by means of an overrunning clutch. It is suggested that a plan now used on gasoline railway cars, by which the engine is started by a charge of black powder detonated by a special mechanism in the cylinder head, may be further developed, although the problem is difficult in engines with a large number of cylinders.

Exhaust mufflers of light weight, effective in muffling and able to withstand excessive heat would be desirable. The

mufflers could not interfere with the cooling of the exhaust valves by radiation and conduction. Aircraft engines have 200 to 600 shaft horsepower, and since the heat constantly passing out of the exhaust gases is at a rate equal to twice the useful power, it makes muffler construction difficult. An aviation muffler would require at least ten times the power of an automobile muffler, which is called upon to radiate 10 per cent of the amount of heat which would pass through the aviation muffler.

Fuel storage and supply systems are not yet satisfactory. The arrangement of the fuel tanks and lines, and methods of fitting the tanks to the engines, are unsettled features of aircraft construction. Suggestions have been made to make the tanks and lines of steel to make them bullet proof. The weight is an objection, but this may be overcome by developing special alloys possessing little weight and great strength.

Gasoline having a boiling point not exceeding 250 degrees Fahrenheit is the only successful fuel used in airplane engines thus far. Hydrocarbon fuels of the higher boiling points crack or become dissociated under high temperature and pressure. A fuel which carried the oxygen required for its combustion would eliminate the effect of altitude and the temperature of the atmosphere upon the power of aviation engines.

There is room for improvement of the various instruments devised for aircraft, including the barographs indicating and recording the altitude, drift meters indicating the side slip of the plane, inclinometers indicating the angle of the plane, tachometers indicating the engine speed, oil, gasoline and water gages indicating the temperature and pressure of these fluids, and speed indicators which indicate the speed of the plane relative to the air through which it is traveling.

Two instruments which would be exceedingly valuable would be one giving the speed of the plane relative to the ground and one showing the altitude of the plane above the ground. Pilots flying at night with a barograph can only know their altitude above sea level, and when over strange country, if they fly at low elevations, they are not certain that they are at a safe altitude.

Dr. W. F. Durand, discussing aeronautical problems in the bulletin, points out the need for better materials for airplane construction, improved engines, pitch adjusting propellers, improved spark plugs, parachutes, stabilizing devices, self-starters and aeronautical instruments.

The development of wing curves of a high speed type which will have a small center of pressure movement through large angles of incidence and development of wing curves of greater lift-drift ratio are important. To engage in experiments of this nature it will be necessary to use wind tunnels which give wind speeds exceeding 100 m.p.h.

Airplanes can be improved, according to Mr. Stout, to allow greater visibility, greater gun range, quicker maneuvering and better stability. The range of flying speed can be increased to minimize landing danger. Fuel consumption can be minimized by further elimination of parasite resistance. Airplane construction should be investigated for possibilities of lightening the planes and to change them from their present kite-type construction to more stable design.

Wooden propellers are far from satisfactory, though as yet no substitute has been found. Propellers would be desirable which would permit motors to operate at the best speed (around 2000 r.p.m.) without requiring gearing down from motor to propeller.

The compass used in airplanes to-day is far from satisfactory. The gyroscope is not yet developed in light enough form. Possibly airplanes of the future will be steered along wireless rather than magnetic lines with definite control between cities.

Bullet-proof tanks are desirable. Otherwise the airplane engine—the Liberty engine—says Mr. Stout, is proceeding satisfactorily, its excellent development being due to standardization and to the fact that our program comprises but a single type.

# An Improved Elastic Limit Recorder

Consisting of an Attachment to a Standard Testing Machine by Means of Which One Person Can Accurately Determine the Elastic Limit of Specimens Both in Tension and Compression

THE method usually employed heretofore in making elastic limit determinations required three persons, one for reading the elongation with an extensometer, another for operating the testing machine and the third to note down the data. The method is, therefore, hardly suited for commercial work where quick results are wanted.

An improved instrument, due to the late J. M. Summer, has been in use in the physical testing laboratory of the Westinghouse Electric & Mfg. Co. at East Pittsburgh for some years, and was described in a paper read at the recent annual meeting of the American Society for Testing Materials.

This recorder may easily be applied to the standard testing machine, and by its use a single person can accurately determine the elastic limit of any sample that is being tested in tension or compression.

The apparatus consists of a semi-automatic load-indicating mechanism which is attached to the testing machine by means of a frame. The recorder can be moved to the right or left and fastened securely in any desired position by means of a set screw. The vertical rows of holes in the standards at each end allow the recorder to be raised or lowered at will.

Attached to the weighing poise is a card graduated to conform to the graduations of the beam, the range being from zero to 12,000 lb., with a minimum reading of 100 lb. This allows a standard 4 by 6-in. filing card to be used, and the results are sufficiently accurate for commercial work. As the limit of accuracy of weighing on a testing machine of 100,000-lb. capacity is about 50 lb., it might be desirable to have the minimum reading of the card 50 instead of 100 lb. This can be easily accomplished by increasing the length of the card to 12 in. and reducing the weight of the poise one-half, thus doubling its rate of travel.

On the back of the card spaces are ruled in which may be recorded the serial number of the sample tested, ultimate (beam) load, elongation in 2 in., and the reduced diameter. After the elastic limit is determined the card is filed so as to be available in case a complete curve is subsequently desired.

The recorder is shown in detail in the cut. It is essentially a solenoid with a loosely fitting armature, A. When at rest the armature is at the bottom, as shown, but when current is flowing through the coil the center of the armature will be at the center of the coil. The adjustable screw, S, is set so that it will just touch the armature when it is in this position.

If the armature is at rest at the bottom of the tube and the circuit is closed it will be pulled up and its inertia will carry it past the center of the coil, so that it will hit the screw E a hammer blow. It will then drop to the center of the coil, where it will be held until the circuit is broken, when it will drop to the bottom of the tube.

The bell crank, D, is pivoted at P, so that when the armature hits S the motion is transmitted to the prick punch B, which is driven sharply against the card in the holder, H, making a small pin hole in the card and immediately returning to its normal position, allowing the card to continue its movement. A light spring on the crank assists it in returning to its normal position.

In the bottom of the tube is a short spring which acts as a shock absorber for the armature. A clamp, E, on the side of the recorder serves to mount it on the frame.

The frame consists of two upright pieces fastened to the machine, with a crosspiece on which the recorder is mounted by means of clamp E. The recorder can be slid along this crosspiece in order to set it so that it starts at the zero point; and also in order to reset it, which is necessary when

the load at the elastic limit exceeds 12,000 lb., as the record must then be run across the card a second time.

The uprights have holes drilled about  $\frac{1}{2}$  in. apart so that the height can be adjusted and the position of the recorder changed. In this way several tests can be put on one card.

A push button for operating the recorder is located where the operator can conveniently reach it while he is watching the extensometer.

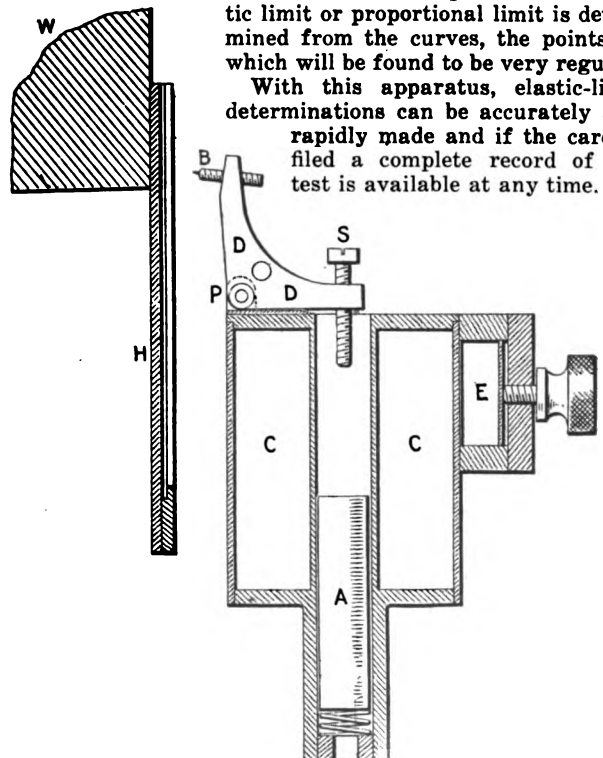
The card holder is made of aluminum and is fastened securely to the poise. A hole is drilled in the poise to remove a weight equal to that of the holder.

When using the recorder, the test specimen is placed in the machine in the usual way, with the extensometer in position. The card is then placed in the holder and fastened so that it cannot shift. The poise is then set so that the beam reads zero load and the recorder is slid along the cross bar until when the button is pressed the punch mark is on the zero line on the card. The recorder is clamped in this position, the machine started, and the operator stations himself at the extensometer. When the extensometer shows predetermined elongations, such as 0.0002, 0.0006 in., etc., he presses the button. As the card attached to the poise is moving in front of the recorder, which is stationary, and as the card is graduated to correspond to the beam, the punch marks will indicate the load at which the elongation is measured.

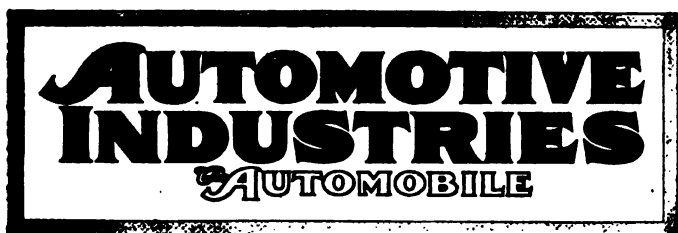
The operation is continued until the elastic limit is reached, after which the extensometer is removed and the yield point determined. The test is completed in the usual manner, the record being made on the back of the card.

For the next test, the recorder can be moved down to the next position, and in this way five or six tests may be grouped on the same card. After the tests are completed the card is removed and curves plotted. The elastic limit or proportional limit is determined from the curves, the points of which will be found to be very regular.

With this apparatus, elastic-limit determinations can be accurately and rapidly made and if the card is filed a complete record of the test is available at any time.



Summer elastic limit recorder



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## Standardizing Tractor Parts

THE fact that the majority of new tractors seen at the Salina demonstrations used standardized types of robust automobile or motor truck engines made especially stout to meet tractor requirements is proof that a new maker generally buys the best goods that are on the market. These same makers were not able to purchase standardized front axles, frames or other parts, and hence were forced to design and manufacture something of their own. Stronger arguments for arriving at some fairly definite conception of tractor parts could not be asked for. Herein lies a profitable field for the parts maker, and the first man in the field with a real job will have a good start on other competitors. There is room for nearly as much similarity in front axle tractor design as in front axle truck design. The same can be said of tractor steering gears. The lack of some definite form of tractor frame has led to a few serious engineering errors in

some new tractors. To-day the trend of tractor design is sufficiently well defined so that the parts maker can design a job that will meet the requirements of a great many firms.

## Handicaps of the Aircraft Inventor

OF late numerous inventors have been turning their attention to aircraft, because inventive effort in this field has been encouraged by our Government. Unfortunately it is a very difficult thing for the individual inventor, not connected with the aircraft technical service, to do effective work, for the reason that he cannot be familiar with the latest practice in military aeronautics. Aircraft development has progressed to a considerable extent along certain lines, and for the purpose of the present war there is practically no chance that any radical innovations such as engines functioning on other than the ordinary cycles or plane constructions sustained by other means than the lift on wings inclined to the direction of propeller thrust will be of any practical use, as it would take too long a time to reduce such innovations to a production stage.

Aircraft development will take place along the lines of detail improvement. Improved designs will be gotten out in which the material will be disposed to give greater strength in the directions where strength is needed and in which the parasite resistances will be reduced. But the untrained inventor can do little along these lines, because it takes experience and training to judge the distribution of strains in a complicate structure like an airplane.

In the simpler elements of the airplane, such as turnbuckles, cable loops, etc., standardization has been carried through to a considerable extent, to facilitate production and replacement of parts, and change in design is not greatly desired, though if sufficient advantage can be shown the standards will, of course, be modified.

Much inventive ingenuity is also being spent on devices intended to preserve the life of aviators, these taking the form of gyroscopes or other automatic stabilizers, or of parachutes. While the motive behind these efforts is most praiseworthy, the fact is that anything which materially reduces the speed and climb cannot be tolerated on a fighting machine, as it might be a danger rather than a safeguard.

It will thus be seen that the path of the inventor who wants to perfect military aircraft is strewn with difficulties. There will undoubtedly be much waste of effort in a fruitless search for radical improvements in design. Much as one would like to avert such waste, it would not be good policy to discourage inventive effort in this direction because it has been the general experience that occasionally sound practical ideas pertaining to an industry came from persons entirely outside of it, and one improvement thus achieved might more than pay for the effort wasted on hundreds of impractical ideas. The problem is to guide invention into the proper channels.



## A Suggestion for Our National Shows

By David Beecroft

**W**HY should not the national automobile shows this year take the form of national automotive exhibitions of what the automotive industries have done as direct war work in the development, manufacture and production of automotive apparatus?

Let the Grand Central Palace and the Chicago Coliseum be converted into exhibits of this war machinery.

Let the exhibits contain as much airplane apparatus as it is possible to display. There are many types of aviation engines; there is a great volume of equipment for airplanes; there are our training planes; there are our fighting planes that have already been seen by hundreds but which should be seen by hundreds of thousands; there are many parts entering into the airplanes that could be separately shown.

But aviation is but one small aspect of such an automotive exhibition. The volume of new types of artillery tractors developed by the ordnance department should all be exhibited. These have been publicly shown in a few places, but they, too, should be shown to the hundreds of thousands that might attend a national show.

Besides aircraft and ordnance there is the motor truck in all of its many forms. The government has labeled it a 100 per cent essential in war. It should be shown in all its phases of usefulness.

The farm tractor, which has become the veritable industrial tank for our armies of agriculturists, should be shown. Our city populations are strangers to it. Nine-tenths of the country has not a speaking acquaintance with it. It is a part of the automotive field, a new member of the circle of automotive industries, and as a war machine stands side by side with the airplane, with the artillery tractor, with the motor truck, with the motorcycle and with the automobile.

With such an array of war-time exhibits a great educational propaganda could be started. Our people must be more familiar with our automotive war apparatus. The more people who would see our airplanes the more sane would be the attitude of the public on airplane questions. Educate our people on airplanes for training and fighting uses, and they are better judges of airplane rumors. Such an education would be one of the best possible guarantees against so many of the malicious rumors that have infested the nation in the last 10 months.

Make such a great war automotive exposition popular to the last degree by giving all receipts above expenses to war organizations. Give the receipts for one day to the Red Cross. For other days divide them among the Y. M. C. A., the Salvation Army, the K. of C. and other war activities that are worthy of support.

Would such an exposition not be one of the greatest demonstrations to the nation of what these industries are doing for the war?

Would not such a demonstration convince hundreds of thousands directly, and perhaps millions indirectly, of the value of the great automobile industry, so often wrongfully designated a pleasure car industry, to this nation and all our Allies?

If such a great demonstration of war apparatus were not possible then the New York and Chicago shows could be staged to represent two at least of the automotive industries that are in the 100 per cent essential column, namely, trucks and tractors.

Again the West has been in the van, and for several years has been staging automotive apparatus together in a single show. The automobile has not for years held the stage in the great distributing centers such as Twin Cities, Kansas City, St. Louis, etc. In these cities trucks, which were relegated out of the New York and Chicago shows, have always been in these Western shows. Boston has seen very clearly the eventual in the truck field and has always insisted on the truck show, and has each year held a successful one. New York and Chicago have been the only centers where the truck was legislated out of the show.

This year unquestionably the truck and the tractor will hold their well-established places in the Western show circuits, and it is fitting that these two greatest national necessities should be introduced face to face with the citizens who would attend the two great population centers of the nation.

# □ Latest News of the

## Manufacturers Look for Only 75% Cut

But Are Ready to Accept 100 Per Cent Curtailment if Necessary

DETROIT, Aug. 13—The shock caused by the War Industries Board when it announced the possibility of curtailing passenger car production 100 per cent has passed away and the situation is viewed with clearer vision by the manufacturers, though it is still regarded as most serious.

The decision is not looked upon as an order by the manufacturers, and they are waiting to see what the outcome will be. The War Industries Board's reply to the letter sent by the National Automobile Chamber of Commerce simply brought to a head an issue which has been pending for some time.

If it is necessary for the Government to utilize their plants to 100 per cent capacity, the manufacturers are ready to hand them over regardless of the hardships it may cause the passenger car business and its distributing organization.

Pending a decisive step to be taken by the War Industries Board and the issuance of an official order manufacturers will continue producing cars as their ability permits. Of course it is too early to even hazard a guess, but manufacturers think they will be allowed to remain in production, however small the extent may be, and do not believe the cut will be so drastic as the decision seems to indicate.

Until the questionnaires which have been sent out by the War Industries Board have been returned and an analysis of the situation has been made, manufacturers do not expect to know definitely whether or not a 100 per cent curtailment will follow. It is their firm belief that plants will be engaged in war work to a greater extent, but production may not reach 25 per cent of normal.

The data and information which the War Industries Board requested on July 16 have not been completed by the majority of manufacturers and, according to their understanding, are not due until Aug. 15. Owing to this fact very few manufacturers were able to state at this time just how much inventory they have on hand.

The Hupp Motor Car Corp. stated it had enough big parts in stock to last at least 12 months, but of the smaller ones some had less than a month's supply. The same conditions prevail with most of the larger manufacturers. In-

ventories were never so unbalanced. The Liberty Motor Car Co., however, reports a well-balanced stock, and is in a position to maintain production for 4 or 5 months without buying more.

The Ford Motor Co. is very reticent concerning the situation. It states that no plans have been made and that it will continue production until the Government tells the company to do otherwise. It will be remembered that 75 per cent of the capacity of this company is engaged on war work. The daily commercial production is now 750, of which 350 are passenger cars.

The biggest portion of Dodge Bros. plant is engaged on war work, and further orders are constantly being added. The officials declined to make any comment on the proposition, and it is difficult to state what their attitude is.

According to Hugh Chalmers, vice-president of the National Automobile Chamber of Commerce and representative of that organization in Washington, who has just returned to Detroit, there is no desire on the part of the War Industries Board to put the automobile industry out of business, yet it is the War Industries Board's contention that having the industry go on a 100 per cent war manufacturing basis would be an ideal condition.

Assurances were given Mr. Chalmers that if steel is available after war industries needs have been satisfied, the motor car manufacturers will get their share.

The common error in thinking that the automobile industry uses only 5 per cent of all the steel produced in this country should be corrected. It is not this steel that plays such an important part in the manufacture of cars. It is the special steel—chrome nickel, vanadium, etc.—that is the bone of contention.

Mr. Chalmers addressed the following letter to the members of the National Automobile Chamber of Commerce:

"Supplementing what Alfred Reeves has written to you with reference to the letter from the War Industries Board, it is only fair to say that we did not know that any publicity would be given to this letter, because we were assured by the members of the board it was not their intention to give any to this subject. They denied having given out any of the objectionable publicity in the past and agreed with us that we should have as little as possible.

"The attitude of the War Industries Board was this:

"It was very much pleased at the spirit shown by our members in voting for the 50 per cent curtailment of passenger cars, but it felt it could not accept that agreement without obligating itself, indirectly at least, to give us materials on a 50

(Continued on page 302)

## Production Reduced in Detroit District

Some Manufacturers Are Close to the 25 Per Cent Line, Others Still Lower

DETROIT, Aug. 9—The most marked change in this territory in the passenger car manufacturing field is the gradual reduction of production. Many manufacturers are nearing the 25 per cent line of production; some have already arrived at this figure. Whether this output will be reduced still further is a matter of conjecture. Manufacturers are reticent about making any prophecies regarding the future. They will continue production up to the limit of their ability to secure materials, many feeling optimistic about the situation, and believe relief of the strain under which they are laboring is close at hand.

Production of the Willys-Overland, Inc., averages 400 daily; that of the Paige is 35; Reo has reduced its production 50 per cent compared with a month ago. It is now 40 cars per day, while the output of the speed wagon is 25 daily. Buick's production is in the neighborhood of 175 daily; Chalmers, 50; Harroun is reported at 10; King averages also 10; Liberty produces 7, and Scripps-Booth, 40. Ford passenger cars come out at the rate of 350 a day and the trucks at 400. Packard, Hupp, Briscoe and Columbia production figures are the same as reported a month ago.

Production of the Cadillac goes entirely to the Government. This was curtailed Aug. 1 from 40 cars daily to 25. This latter figure represents what was going to the Government. With the curtailment of production it is apparent that no cars are going into the commercial field from this plant.

## Navy Contractors Asked to Ship Early

WASHINGTON, Aug. 13—The Bureau of Supplies and Accounts of the Navy Department requests all navy contractors and others engaged directly or indirectly in the purchase, shipment and storage of navy material and supplies to endeavor to move all materials and supplies possible prior to the winter season so as to prevent freight congestion during the colder months. The statement adds that while the railroads are now handling considerably more traffic than usual and will increase freight equipment and terminal facilities, it is possible that we will experience unusual severe weather again this coming winter, which would tend to hamper freight shipments.

# Automotive Industries □

## Trucks Are Classified Among Utilities

Priority Board Recognizes Industry as Essential—Manufacturers to Make Monthly Reports Giving Details of Commercial Vehicles Made and Sold

WASHINGTON, Aug. 9.—Motor trucks used directly or indirectly for war purposes are war essentials and their production for such purposes will be facilitated. Motor trucks employed in essential uses in civilian industry constitute an important transportation medium, and curtailment for such uses should be avoided as far as possible. Manufacturers of motor trucks whose factories are exclusively devoted to producing products absorbed directly or indirectly by the Government or in other uses of essential importance will be given class B-4 rating for steel requirements, conditioned, however, that the manufacturer will observe a pledge of co-operation and the regulations of the Priority Board. These statements form the salients of a circular now being prepared by the War Industries Board for distribution to manufacturers of motor trucks, which outlines the assistance they will receive from the Priority Division in the manufacture of trucks.

### Will Define Essential Uses

The circular will specifically define essential and non-essential uses of trucks. It states that the demand for iron and steel is such that no guaranty can be made to the motor truck or any other industry that its steel requirements or any operation thereof will be met. However, the members of the motor truck industry, states the circular, who comply in good faith with the pledge of co-operation will be accredited the class B-4 rating in procuring their supplies of fuel, iron and steel. The B-4 rating insures the issuance of priority certificates, and places the motor truck well up in front in the list of very important steel consumers.

The Priority Division will receive application of any manufacturer of motor trucks for a place on the preference list for fuel, in each instance taking into consideration the fuel situation of the manufacturer, the amount of his direct and indirect Government business, and the uses to which the remainder of his produce is being devoted.

Any motor truck manufacturer whose factory is now or in the future will be exclusively devoted to making products absorbed either directly or indirectly by the Government or otherwise of essential importance, and whose fuel requirements and output bear economical rela-

tion to each other, will be placed upon the preference list for fuel, providing he observes the pledge of co-operation and regulations.

Any manufacturer of trucks who believes that he is entitled to an even higher rating than B-4 for securing steel requirements to complete any part of a contract or order, may make a formal application for the higher rating to the Priorities Division.

The manufacturer's pledge applies also to the uses of steel already in his possession, and to manufactured or partly manufactured trucks in his possession at the time the pledge is made.

### Pledge of Co-operation

The pledge of co-operation to be given by any motor truck maker who desires to be placed on the preference list for fuel, and in class B-4 for steel, is as follows:

"The undersigned hereby pledges itself (1) to use only in the manufacture of motor trucks or repair parts for motor trucks the steel suitable therefor which is now in its possession or which may hereafter come into its possession; (2) to sell no motor trucks of its manufacture except (a) for essential uses as that term has been or may be defined or applied by the Priorities Division of the War Industries Board, or (b) under permits in writing, signed by or under authority of such Priorities Division; (3) to sell no user an unnecessary number of motor trucks even for essential uses; (4) to discourage the purchase of any motor truck to replace a usable truck already in service and to give maximum encouragement to the repair of trucks; (5) that this pledge shall bind not only the undersigned but also its branch houses; subsidiaries, dealers, brokers, factors, commission merchants and all other selling agencies; (6) to make no delivery of any motor truck to any one for resale, either directly or indirectly, until such one has filed with the undersigned its pledge of co-operation in writing; and to make monthly reports as required by the War Industries Board to the Automotive Products Section of said Board or otherwise as said Board may direct."

The manufacturer must also require from anyone to whom he delivers a motor truck for resale a subsidiary pledge in much the same terms.

Each manufacturer must forward dur-

ing the first fifteen days of each month a sworn report to the Automotive Products Section of the War Industries Board showing the number of motor trucks manufactured in the preceding month, the number delivered to the United States Government and its allies, the number on hand, the approximate stock of steel on hand and such other information as may be required. These reports will be held confidential by the Board unless the public interest shall require otherwise.

The creation of new plants or the expansion of existing plants for the manufacture of motor trucks is held to be unnecessary and undesirable inasmuch as existing facilities are ample to produce all the trucks required for essential use or for which steel can be furnished.

The original plan of creating a list of essential truck users as was announced earlier in AUTOMOTIVE INDUSTRIES has been given up for the time being. The Priorities Division has preferred to believe in the good faith of the manufacturers and distributors of motor trucks and is leaving the determination of an essential consumer to them.

### Makers' Monthly Reports to Guide Board

The monthly report of the manufacturers to the Automotive Section of the War Industries Board will be used by the Priorities Division to check the essentialness of the sales of trucks. If it should develop that any violation of the rules and sales are made to non-essential users, the Priorities Division will be obliged to limit the sale of trucks by means of a certified list of purchasers.

The Class B-4 rating comprises orders and work which, while not primarily designed for the prosecution of the war, are, however, of public interest and essential to the national welfare or otherwise of exceptional importance according to the definition of Class B by the Priorities Board.

Applications for priorities certificates are to be made as heretofore by each individual firm to the Priorities Division of the War Industries Board, Washington. The board will furnish the necessary blank forms for this purpose.

### June Exports High for Detroit District

DETROIT, Aug. 13.—The exports from the District of Michigan for June have attained a high record. Among other things the following classes were listed: Automobiles and parts, \$1,500,142; raw cotton, \$1,269,731; iron and steel and manufactures thereof, \$1,678,804. The exports to France were almost all covered by automobile tires, adding machines and sawed lumber.



## New York's Export Figures Improve

Over Half of All Automotive Exports of U. S. Pass Through Metropolis

NEW YORK, Aug. 9.—New York's position as the principal port of export continues to improve, although the figures for June are still slightly below those of January and February. During June the total value of cars, trucks and parts shipped to foreign countries from New York represented 54 per cent of the total automotive exports exported from the United States. In May the New York percentage was 43 and in April the proportion was but 24 per cent.

Automobiles, trucks and parts exported through New York in June totaled \$3,633,577, as against \$3,339,588 in May and \$2,396,448 in April. Passenger cars were valued at \$1,495,346; trucks at \$1,370,955, and parts at \$767,276. The May values were respectively \$1,289,109, \$1,280,606 and \$769,843.

An interesting feature of the June exports is the good showing made by Latin

American countries, Argentina, Brazil, Chile and Uruguay in particular. As a matter of fact Chile was our best car customer for the month.

### A Special Flag for Private Factories

WASHINGTON, Aug. 12.—Every private factory in the United States, devoting more than 50 per cent of its total output to ordnance material, is to have the privilege of flying a specially designed flag. Orders to this effect have been issued by Major General C. C. Williams, U. S. A., and managers of the various ordnance production districts have been requested to inform the Ordnance Department at Washington of the number of plants affected.

The flag measures 4 ft. by 6 ft. Around the 4 sides is a red border. Within this border are 3 broad panels, the center one blue and outer ones white. In the middle of the center panel of blue there is a design in white of the Bursting Bomb, insignia of the Ordnance service.

### Pierce-Arrow Makes Big Profit

BUFFALO, Aug. 8.—The Pierce-Arrow Motor Car Co. reports operating profits of \$1,523,421 and net profits of \$914,029 for the three months ending June 30.

## American Haviland Undergoing Trial

Division of Aeronautics Inaugurates Severe Flight Tests for Plane and Engine

WASHINGTON, Aug. 9.—On a flight to test the American de Haviland-4 equipped with a Liberty 12 engine, two officers of the Air Service left Washington this afternoon at 4.20 for Philadelphia. This test is being made by the Division of Military Aeronautics and the two officers making the flight are Major W. C. Oker and Second Lieut. L. Deutsch. These two officers started originally from Dayton, Ohio. They had made 2 flights from Dayton to Mt. Clemens, Michigan, and return, and one to Camp Perry and return, when on Saturday at 1.14 p. m. they left the Dayton Field and headed direct for Washington, D. C.

At 3.45 p. m. they were 20 miles north of Harrisonburg, Virginia, where they landed for gas, but decided to stay over night. Leaving this location early the next morning they landed on the Polo Field at Potomac Park, Washington, an hour later, making the total flying time from Dayton to Washington in 3½ hr.

Leaving Washington that same afternoon, they made Philadelphia in 58 minutes. Returning to Washington Monday afternoon, they left again for Philadelphia this afternoon. From there they start for Mineola, and will eventually start back for Dayton from the Long Island Field.

Besides testing plane and engine the two officers are testing compasses. The plane carries a spare propeller strapped underneath the fuselage and an extra landing wheel inside. The plane has covered over 2000 miles in the last 2 weeks with no engine trouble and it will be driven until it shows engine or body weakness. The idea is to give the plane and engine as hard a test as possible.

In addition to the extra parts they carry, the officers also have their personal luggage, one idea being to keep the total weight supported up to approximately that of battle flying.

From Dayton to Washington the officers flew entirely by compass, passing over Alleghany and Blue Ridge Mountains at an elevation of about 19,000 ft., and in crossing West Virginia they were above such thick clouds that they did not see that State at all.

### Export Licenses for Sweden Will Be Considered

WASHINGTON, Aug. 10.—Applications for exportation of all commodities to Sweden will now be considered by the War Trade Board.

Exporters in the United States before filing applications for export licenses must obtain from the prospective importer in Sweden advice that there has been issued by an appropriate importing

AUTOMOBILE, TRUCK AND PARTS EXPORTS FROM NEW YORK FOR JUNE

	Cars		Trucks		Parts Value
	No.	Value	No.	Value	
Aden .....	..	.....	29	.....	\$186
Argentina .....	229	\$272,451	29	\$20,283	132,118
Australia .....	104	94,638	7	11,675	27,673
Barbadoes .....	..	.....	..	.....	1,458
Bolivia .....	..	.....	..	.....	99
Brazil .....	82	54,707	7	15,865	11,242
British East Africa .....	4	3,433	..	.....	508
British East Indies .....	..	.....	..	.....	13,288
British Guiana .....	4	2,780	..	.....	6,430
British Honduras .....	..	.....	..	.....	86
British India .....	14	3,460	10	19,925	32,197
British Oceania .....	1	1,109	..	.....	.....
British South Africa .....	224	183,654	5	4,489	55,866
British West Africa .....	12	9,053	13	7,525	880
British West Indies .....	..	.....	..	.....	657
Chile .....	287	349,610	8	12,967	48,041
Columbia .....	1	1,760	1	600	2,447
Costa Rica .....	1	500	..	.....	44
Cuba .....	22	45,016	18	67,264	50,130
Dutch West Indies .....	..	.....	..	.....	206
Ecuador .....	12	19,118	..	.....	557
England .....	..	.....	38	78,761	173,486
France .....	185	98,331	261	945,726	119,542
French Africa .....	..	.....	..	.....	20
French West Indies .....	4	3,879	9	12,870	2,768
Guatemala .....	1	1,196	..	.....	238
Hayti .....	9	7,642	1	1,807	4,257
Honduras .....	..	.....	..	.....	116
Iceland .....	13	10,124	1	2,245	1,586
Italy .....	1	2,500	..	.....	6,536
Jamaica .....	6	3,820	4	4,250	6,054
Mexico .....	19	22,339	4	11,396	8,323
Newfoundland .....	1	4,550	..	.....	65
New Zealand .....	40	32,281	..	.....	70
Nicaragua .....	7	5,843	..	.....	42
Norway .....	5	18,444	25	108,000	.....
Panama .....	3	2,419	..	.....	3,494
Para .....	..	.....	..	.....	488
Peru .....	97	114,389	13	35,287	12,122
Salvador .....	8	11,592	..	.....	371
San Domingo .....	22	13,227	..	.....	2,273
Spain .....	3	9,789	..	.....	2,704
Straits Settlements .....	..	.....	..	.....	116
Trinidad .....	10	3,646	2	11,020	5,924
Uruguay .....	148	72,107	9	9,000	29,419
Venezuela .....	6	6,179	..	.....	3,210

association, or by the Statens Handels Kommission, a certificate covering the proposed consignment. The number of the certificate should be forwarded by the importer in Sweden to the American exporter. This number should be specified on Supplemental Information Sheet X-104, which must be duly executed and annexed to the application for an export license.

Applications for licenses to export to Sweden commodities for which a Handels Kommission certificate or an importing association certificate is required will be considered only in the event that the said certificate has been issued subsequent to June 14, 1918. Certificates issued prior to that date will be treated as void.

#### Ford Plans Mexican Tractor Factory

WASHINGTON, Aug. 9—Henry Ford has submitted a plan to President Carranza of Mexico for the establishment of a plant in that country to manufacture Fordson tractors on an extensive scale. The idea is to instruct Mexican mechanics in Ford factories in this country in the first instance and then send them back to Mexico to operate the new factory.

Tractors will be sold to farmers at practically cost price on terms which will permit of their being paid for out of the increased crops made possible by their use. Mr. Ford states that his sole object is to benefit Mexico, and that any profit which may be made will remain in that country.

It is the intention to invest a considerable sum in the enterprise, several millions if necessary. No factory location has been chosen as yet, but investigation as to local conditions of transport, coal, etc., is being made. The fulfillment of this scheme will naturally reduce the cost to the consumer, who will save freight, duties, import charges, etc.

#### Goodyear June Sales Are \$13,562,915

AKRON, Aug. 12—The gross sales of the Goodyear Tire & Rubber Co. in June amounted to \$13,562,915. Although this total is somewhat lower than for the two preceding months, it makes the total gross for the eight months up to the end of June, \$88,390,432. The remaining four months, normally among the heaviest, should produce an additional \$50,000,000 at least, making the year's business reach \$140,000,000. In the 1916-1917 year, Goodyear transacted \$111,450,000 worth of business.

Practically every product of the company is used extensively by the Government for war purposes. The increase in sales of motor truck tires alone will more than offset any decrease in the demand for tires due to the curtailment of production of passenger automobiles. Demand in all lines of manufacture exceeds production, which is limited only by the number of employees obtainable.

#### Dort Increase Stock to \$2,000,000

FLINT, MICH., Aug. 12—The Dort Motor Car Co. has increased its capital stock from \$1,500,000 to \$2,000,000.

## Bomb German Cities Intensively

### Successive Groups of 25 Planes to Be Dispatched at Frequent Intervals

WASHINGTON, Aug. 10—The feasibility and demoralizing effects of long range bombing were emphasized here by British fliers recently arrived from the front. They state the only way that Germany can be made to realize she is getting the worst of the war is by carrying the war right into Germany, and the quickest way we can do that is by air. Six of the principal manufacturing towns on the western frontier of Germany lie within easy bombing reach of the French and British lines. Raids already undertaken over German soil by the British squadrons operating from the Nancy area have had far-reaching results.

Gas, tanks and airplanes, it was pointed out, are the new features of this war. Gas and tanks can both be comparatively readily overcome by the use of gas masks and anti-tank guns. Aircraft, however, can only be fought to any effective degree by enemy aircraft. In consequence the possibilities, once the Allied air forces greatly exceed those of the Boche, are unlimited.

The following example was pointed out by a British aviator to show what can be accomplished, using a minimum quantity of men, machines and money:

"Given 500 machines each capable of carrying 1 ton of bombs and having a service radius of 200 miles—that is machines capable of dropping 1 ton of bombs on a given town within a radius of 300 miles from their base and returning.

"Select 1 single town within a 300-mile radius which if destroyed will vitally affect production of shells or other munitions.

"Divide the 500 machines into 25 groups of 20 machines each. To obtain the best moral and physical results, the raid must be continuous. Start the groups with intervals of 1 hour between them.

"Deduct as much as 30 per cent for engine failure, machines brought down by the enemy, and machines failing to find or reach the target (this is an exorbitant percentage to deduct. Under active service conditions 10 per cent to 15 per cent prove to be nearer the mark.) The result will be the dropping of 14 tons of bombs on the town selected, each hour, for 25 consecutive hours, that is a total of 340 tons of bombs. The effect on the doomed town can scarcely be imagined. It would be reduced to a complete state of ruin and chaos."

Another important factor, it was stated, to be taken into consideration in air raids is fire. The anti-fire equipment of the larger German towns is capable at the utmost of dealing with from 12 to 15 fires simultaneously, and by calling upon neighboring towns for assistance with about 5 more. This makes a total of 20. A continuous air raid for 25 hours would establish hundreds of fires, the vast majority of which would be left to burn out untouched.

It was said that if the air forces of the Allies were only sufficiently greater than the Germans to allow one attack each week upon a German town as outlined here, the end of the war would be in sight very soon.

#### Wire Wheel Corp. Gains Decision

NEW YORK, Aug. 8—The Wire Wheel Corp. of America has received a decision in the matter of its proceedings to restrain C. T. Silver of New York as agent of the Silver Apperson car from selling or otherwise disposing of a number of Fryer wire wheels purchased by the Apperson company from the Phelps Mfg. Co. It was held by Judge Hand of the U. S. District Court that there seemed to be but small doubt but what the Freyer wheel infringed upon the triple spoke patent, but that inasmuch as Mr. Silver had but a few cars fitted with these wheels on hand and no irreparable injury was likely to be suffered by the Wire Wheel Corp. he would deny a motion for a preliminary injunction if the defendant filed a bond in the sum of \$2,000 to cover such damage as might be shown to have been sustained by such infringement at the final hearing of the case.

#### British Austin Company now Employs 20,000

LONDON, Aug. 6—The Austin Motor Company has grown to be the largest British motor car manufacturing concern, rivalling Fiat for first place in Europe. It is said that the Austin Company now employs approximately 20,000 men as compared with 2500 before the war. At the annual general meeting of the company Sir Herbert Austin reported that during the past twelve months alone there has been an increase of 125 per cent in employees, and an increase of 65 per cent in assets.

Sir Herbert also stated that the post-war plans of the Austin Company are now entirely made. It is believed, as will undoubtedly be the case with other similar companies which have expanded beyond their normal growth, that in addition to their automobile and motor truck work, they will include certain definite branches of general engineering.

#### War Profits of British Motor Car Makers

LONDON, Aug. 10—According to information which has just been disclosed, seventeen of the leading companies in the motor and cycle group earned a total profit of \$5,725,540 in the twelve months ending June 30, as compared with \$5,278,590 for the previous year.

According to the same source of information the year's profits were distributed as follows: 38 per cent went to the common share holders, 16 per cent to the holders of preferred shares and 46 per cent to reserve.

#### Auto Indicator Increases Capital

GRAND RAPIDS, MICH., Aug. 10—The Auto Indicator Co. has increased its capitalization from \$15,000 to \$50,000.

## Against Increase in Freight Rates

N. A. C. C. Traffic Manager  
Argues Before I. C. C. on Proposed Schedule Changes

NEW YORK, Aug. 9—In behalf of automobile manufacturers, J. S. Marvin of the National Automobile Chamber of Commerce appeared yesterday before the Interstate Commerce Commission to argue against the proposed increases in freight rates applied to automobiles as promulgated by the Railroads Freight Classification Committee. The proceedings were a part of the investigation which the commission is making into the so-called consolidated classification case.

### Standardization of Carload Weights

For some time now the railroads have been working on the consolidated classification combining the Eastern, Western and Southern classifications into one for all territories with three different ratings, one for the East, another for the West and the third for the South. The chief object of this move is to standardize the descriptions of articles and the minimum carload weights. But it is also proposed to increase the rating on automobiles in the West 10 per cent or to make it 110 per cent of the first class freight rate.

Following a protest from the automobile manufacturers, it was proposed to draft a reclassification whereby freight vehicles or motor trucks will be separated from passenger cars in the West and given a reduced rating as second class under an advanced minimum carload weight of 12,000 lb. This proposed classification would not, however, satisfactorily provide for mixed carloads of freight and passenger cars and it is therefore likely that some further change will be suggested.

### What the Increase Would Mean

In his argument, Mr. Marvin showed that some of the principal manufacturers have figured that the proposed 10 per cent increase in the classification of passenger cars would amount to from \$50,000 to \$160,000 on their individual shipments based on a volume of business equal to that of 1917, and that the total additional cost on all automobile shipments into the West on the same basis would reach perhaps a million and a half dollars. This would be in addition to the 25 per cent general increase in freight rates which went into effect June 25 and he stated that the railroads as a whole would gain not less than ten million dollars by this 25 per cent increase on a normal year's production. It was brought out that the shipping of automobiles had grown from a small volume when the present classification was fixed to 300,000 carloads per year and that the average value of automobiles on the contrary had declined until it was but 45½ per cent of the average value seven years ago.

The use of automobiles in a utilitarian way by business men generally, doctors, army and Red Cross workers, farmers, contractors, builders and salesmen was brought out and supported by an ample array of facts and data. The evidence included a technical discussion on the shipping of automobiles and the furnishing of freight cars which does not rest as heavily at this time on the western lines as it formerly did.

### Freight Advancement Not Justified

The Commission was informed that the proposed classification does not adequately cover the shipping of automobiles as it now obtains with respect to loading which now exceeds the minimum carload weights, particularly on Western shipments, and it is, therefore, a much more desirable class of freight than it was heretofore.

In support of their action Chairman Fyfe of the Western Classification Committee pointed to the decrease offered in the rating on freight machines, but Mr. Marvin declared that this was long over due and had been contended for during the past several years, similar action having been taken by the Eastern and Southern lines long ago. It was pointed out that the reduction in the rating on freight machines could not be offered to the one hundred or more manufacturers who make passenger machines exclusively as justification for advancing their rating.

Chairman Fyfe also tried to show that the carriers' earnings would be about equalized by advancing the passenger machine rating and reducing the truck rating, but Mr. Marvin contended that the much larger volume of passenger machines in normal times disproved this statement and that each type of machine should be rated on its merits. He also produced a summary of all the light-loading articles in the classification pointing to the fact that none of them moved in such volume as automobiles, but that it was only on the automobiles that the consolidated classification showed an increase.

### Wheels, Tanks and Other Parts

Objection was also made to an increase from 24,000 lb. to 30,000 lb. carload minimum on automobile wheels shipped in the East; an increase of one class in the carload rating on gasoline tanks, spring assemblies and jacks in the East; the minimum weight on 50 ft. cars in the West would be increased 2000 lb. which was stated would affect certain types of machines which cannot be double-decked and attain heavy loading. Rules that would require open car shipments to be covered by fireproof tarpaulins and detachable parts boxed and attached to the floor of freight cars, were opposed on the ground that the manufacturers have safer ways of hiding the tools from view that would be better for both shippers and carriers and that all the manufacturers can do is to use tarpaulins that have been fireproofed. The carriers thought that on these points they could come to an agreement with the shippers.

## Fordson Tractor Price Advanced

Regular Prices in Effect, and Dealers and Distributors Make Profits

SALINA, KAN., Aug. 8—The price on Fordson tractors has been advanced. The period of distribution "without profit" is at an end. Everybody now is making some money.

Probably the prices which prevail here may be taken as typical of what the Fordson prices will be everywhere, as in all probability a uniform price will prevail, freights being taken into consideration.

The Hudkins Tractor Co., distributor here for the Fordson in the 50 northern counties of Kansas, is making the following prices:

Retail price at Salina for the tractor ..... \$920.00

Retail price at Salina for the No.

7 Oliver plow ..... 145.00

Retail price at Salina for the Lean harrow, f.o.b. Mansfield.. 146.00

Price of tractor to sub-dealer, f.o.b. Salina ..... 787.50

To this price the dealer is permitted to add a profit of 12½ per cent.

As far as it is possible to ascertain here the price of the tractor to the distributor remains as it was, \$750, f.o.b. Dearborn, Mich.

Nor has any change been made in prices to distributors on the No. 7 Oliver plow nor the Lean harrow.

For the present the distributors and dealers selling the Fordson tractor will confine their equipment sales to the plow and the harrow, but will take on other lines as rapidly as they receive the approval of Henry Ford.

### Government Contractors May Take Over Special Plants on Completion of Work

WASHINGTON, Aug. 13—Hereafter manufacturers who are furnished with special materials at the Government's expense may agree to take over such facilities at a fair value. Manufacturers frequently have to construct additional buildings or provide such machinery in order to fulfill terms of war contracts. Under the terms of the Government contracts now made, title in such improvements vests in the United States. The new clauses in the contracts give the contractors opportunity to take over these new facilities, paying for them at their appraised value at the time of making the offer, either by payment of money direct or by an amortization plan.

If the contractor does not make the Government an offer or if his offer is unacceptable the Government retains the right to remove all facilities provided after the termination of the contract. A reasonable time is given to the Government to remove all facilities, or if the Government prefers to keep the facilities, the contract provides that it may buy



the land upon which they have been erected.

Increased manufacturing facilities created by the War Department exclusive of the new industries serving the Navy and Emergency Fleet Corporation, from April 7, 1917, to July, 1918, cost \$400,000,000. Seventy per cent has been or will be spent in sections of the country other than in the New England or east central states. In fact the investments have been distributed through almost half of the United States.

#### Dealers' Association to Meet War Industries Board on Car Curtailment

WASHINGTON, Aug. 13—The National Automobile Dealers' Association and the War Industries Board will hold a conference regarding curtailment of the passenger car industry on Friday, Aug. 16, at 10 o'clock. This meeting is the result of numerous telegrams from officers and members of the association requesting a hearing before the board in relation to its suggestion that automobile manufacturers convert their factories to 100 per cent war work by Jan. 1, 1919. The meeting will be between the officers of the association and the sub-committee of the War Industries Board, which deals with the automobile industry.

Possible seizure of the stock of materials now on hand in passenger car factories is hinted at by the War Industries Board in its statement, which says the board "will not deprive the manufacturers of stocks of material they have on hand unless the demand of the war situation requires it, in which event the automobile industry will be treated as any other industry would be under like conditions."

The War Industries Board, in its formal statement, announcing the meeting for Friday, also says that it "wishes the automobile dealers and everyone else to understand that the letter to the automobile manufacturers (suggesting a 100 per cent war work program) was prompted only by labor and material conditions that made it imperative if the Government's war program is not to be interfered with."

## Government Traffic Offices

### Established at Detroit and Other Points to Facilitate Movement of War Supplies

DETROIT, Aug. 13—For the purpose of facilitating the movement of materials and supplies for the War Department, the Government has established an office in Detroit and several other points throughout the United States. These offices will be under civilian traffic managers with commissioned officers as assistants where there is need of help. The Detroit office will be in charge of A. J. Dutcher.

In circular No. 2A, superseding and canceling No. 2, the functions of the bureau are explained, in part, as follows:

The duties of those in charge of branch and district offices with respect to the transportation of property are as follows:

A. To represent the Inland Traffic Service in all matters within its jurisdiction, subject to the established rules and regulations.

B. To promptly and effectively respond to all requirements of the War Department pertaining to the transportation of War Department property, inland and coastwise.

C. To respond, with respect to matters within their jurisdiction, to requests from officers and representatives of the United States Railroad Administration and the individual carriers, including water lines.

D. To perform all duties pertaining to the transportation, inland and coastwise, of all property of the War Department moving by express, freight or otherwise, and the routing thereof, beginning with the ordering of cars or other vehicles for use in shipping the property.

E. To exercise special supervision over the shipment of property by express

and to substitute freight service when practicable.

F. To inform themselves with respect to the service available by inland and coastwise waterways and the rates applicable, and to encourage the movement of the maximum amount of property via such routes when safe and practicable and the expense therefor is not in excess of the expense for movement by rail, including cartage and considering land grant deductions. Any departure from the latter rule must be approved by the chief, Inland Traffic Service.

G. To confer with officers and agents of the carrier, to insure the prompt movement to its destination of all property of the War Department being delayed en route; to report to the consignee and to the chief, Inland Traffic Service, through the proper channels, the action taken in all such cases, and for such other purposes as may be necessary.

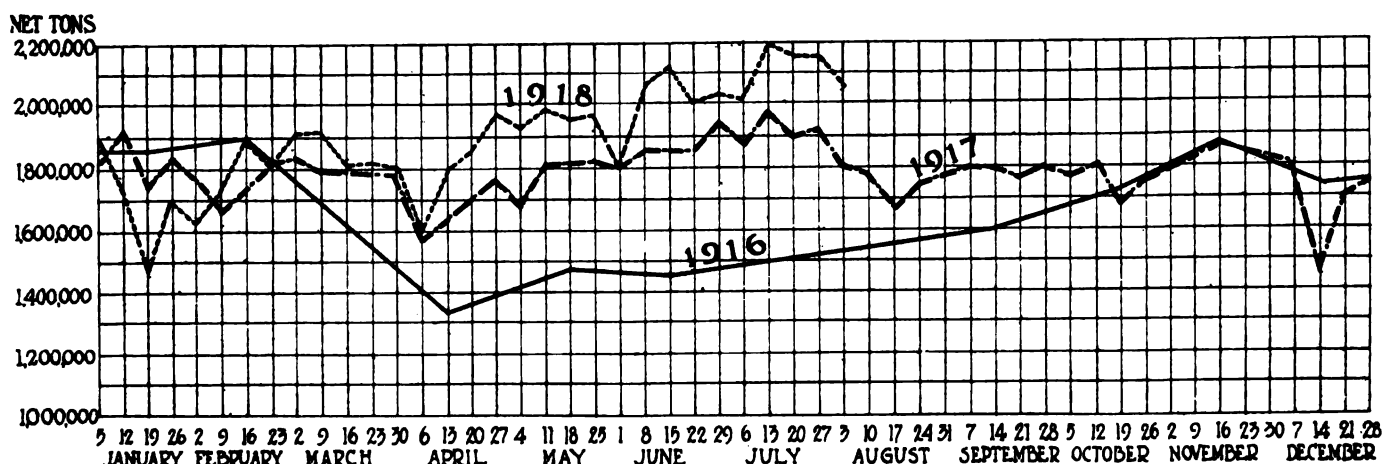
H. To keep themselves informed at all times with regard to the conditions at important railway centers and junction points, transfer depots, etc.

#### N. Y. to Announce Approved Headlamp Devices Sept. 1.

ALBANY, N. Y., Aug. 10—Secretary of State Francis M. Hugo is not expected to be able to announce the full list of non-glare headlight devices until about Sept. 1. About forty devices are waiting at the Electrical Testing Laboratories, East End Avenue and Eightieth Street, New York, for test. The tests will be in charge of W. P. Little, who will begin the work as soon as testing reflectors are received.

#### Transport Truck Elects Officers

MOUNT PLEASANT, MICH., Aug. 10—At the first directors' meeting of the new Transport Truck Co., held July 27, the following officers were elected: President and director of sales, M. A. Holmes; first vice-president and chairman of board of directors, H. E. Chatterton; vice-president and treasurer, A. E. Gorham; secretary, W. D. Hood.



Estimated average total production per working day of bituminous coal, including coal coked. The average daily requirements established by the Fuel Administration are 2,100,000 for the summer months and 1,970,000 during the winter months (from Oct. 1 to March 31)

## Lower Car and Truck Taxes Agreed On

### Ways and Means Committee Bases New Tax on Horsepower

WASHINGTON, Aug. 9—Lower taxes on automobile and truck users of the nation were agreed upon yesterday by the Ways and Means Committee. The new automobile tax is based on horsepower instead of original cost price. It will raise \$50,000,000 instead of the \$100,000,000 estimated on the earlier tax proposal. The tax agreed upon yesterday applies to users of both passenger cars and trucks and was as follows:

23 hp. or less.....	\$10.00
24 to 30 hp.....	20.00
31 to 40 hp.....	30.00
More than 40 hp.....	50.00

The original tax as proposed, a tax based on the original cost of automobiles and trucks, was withdrawn because of considerable opposition due to the injustice of the tax. Under the original tax planned, owners of cars 5 to 6 years old would have been compelled to pay a higher tax in many instances than owners of cars 1 to 2 years old.

It is expected that there will be some opposition to the new tax proposed, owing to the fact that it will lay a heavy burden on the users of motor trucks, which are at no time considered as other than utilitarian.

### A Million and a Half Women Replace Men In British Industries

WASHINGTON, Aug. 12—The total number of women directly replacing men in industry in Great Britain is reported as 1,442,000 for January, 1918, by the current issue of the monthly labor review of the Department of Labor. In April, 1917, the number of women directly replacing men was estimated at 1,256,000, over three-fourths of whom were in industrial and commercial occupations and in Government employ.

The degree to which women replace men varies widely in different industries. In Government establishments not including controlled establishments they formed 36 per cent of the total employees; in banking and finance 24.6 per cent; in commercial occupations, 16.9 per cent; in engineering firms 7.14 per cent; in all metal trades 6 per cent. These figures refer only to the women directly replacing men. Many others are working but only partially or indirectly replace the men who have been withdrawn.

### Ordnance Department Needs More Men

NEW YORK, Aug. 12—The Government needs still more experts in plants of this district. C. V. Meserole, room 306, 45 John Street, special representative in New York of the Ordnance Department, has issued a call for produc-

tion men experienced in machine shop and erection, ammunition, explosives, loading, small arm and gauge work. These are among the best paying positions in the Ordnance Department, and require men capable of visiting shops, conferring with managers and speeding up the work whenever opportunity presents itself. Selling experience, ability to direct large forces of men and personality are important qualifications.

### Farm Tractors at Wisconsin State Fair

MILWAUKEE, WIS., Aug. 12—Twenty-six manufacturers of farm tractors have made reservations of space for display and demonstration purposes at the annual Wisconsin State Fair, to be held at West Allis, Milwaukee County, during the week of Sept. 9-14. The tractor show is expected to be one of the largest yet held in connection with a state fair. The department is operated directly by the management of the fair, while the motor car and truck exposition will again be under the immediate direction of the Milwaukee Automobile Dealers, Inc., which has conducted the motor show on the fair grounds for four years past. The tractor show will be under a tent, while the motor show will occupy a mammoth fireproof building erected for this purpose several years ago. O. E. Remy is general secretary of the fair.

### Ford Modifies Wages Plan

DETROIT, Aug. 12—The Ford Motor Co. has modified its wage payment scheme with the result that employees who meet all requirements are entitled to \$5 a day on completion of 30 days' work at the plant. The former rule provided that an employee had to be with the company 6 months before being eligible for the \$5 rate. The minimum wage scale has been raised from 43 cents to 50 cents an hour.

### Lee Rubber Shows Substantial Earnings

CONSHOHOCKEN, PA., Aug. 9—The Lee Tire & Rubber Co. has shown net earnings before taxes substantially in excess of \$300,000 on a gross business of over \$3,000,000 during the first six months of the year.

### Zwebell Bros. Co. Incorporates

MILWAUKEE, WIS., Aug. 12—Zwebell Bros. Co., Milwaukee, has been incorporated with a capital stock of \$25,000 to engage in the manufacture of a mold for retreading tires and also to conduct a general wholesale and jobbing business in tire repair material and supplies. The principal stockholders are Arthur B., Herbert A. and Albert R. Zwebell, who have been engaged in the motor car sales and repairshop business for many years and recently developed an improved method of dry-cure retreading. Temporary headquarters have been established at 188 Eighth Street, Milwaukee.

## No Anthracite for Newark Dealers

### Fuel Administrator Refuses Standard Sizes to Automobile Men

WASHINGTON, Aug. 12—The refusal of the Newark, N. J., Fuel Administrator to give standard sizes of anthracite coal to automobile manufacturers, dealers and garages, as reported this past week, is not entirely in accord with the national anthracite distribution plan of the United States Fuel Administration. Anthracite coal is being conserved for domestic purposes almost entirely. It is only allotted for other use in exceptional instances, for example where war plants must have it. The general industry of the country is asked to use only bituminous coal and fine screenings of anthracite coal, known as buckwheat and rice sizes. Garages, however, will be entitled to anthracite coal if they require it. They are classed by the Fuel Administration as public utilities. Automobile dealers are classified as retail establishments, the same as any other retail store, and come under the head of domestic consumers, and are also entitled to anthracite coal. Automobile and truck manufacturing plants will get bituminous coal and buckwheat and rice anthracite unless they are engaged in war work, and anthracite coal is essential to the operation of the factory.

### War Conservation Investigation of Wisconsin Dealers

MILWAUKEE, WIS., Aug. 12—Alfred Reeke, head of the Alfred Reeke Co., Milwaukee distributor of the Nash, is making a tour of investigation as state director of war conservation of the National Automobile Dealers' Association to determine if Wisconsin dealers and garagemen are complying with the regulations and rules relative to the business. Violations reported so far have been few and far between and Mr. Reeke believes he will be able to return with a 100 per cent report. Garagemen in all of the smaller communities have adopted the rules and arranged for an emergency service station for Sunday, holiday and night work under the usual restrictions.

### Wisconsin Power Farming Association Formed

MILWAUKEE, WIS., Aug. 12—To promote the "Better Farming" movement and bring the tractor to the attention of every farmer in Wisconsin, representatives of all of the larger tractor manufacturers in this state have organized the Wisconsin Power Farming Association. The first general meeting was held in Milwaukee on Aug. 6. Officers have been elected as follows: President, F. W. Kamm, sales manager tractor department Allis-Chalmers Mfg. Co., Milwaukee; vice-president, Fred. F.

Hatcher, manager Milwaukee branch John Deere Plow Co.; secretary, E. A. Brauh, sales manager Trenam Tractor Co., Stevens Point, Wis.; treasurer, W. F. Loomis, manager Milwaukee branch Oliver Chilled Plow Co. F. W. Geddes, general manager of the Cleveland Tractor Sales Co., Milwaukee, is an additional director.

#### Hurricane Sweeps Gerstner Aviation Field

WASHINGTON, Aug. 10—Two men died at Gerstner Field, La., as a result of the hurricane which swept that vicinity on Aug. 6. Damage done to Government property is estimated in the amount of \$991,000.

All the planes except five scouts and about 38 training planes were completely demolished. These will be quickly repaired and ready by the time the hangars are reconstructed. The lighting system at the field will need entire overhauling as a result of the storm. Clearing up of debris and the salvaging of engines and machines are now going on.

#### Wind Velocity of 96 M.P.H.

The wind velocity at the height of the storm was 96 miles an hour. Twelve hangars were totally wrecked; ten partially; only two were left in any condition to afford shelter to property now being salvaged. The quarters of the officers and men held together and defied the storm. Eight men were injured, but not seriously. All the wires are down in the vicinity of Lake Charles and Lake Charles village is badly damaged. Practically all the houses within a radius of 30 miles have been laid flat. The training camp at Gerstner Field also reports that it furnished a guard of soldiers, who assisted in the relief work at the village of Lake Charles.

#### French Ordnance Experts Arrive

WASHINGTON, Aug. 12—A mission of French ordnance engineers and experts has arrived in the United States. It is to be headed by Lt. Col. J. Martinon, who was at one time in charge of production of a large French ordnance factory. The purpose of the trip is to make possible better co-operation between the industrial resources of the two countries in the output of ordnance materials. The members of the mission will visit factories in this country, and it is expected that a mission of American ordnance experts engaged on a similar mission will visit France at a later time.

#### Tractors at Columbus State Fair

COLUMBUS, Aug. 8—It is expected that at least 25 tractor manufacturers will exhibit at the Ohio State Fair, which will be held during the last week of this month. Because of the number of tractor exhibitors the fair management has set aside considerable additional space for their accommodation.

## National Trademark on Goods

### Divergent Views on Proposal Made by Department of Commerce

WASHINGTON, Aug. 10—Both approval and opposition have been voiced by American industry to the proposal of the Department of Commerce for a national trademark to be affixed to American merchandise.

Objections to the national trademark are based on the fact that less important domestic competitors using the same trademark will be benefited in export trade so that they can compete with the larger companies who have spent years of earnest effort and considerable funds to establish their reputations. Another objection is that the trademark will apply to all sorts of products, good, bad and indifferent.

The Department of Commerce replies to this opposition by pointing out the benefits derived from a national trademark. At the present time foreign competitors can use the legend "made in U. S. A." and there is no method for preventing that use. Consequently, to-day foreign manufacturers are competing with American manufacturers. A national trademark will create good will in foreign markets for our products, increasing our foreign trade and popularity.

#### Bond to Forestall Dishonest Practice

The trademark bill now pending provides a forfeiture of a bond of \$5,000 as well as revocation of the trademark license, which will prevent the sale of dishonest goods abroad and thus forestall boycotts of American goods which have resulted from inferior exports, thus not only disproving that good, bad and indifferent goods can be exported with a national trademark, but substantiating the claim that boycotts will be forestalled.

The fact that the mark will be used by competitors to the disadvantage of the established concern is offset by the delay and expense attached to building up a big foreign business. A domestic competitor who has now export business will begin with a certain amount of good will as a result of the national trademark, but he must still develop a merchandising organization to sell his goods abroad, must overcome the problems of transportation, credits, agencies, special styles and models, correspondence in foreign languages, duties, packing, etc., and when he has accomplished all these if his goods find a market abroad it will not be at the expense of the established manufacturer unless the product is more meritorious, in which event opposition to the trademark is a purely selfish one which will not be considered by the Department of Commerce.

The bill which has been presented to Congress by the Department of Commerce authorizes the Secretary of Commerce to secure a design to be adopted and promulgated as an emblem in the nature of a trademark suitable for affixing in any manner to merchandise produced or manufactured in the United States which is to be known as the national trademark. It is to be registered in the Patent Office in the name of the United States of America, without limitation of time and covering every description and class of

goods recognized under the Trademark Act active in this country.

The trademark is to be protected in foreign countries. Any manufacturers, producers or merchants in the United States can secure the license by making application and payment of a reasonable fee. Bond is to be executed not to exceed \$5,000 that the licensee will faithfully comply with all the rules and regulations.

Provision is made in the bill to protect its rights, to prevent imitation of the trademark and to terminate the license in event of infractions of the rules.

#### To Finance Tractor Purchases

BOSTON, Aug. 10—With a capitalization of \$1,000,000, nearly all of which has been paid in, the Commercial Finance Corp. of Boston is about ready to start operations financing the sale of motor trucks and tractors throughout New England at first and other parts of the country later. While the motor dealers are not behind it as a body a number of them have invested in the company. On the Board of Directors are F. A. Hinchcliffe of the Jordan agency, who is treasurer of the Boston Automobile Dealers' Association; Edward C. Becker of the Becker-Stutz Co., and John L. Judd, who sells the Smith Form-A-Truck, Gramm Bernstein and Columbia trucks and the Allen and Auburn cars. It is planned to put other motor dealers on the board later. Some of the prominent financiers in Boston are identified with the company. With the tractor field practically dead in New England due to motor dealers not paying any attention to this type of vehicles, the men behind the new company will try to interest farmers in speeding up through the use of such vehicles, and from tractors to trucks to carry the product to market will be a short step. It will finance the buying of passenger cars, too, and its charter allows it to deal in other things, but at first the truck and tractor field will engage the attention of the officers.

#### State Good Roads Meet to Open Sept. 3

DETROIT, Aug. 12—The tenth annual convention of the Michigan State Good Roads Association will be held here from Sept. 3 to 6 at the fair grounds. More than 100 manufacturers of road machinery have agreed to exhibit and men prominent in good roads movements in this and other states will give addresses. The program has been arranged as follows: Sept. 3, State Highway Commissioners' Day; Wednesday, Manufacturers and Materials Day; Thursday, Michigan State Good Roads Association Day; Friday, Demonstration.

#### 50,000 Unskilled Workers Needed for War Orders

WASHINGTON, Aug. 12—War employers making reports since Aug. 1 of labor shortage show a total need for 50,000 unskilled workers. In some instances operation is virtually at a standstill.



### Slater Joins the Williams Foundry & Machine Co.

AKRON, Aug. 12—William J. Slater has resigned as pneumatic tire sales manager of the Firestone Tire & Rubber Co. to become the general sales manager of the Williams Foundry & Machine Co.

E. Van Hanbach has resigned as chief engineer of the Whittier Co., Chicago, to come east and take up the duties of sales manager and engineer with the Schaaps Automobile Co., Brooklyn, N. Y.

W. S. Johnston, president of W. S. Johnston, Inc., Trenton, N. J., distributors of Marmon, Chalmers and Maxwell cars and Selden trucks, has joined the engineering department of the Naval aircraft factory at Philadelphia.

L. Clyde Smith has been appointed assistant general manager and treasurer of the Detroit Weatherproof Body Co., Pontiac, Mich. He recently disposed of his interests in the Detroit Welding & Mfg., Detroit Electric Welder and Burns Starter companies.

### Entries for State Fair Coming In

DETROIT, Aug. 13—Sixteen truck and passenger car manufacturers have signified their intentions of entering exhibits in the Michigan State Fair this year, which will be held Aug. 30 to Sept. 8. The names follow:

Dodge Brothers	Denby Motor Truck
Ford Motor Co.	Co.
Olds Motor Works	Detroit Universal
Maxwell Motor Sales	Truck Unit
Corp.	Republic Motor Truck
McCord Mfg. Co.	Co.
Smith Form-a-Truck	Signal Motor Truck
Acme Motor Truck	Co.
Co.	Federal Motor Truck
Acason Motor Truck	Co.
Co.	Frank Foster (Sterling Motor Truck Co.)
Nash Motors Co.	

Seven accessories have also signed as exhibitors, as follows:

L. Lawrence Welding Co.	Irwin Tire & Repair
Specialty Sales Co.	Co.
Lyknu Polish Co.	Security Auto Theft
Coffield Tire Co.	Signal Co.
	Presto Cloth Co.

### May Adopt Treasury Plan of War Profit Taxation

WASHINGTON, Aug. 13—It now appears likely that the Treasury plan of taxation will be adopted in preference to the scheme suggested by Congressman Claude Kitchin. The Treasury tax, which aims to collect at least \$5,000,000,000, demands an 80 per cent tax on actual war profits, to be determined by ascertaining the average annual profits for 3 years previous to our entrance in the war. The average annual profits prior to the war will be regarded as the basis of profits, and all profits in excess of this will be considered war profits, and subject to 80 per cent tax. An alternative tax is also included, the same as the present excess profit tax, from 20 to 30 per cent, and taxpayers will be obliged to pay the tax which brings the higher return to the Government.

## Men of the Industry

### Changes in Personnel and Position

E. P. Dillon, manager of power division, New York office of the Westinghouse Electric & Mfg. Co., has resigned to become general manager of the Research Corporation of New York. Mr. Dillon came to the Westinghouse company in 1909, having been previously connected with various mining companies.

C. L. Alexander has resigned as sales office manager of Dodge Brothers, Detroit, to assume new duties Aug. 15 as expert in business administration in the Detroit district of the ordnance department.

### Senate Aircraft Report Expected Soon

WASHINGTON, Aug. 10—Secretary of War Newton D. Baker was questioned yesterday for more than an hour by the Senate Military Affairs sub-committee on aircraft. None of the details were made public, but it is reported that both the Senators and the Secretary reached a point of irritation. The Senators charged the Secretary failed to properly reply to questions which the Secretary in turn did not apparently see fit to answer.

The committee has finished its hearings and the report, it is said, will be made public some time early next week. It is understood that some instances of "graft" were found and brought to the attention of the Department of Justice. The committee report will deal only with the causes of the so-called "fall-down" of the air program.

### Hodgkins Leaves Studebaker

SOUTH BEND, Aug. 12—R. T. Hodgkins, for the past 4 years general sales manager for the Studebaker Corp., South Bend, has been appointed general sales manager of the Cleveland Tractor Co., Cleveland. Prior to his connection with the Studebaker he was head of the sales organization of the hoisting machinery department of the Yale & Towne Mfg. Co.

W. O. Kennington, European consulting engineer of the Remy Electric Co. is now in this country on a special mission for the British government.

Paul J. Barnard, sales manager of the Walker Mfg. Co., Racine, Wis., manufacturer of jacks and other accessories, has resigned to accept a commission as captain in the Quartermaster Department in the U. S. Army.

### Decrease in Production of Bituminous Coal

WASHINGTON, Aug. 13—The bituminous coal mines of this country produced 12,422,000 tons of coal during the week ended Aug. 3. This was an increase of 1,563,000 tons, or 14.3 per cent, over the production of the corresponding week of 1917. It was a decrease of 3 per cent, or 396,000 tons, over the output of the preceding week. Car shortage was the chief cause for the decline.

Anthracite shipments during the week ended Aug. 3 amounted to 39,632 carloads, a decrease of 1310 carloads, or 3.2 per cent, as compared with the preceding week.

During the week of July 27 the mines produced 82.6 per cent of their full time output. The losses were due to the following causes: Car shortage, 7.4 per cent; labor shortage, including strikes, 4.2 per cent; mine disability, 4.1 per cent; no market, 0.2 per cent; all other causes, 1.5 per cent.



One of a number of automobile searchlights used on the Italian front. Current is furnished by an engine-driven generator, and a portable searchlight may be operated from a distance by means of the electric cable shown on the reel at the rear

**Chevrolet Building New Factory**

YORK, Aug. 10—The Chevrolet Co. will erect an addition to its 2nd Point plant at Tarrytown to space for building a large number of kitchen trailers for the Government. The new building will be three stories and basement, built of reinforced concrete. The cost is to be \$175,000 and the contract calls for its completion in

**Electric Auto Co. to Make Gun Sight Parts**

INDO, Aug. 12—The Electric Auto Co. has been awarded additional contracts by the Ordnance Department for parts for large guns. One contract calls for panoramic sight extensions and the other for sight levels. They will be used on the French 15 mm. gun. The company is also making machine gun sights.

**Coal for Detroit Workers Assured**

DETROIT, Aug. 14—A committee of Detroit coal consumers conferred here with the officials of the United States Fuel Administration to secure coal supply for Detroit, and particularly the domestic consumption supply. It was stated that the supply of coal for Detroit was excellent, and that additional assurances were asked for to supply of coal for domestic consumption in order that the labor element in that city will have no trouble in getting a proper supply of workers. The committee was assured of a satisfactory supply of domestic sizes of coal.

**New Truck from St. Louis**

ST. LOUIS, Aug. 12—The Universal Truck & Traction Engine Co. of St. Louis has completed a demonstration of a new truck designed by Daniel T. Timberlake. It has a short turning radius,

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

offers optional location of motor and has steering aid from the motor. A factory is planned at St. James, Mo. Edward Bray, of St. James, is president of the company. The company has offices in the Syndicate Trust Building, this city.

**Building New Winther Factory**

KENOSHA, WIS., Aug. 12—Work has begun on the construction of the new plant of the Winther Motor Truck Co. at Kenosha, Wis. It will be of brick and steel, 150 x 350 ft., and with complete equipment will represent an investment of approximately \$125,000. The company is now operating in leased quarters at Winthrop Harbor, Ill., just south of Kenosha.

**Milwaukee Steel Foundry Co. Extends Factory**

MILWAUKEE, WIS., Aug. 12—The Milwaukee Steel Foundry Co., 101-121 South Water Street, Milwaukee, is making plant extensions and improvements costing \$125,000, which will provide a complete electric steel casting shop to supplement the present converter steel plant having a monthly output of 400 tons. A 3-ton Heroult furnace will be installed. A new pattern shop and storage building, 40 x 80 ft., five stories high, and a new office building, 40 x 50 ft., two stories, are also to be constructed. The electric steel foundry unit will be 100 x 125 ft. Burton C. Wait is president and general manager.

**Pierce-Arrow to Build Hispano-Suiza Airplane Engines**

BUFFALO, Aug. 10—The Pierce-Arrow Motor Car Co. has made arrangements with the Wright-Martin Aircraft Corp. whereby it will manufacture Hispano-Suiza airplane engines. These will be produced at the rate of 30 per day by Jan. 1, and it is expected that the rate of production will be increased to 50 per day by April next.

**Oakland to Build Trucks Almost Exclusively**

PONTIAC, MICH., Aug. 8—The Oakland Motor Car Co. will devote most of its capacity to building trucks for the duration of the war. It is expected that production will start in about 90 days. The truck will be a 1-ton model which will embody several new features.

**Buick Prices to be Increased**

DETROIT, Aug. 14—The Buick Motor Co. will increase prices on its 1919 models, which are expected to be ready on or about Sept. 1, as follows:

Model	Old Price	New Price
H-44; H-45.....	\$1,245	\$1,495
H-46 .....	1,695	1,985
H-47 .....	1,845	2,095
H-49 .....	1,495	1,785
H-50 .....	2,175	2,485

**Ben Hur Plant Acquired by Government**

CLEVELAND, Aug. 10—The plant of the defunct Ben Hur Co. at Willoughby has been leased by the government for the duration of the war, and the factory is already being placed in readiness for the work.

**New Buildings for Overland Completed**

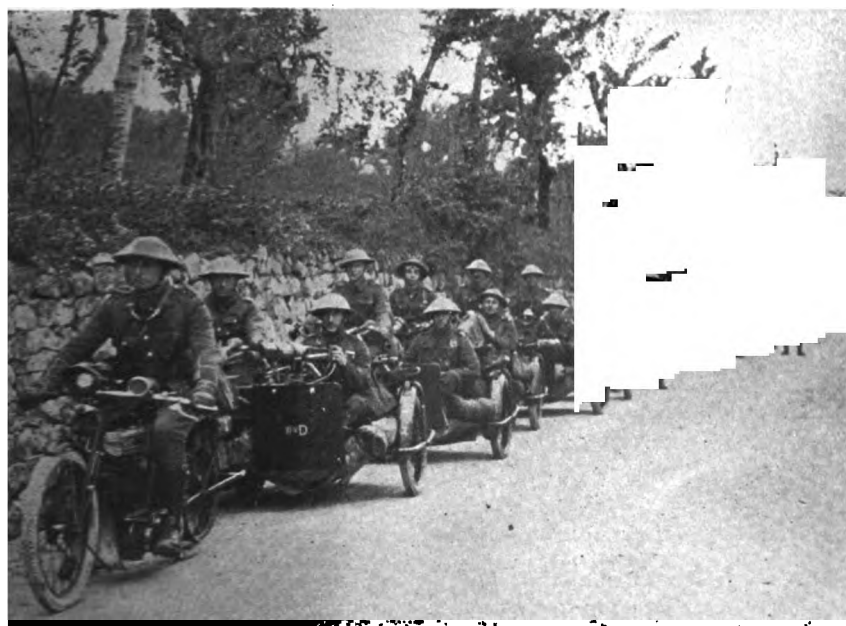
TOLEDO, Aug. 13—The additions erected for the Willys-Overland, Inc., to be used for war work to manufacture shells and gun carriages, have been completed and production will begin early in September.

**Shop Committees to Spread Education**

WASHINGTON, Aug. 14—Employers engaged in Government work have been asked to have shop committees selected by employers and employees, created in all the plants for the purpose of spreading education to increase production. This work is under the Industries Plants Division of the Information and Education Service of the Department of Labor. The creation of these committees is the first step in a nationwide organization of employers and employees for increased production in all lines of war work.

**Automobile Makers Pay \$23,981,000 Revenue**

WASHINGTON, Aug. 10—Automobile and motorcycle manufacturers and dealers paid into the Treasury Department \$23,981,000 under the war revenue bill for the year ended June 30, 1918, according to a statement issued by the Treasury Department.



A British motorcycle machine gun detachment operating in Italy

## President Approves Copper Price

Operators Must Not Reduce  
Wages; Must Not Sell  
Above Maximum

WASHINGTON, Aug. 10—The President has approved the maximum price of 26 cents per pound for copper, which was announced in last week's issue of **AUTOMOTIVE INDUSTRIES**.

The conditions are: First, that the producers of copper will not reduce the wages now being paid; second, that they will sell to the United States Government, to the public of the United States, and to the Allied Governments at not above the maximum price; third, that they will take the necessary measures, under the direction of the War Industries Board, in the distribution of copper to prevent it from falling into the hands of speculators, who might increase the price to the public, and, fourth, that they will pledge themselves to exert every effort necessary to keep up the production of copper so as to insure an adequate supply so long as the war lasts.

The price takes effect Aug. 15, 1918, and is subject to revision after Aug. 1, 1918, f.o.b. cars or lighters at eastern refineries; f.o.b. cars or lighters at Pacific Coast refineries for Pacific Coast destinations, and f.o.b. cars or lighters New York if shipped to Eastern or interior destinations from Pacific Coast refineries and from refineries in the in-

terior of the United States. All shipments made after Nov. 1, 1918, are subject to any change in price made by the Price Fixing Committee to take effect after that date. This maximum price is subject to the additional charges on copper shapes approved by the Price Fixing Committee on June 5, 1918.

### Field Mfg. Co. Making Government Truck Bodies

OWOSSO, MICH., Aug. 12—The Field Mfg. Co. is turning out daily from ten to twelve motor truck bodies, which, when fully equipped, will be mounted machine shops for the repairing of airplanes in France. The company has an order for 450 of these bodies, of which 250 have already been shipped. The bodies are being made under government inspection, a government representative being stationed at the plant at all times. The Government's purpose in having the machine shops mounted on trucks is that the shop may go to a disabled airplane instead of it being necessary to bring the airplane to the shop.

### Ford Has Many Electrical Repairs

DETROIT, Aug. 12—An idea of the magnitude of the plant of the Ford Motor Co. can be gathered from the following, which gives only a month's tabulation of the electrical equipment that was required for either new or repair work from April 16 to May 16: Tungsten lamps, 1682; carbon lamps, 2739; mercury vapor tubes, 102; shifters, 36; lamp cord, 1619 ft.

## Nordyke & Marmon Co. Establishes Car Line Service for Its Employees



A special street car service for its 4000 employees is being operated by the Nordyke & Marmon Co., Indianapolis. Ten street cars run for two hours both morning and evening between the factory and the center of the city. Company employees operate the cars

## Few Amputations Among Wounded

British Figures Show Causes of  
Disablement and Their Effect  
on Vocational Re-education

WASHINGTON, Aug. 12—In the recent issue of the Vocational Sun which is the official publication of the Federal Board for Vocational Education are given the results of an analysis of the causes of disability found among British soldiers who have been forced to leave the present war because of wounds or illness incurred in it.

As the re-education of disabled soldiers will shortly be undertaken in this country on a systematic basis, the statistics given below should prove not only of interest but highly instructive. They are calculated from a total of 3,000 pension records which had accumulated up to the end of April of this year.

### Small Percentage Need Amputation

In view of what we have seen here in the way of photographs of maimed and legless soldiers, learning that in the British army, in various occupations, it is rather surprising to note that only a total of 4.9 per cent of injuries sustained by these more than 300,000 disabled men necessitated amputation of an arm or leg.

The percentages of the different degrees of disablement among these retired British soldiers were as follows:

Wounds, etc., to legs not necessitating amputation	.....
Chest complaints and tuberculosis	.....
Heart disease	.....
Wounds, etc., to arms not necessitating amputation	.....
Rheumatism	.....
Nervous diseases, shell shock, etc.	.....
Wounds, etc., to hands not necessitating amputation	.....
Wounds, etc., to head	.....
Eyesight cases	.....
Wounds and injuries to legs necessitating amputation	.....
Deafness	.....
Wounds and injuries to arms necessitating amputation	.....
Frostbite, including cases of amputation of feet or legs	.....
Miscellaneous wounds and injuries	.....
Miscellaneous diseases	.....

### Bombing the German Base at Bruges

WASHINGTON, Aug. 10—Bruges, one of the most important German naval bases in Belgium, has been attacked so often by the British, that it is now one of the best defended points in the world. A night bombing on the Western Front, The report, made by a member of the Royal Air Forces, describes in detail the work and sensation of night bombing.

The pilot and observer of a night bombing machine proceeding over Bruges have no difficulty in finding their way. Searchlights moving restlessly over the town make a haze of light which can be seen 30 miles off. Further air "scare" are so numerous each that the city is a constant display of red flashing bombs and brilliant emerald colored balls of fire mounting into the sky and ending at some usually inary fall.



ing near the city the observer through a little door in the nose machine, examines his bombing and adjusts the bomb-dropping. As he kneels on the little wooden, 10,000 ft. or more above the ground is usually so absorbed in his atching the ground and seeking objective that his surroundings seem very normal and he is entirely at

ratches for the black line on the ground, which serves as a guide, and the pilot with a wave of the hand. The approach to the town is forecast by the presence of shipping docks; far to the left is the dark line of the Belgian coast and the guarding searchlights over Ostend and Zeebrugge are instantly.

The observer, states the report, waves his hand, the roar of the engine dies in the machine dives for its target. The bomb handle is unstrapped. The observer leans far over the front, following the course of the little metal bar of sight. He quickly guides the pilot to the left and the bar sweeps and crosses the section of the ob-

#### Deeds of Gunners Watching

The observer then checks the pilot and his bomb-lever in readiness. Hundreds of Germans stand waiting at their machine-guns, but the observer has time for nothing but the passage of the sight bar over the objective. Suddenly the sight registers the range. He pulls the lever forward slowly, pulls the trigger and pushes it forward again and

the rear of the plane comes under a shower of 14 dropping bombs. The observer turns and the machine sweeps away from the shower of shells, searchlights and explosions that the observer will bring; meanwhile the observer keeps his eye on the objective, for the red spurt of flame that the bomb strikes.

Sheets of flame sweep forward. Simultaneously come hundreds of green balls streaming from the machine while like a handful of ribbons searchlights are thrown up into the sky. The airmen fly home content with their work, leaving the searchlights vainly searching every quarter of the heavens—

#### Ford Resumes Operations

DETROIT, Aug. 12—After a complete shutdown of more than 5 weeks, the Ford Motor Co. factory of the Ford Motor Co.

City, opposite Detroit, has resumed operations to-day, but with less than 50 per cent reduction of the work-force. Only 100 cars will be produced. Previous to the shutdown the normal output of the company averaged from 225 to 250 cars a day. While the company announced it was compelled to close down because of a shortage of labor, numbers of the employees who signed petitions, demanding a wage of \$5 a day, charged they were misled and locked out.

## Madison Dealers Help Farmers

### Employees Are Released to Work on Farms in Vicinity of City

MADISON, WIS., Aug. 10—Dealers and garagemen of Madison, Wis., state capital of Wisconsin, have gone perhaps farther in war conservation work than those of many other cities by releasing their employees, who are physically fit for such work, to work on the farms in the immediate vicinity of Madison during the rush of the harvesting season. The men are being released for two or three days at a time, depending upon the urgency of the calls for farm help. They have agreed to accept whatever wage is paid by the farmer for their services.

The movement resulted from a number of conferences held by the dealers' section of the Madison Association of Commerce, comprising all the dealers and garage owners of Madison. It was decided to enter into an arrangement with the United States Employment Service, through the Madison office, whereby calls for men be made to the employers and they select members of their staffs to respond. The dealers' section includes oil and tire dealers and, in fact, all interests allied with the automotive industry. The action was given wide publicity through the medium of a large display advertisement in the Madison newspapers, in connection with the announcement of the adoption of the war conservation program of the National Automobile Dealers' Association, curtailing hours of service, eliminating free service, enforcing a strictly cash basis and other reforms.

Louis F. Schoelkopf, president of the Madison Association of Commerce, and one of the pioneer dealers and garagemen of Madison, is given credit for the origination of the idea of sending mechanics to the harvest fields. A survey of the employees of garages and repair-shops showed that a great many of the men have had farm experience and are competent to assist threshing gangs and shocking crews. Thus they are able to command practically the same wages as skilled farm laborers. The farmers have been quick to avail themselves of the help thus provided and glad to pay top-notch wages for this class of work. The present month is the most active harvesting period in southern Wisconsin, and more calls are being received than can be filled with the number of men available.

#### Munitions Plant Opens School for Women

JACKSON, MICH., Aug. 12—The Jackson Munitions Corp. has opened a school of instruction for women munition workers, and from now on classes will be held each week day, at which officials

of the company and heads of departments will give instructive lectures relative to the work. This school is for the purpose of recruiting a large number of women who will be needed when the plant is running at full capacity. The plan is to hire inexperienced women, the only qualification necessary being that they be healthy, strong and American. The school will give the applicant a preliminary knowledge of the general nature of the factory's business. At present a force of 150 women is employed at this factory, but this will be very greatly increased soon.

#### Changes in War Supply Contracts

WASHINGTON, Aug. 12—Changes in war supplies' contracts which have just been approved by the superior board of review of the general staff of the War Department provide that hereafter manufacturers who are furnished with special equipment at the expense of the Government may agree to take over such facilities at a fair value in diminution of the profit which they otherwise would make.

The increased manufacturing facilities that have been created by the War Department, exclusive of the new industries serving the army and the Emergency Fleet Corporation from April, 1917, to July, 1918, cost approximately \$400,000,000. These investments have been distributed through almost half of the states. Seventy per cent has been or will be spent in sections of the country other than in the New England or east-central states. The new clauses in the contracts give the contractors an opportunity to take over these new facilities. If the contractor wishes to take title to the facilities he may make written offer to the Government.

#### Goodrich Earnings Almost Double

AKRON, OHIO, Aug. 12—Net profits for the first 6 months of 1918 of the B. F. Goodrich Co., after deduction of maintenance charges, depreciation and doubtful accounts, and after all excess profits and income taxes are provided for, were \$7,150,000. This is almost equal to the profits of the company for the entire year of 1917, which amounted to \$10,544,677. The increase of profit, it was stated, was not entirely due to the increase in war work done by the company, but rather to the large increase in the whole volume of business.

At the recent quarterly meeting of the directors a 1 per cent dividend was declared on preferred stock, payable on Oct. 1 to stockholders of record Sept. 20. A 1 per cent dividend was declared on the common stock, payable on Nov. 15 to stockholders of record Nov. 5.

#### Gear Association to Meet

PHILADELPHIA, Aug. 12—The semi-annual meeting of the American Gear Manufacturers' Association will be held at the Onondaga Hotel, Syracuse, N. Y., Sept. 19, 20 and 21. The program of the meeting will be announced later.

# Industrial Review of the Week

## A Summary of Major Developments in Other Fields

### Farm Machinery Makers Get Reduction on Steel

The fact that makers of agricultural machinery have secured a reduction of \$5 a ton on steel bar shipments in the second half of the year is widely commented on in the steel trade. A concession to this interest on its bar purchases has been no uncommon thing for years. Government price fixing promised to be the end of it. But there was pressure at Washington to prevent any advance in implements to the farmer. The implement manufacturers finally agreed to make no advance if the Government would get them a \$5 reduction on bars. The steel men were appealed to and the reduction was granted.

It remains to be seen how far complications in other bar-consuming trades will result from 2.65c. bars for agricultural purposes. But no other industry heretofore has been able to secure the preference given to implement makers and the odds are even greater now with the Government thrown into the agricultural scale.

High heat and humidity cut down pig iron and steel outputs last week, estimates for the Pittsburgh district running from 10 to 15 per cent, while losses at some eastern Pennsylvania plants were considerably higher.

A factor to be counted on as the American army in France grows is the spirit of the steel workers, particularly in mills supplying the chief essentials, as plates, shell steel and latterly rails. There are some signs of the same effort to get output that has been seen at shipyards, but they might be more general.

The estimated July production of steel ingots, based on the compilations of the American Iron and Steel Institute, is 3,531,600 gross tons. The daily rate fell off about 2.9 per cent from that of June, and while the estimated annual production rate on the July figures (counting 26 days) is only 41,984,000 tons, the rate on the actual output of the last five months, or since the winter and railroad handicaps of January and February, is 42,496,000 tons.

A meeting of the special committee of steel manufacturers with the director of steel supply will be held at Washington next week. The decisions to be made, having to do with the recent more pressing demands from abroad, are regarded as among the most important in the present effort of the War Industries Board to meet the situation.

The action of the War Industries Board in denying steel for passenger automobiles is in line with what has been plainly indicated for months as to the narrowing of the channels of steel uses. Some mills, as in sheet and wire lines, are tending to a steady 60 per cent operation.

In the attempt to increase pig iron and steel output, the new by-product coking capacity is strongly counted on. Of the proposal for Government-aided new construction in iron and steel, the main tangible development is in connection with new steel capacity in the Birmingham district.—*Iron Age*.

### Manufacturers Look for Only 75 Per Cent Cut

(Continued from page 290)

per cent basis. This, of course, they cannot guarantee to do, either for us or for any other so-called non-war industry.

"The board feels that the curtailment will have to be greater than 50 per cent, but at this last meeting the board expressed the wish and desire for the automobile industry to continue in business; that they realized the importance of this industry to the country in its regular business of making passenger cars, and its particular importance to the Government at this time in carrying out its war program.

"The suggestion that the industry go to war work up to 100 per cent is, I believe, what the War Industries Board would consider an ideal situation, from their standpoint, and I think this statement is made more as a warning to our companies to take on war work. The War Industries Board feels, of course, that any company that is engaged in non-war work will have its interests best served if it has 100 per cent war work, but the board never has in any conference expressed a desire for a 100 per cent curtailment of passenger cars. But it feels that the curtailment will have to be greater than 50 per cent. The War Industries Board has never discussed anything more drastic than a 75 per cent curtailment.

"We have been assured again by the War Industries Board that if steel and other materials are available after the war program is taken care of, our industry will get its share, and the board has promised that it will not under any circumstances make any definite commitments to our industry or to any other so-called non-war industry.

"We were somewhat handicapped in our discussion at this last meeting because the inventories were not all in and the board felt that it could not deal properly with the situation until these figures were available. However, after these figures are completed, we are to have another meeting with them, when it will be determined what steel and other materials can be released to the passenger car manufacturers, and on what basis.

"I have written to President Clifton stating it may be advisable to hold another membership meeting after the inventories are completed, and we have

### Lake Iron Ore Movement Breaks All Records

WASHINGTON, Aug. 14—A record breaking movement of iron ore by the Great Lakes fleet is officially reported to the Shipping Board. Notwithstanding the transfer from the Great Lakes of a considerable number of seagoing vessels to transatlantic service, more ore is being moved by the lake carriers than ever before in the history of the trade. The figures for July broke all monthly records. In that month a total of 10,659,203 tons of ore was brought from the Lake Superior mine.

These results have been achieved by speeding up operations of the lake fleet under the direction of the Shipping Board. Many days have been cut from time in port, thus contributing in effect an increase of tonnage. In accordance with instructions from the Shipping Board, the carriers, whenever possible, are loading to the waterline.

To the Shipping Board, the chief significance of the record-breaking movement of ore is the assurance it gives of an increase in the output of steel. An indicated deficiency of this material for war requirements has been causing the board considerable concern.

### Plenty of Oil Tank Cars Available

WASHINGTON, Aug. 13—If oil production during the coming months falls below the standard set by army and navy officials no blame can attach to the Railroad Administration, according to Director-General McAdoo. Sufficient tank cars have been provided in all fields, he said, to carry the production to distributing points without delay.

Several months ago, Mr. McAdoo pointed out, oil producers were complaining because they could not obtain tank cars to carry their products. The tank cars, he said, were placed under the control of the Government and were distributed so as to provide tonnage in all oil fields.

### Marine Corps Places Contracts

WASHINGTON, Aug. 12—The Quartermaster of the U. S. Marine Corps has placed the following contracts:

The Trailmobile Co., Washington, D. C., 12 trailmobiles.

H. W. Johns-Manville Co., Philadelphia, Pa., fuse renewals.

had a chance to discuss the matter again with the War Industries Board. In order to expedite matters, I would suggest that if you have not sent in your inventory of materials, that you do so at once, as failure to do so is only holding up further negotiations with the board for the materials which we need."

## AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>	
Muriatic, lb. ....	.02-.03
Phosphoric, ct. ....	.35-.39
Sulphuric (60), lb. ....	.09
<b>Aluminum:</b>	
Ingot, lb. ....	.33
Sheets (18 gage or more), lb. ....	.40
Antimony, lb. ....	.13-.13½
<b>Burlap:</b>	
8 oz., yd. ....	.19
10 oz., yd. ....	.24½
<b>Copper:</b>	
Elec., lb. ....	.26
Lake, lb. ....	.26

<b>Fabric, Tire (17¼ oz.):</b>	
Sea Is., combed, lb. ....	1.65-1.70
Egypt, combed, lb. ....	1.25-1.35
Egypt, carded, lb. ....	1.20-1.30
Peelers, combed, lb. ....	1.05-1.20
Peelers, carded, lb. ....	.95-1.05
<b>Fibre (¼ in. sheet base), lb. ....</b>	
.....	.50
<b>Graphite:</b>	
Ceylon, lb. ....	.07½-.25
Madagascar, lb. ....	.10-.15
Mexican, lb. ....	.03½
Lead, lb. ....	.08-.09
<b>Leather:</b>	
Hides, lb. ....	.18-.35½

Nickel, lb. .... 40-.43

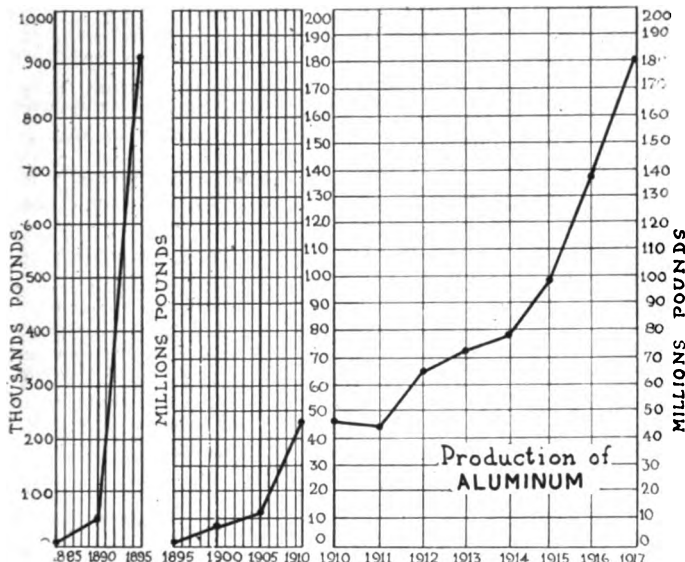
## Oil:

<b>Gasoline:</b>	
Auto., gal. ....	.24½
68 to 70 gal. ....	.30½
<b>Lard:</b>	
Prime City, gal. ....	2.25
Ex. No. 1, gal. ....	1.55
Linseed, gal. ....	1.84
Menhaden (Brown), gal. ....	1.20-1.22
<b>Petroleum (crude),</b>	
Kansas, bbl. ....	2.25
Pennsylvania, bbl. ....	4.00

## Rubber:

<b>Ceylon:</b>	
First latex pale crepe, lb. ....	.63
Brown, crepe, thin, clear, lb. ....	.60

<b>Smoked, ribbed sheets, lb. ....</b>	
.....	.62
<b>Para:</b>	
Up River, fine, lb. ....	.68
Up River, coarse, lb. ....	.40
Island, fine, lb. ....	.59
Island, coarse, lb. ....	.27
Shellac (orange), gal. ....	.70-.76
Spelter ....	.08½-.09
<b>Steel:</b>	
Angle beams and channels, lb. ....	.03
Automobile sheet (see sp. table), Cold rolled, lb. ....	.06½
Hot rolled, lb. ....	.03½
Tin ....	.91-.92
Tungsten, lb. ....	2.40
Waste (cotton), lb. ....	.12½-.17



The production of aluminum in the United States since 1895. Note the rapid increase since 1911

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lb.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping....	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock .....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping .....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping .....	6.55	6.45
<b>Automobile Sheet Extras for Extreme Widths:</b>		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 to 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
<b>Black Sheet Extras to Apply to Narrow Widths:</b>		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co. ....	62¼	63½	+ ½
*J. I. Case T. M. Co., pfd. ....	82	85	-1
Chalmers Motor Co., com. ....	3½	5½	..
Chalmers Motor Co., pfd. ....	30	40	..
*Chandler Motor Co. ....	88½	89½	+2½
Chevrolet Motor Co. ....	134	138	+3
*Fisher Body Corp., com. ....	37½	39½	..
*Fisher Body Corp., pfd. ....	89	90	..
Fisk Rubber Co., com. ....	60	63	..
Fisk Rubber Co., 1st pfd. ....	100	103	+1
Fisk Rubber Co., 2nd pfd. ....	78	83	..
Firestone Tire & Rubber Co., com. ....	104	106	+ ½
Firestone Tire & Rubber Co., pfd. ....	92	94	..
*General Motors Co., com. ....	153	154½	+18
*General Motors Co., pfd. ....	81½	81¾	-1¼
*B. F. Goodrich Co., com. ....	45¼	46	- ½
*B. F. Goodrich Co., pfd. ....	98½	100¼	+ ¾
Goodyear Tire & Rubber Co., com. ....	159	162	-5
Goodyear Tire & Rubber Co., pfd. ....	97½	98½	+ ½
Grant Motor Car Corp. ....	2¼	3¼	..
Hupp Motor Car Corp., com. ....	3	4	..
Hupp Motor Car Corp., pfd. ....	79	82	..
International Motor Co., com. ....	28	32	..
International Motor Co., 1st pfd. ....	55	65	..
International Motor Co., 2nd pfd. ....	35	45	..
*Kelly-Springfield Tire Co., com. ....	49	51¼	- ½
*Kelly-Springfield Tire Co., 1st pfd. ....	80	87	..
*Lee Rubber & Tire Corp. ....	21¼	22	- ½
*Maxwell Motor Co., Inc., com. ....	26	26½	-2
*Maxwell Motor Co., Inc., 1st pfd. ....	55	56	+ ½
*Maxwell Motor Co., Inc., 2nd pfd. ....	20¼	21½	- ½
Miller Rubber Co., com. ....	110	112	- ½
Miller Rubber Co., pfd. ....	96¼	98½	-1
Packard Motor Car Co., com. ....	..	125	..
Packard Motor Car Co., pfd. ....	92	97	..
Paige-Detroit Motor Car Co., pfd. ....	7	8½	..
Peerless Truck & Motor Corp. ....	13	17	..
Portage Rubber Co., com. ....	..	120	..

	Bid	Asked	Net Ch'ge
Reo Motor Car Co. ....	14½	15½	+ ½
*Saxon Motor Car Corp. ....	6½	8½	..
Standard Motor Construction Co. ....	12	14	..
*Stewart-Warner Speed. Corp. ....	57½	58½	-2
*Studebaker Corp., com. ....	43¼	44¼	- ½
*Studebaker Corp., pfd. ....	85	90	..
Swinehart Tire & Rubber Co. ....	50	55	..
United Motors Corp. ....	32	32½	+ ½
*U. S. Rubber Co., com. ....	61	62½	+ ½
*U. S. Rubber Co., pfd. ....	105	106	+ ½
*White Motor Co. ....	43¼	45¼	+1½
Willys-Overland Co., com. ....	19½	20	- ½
*Willys-Overland Co., pfd. ....	82¼	83	..

\*At close of business Aug. 14. Listed N. Y. Stock Exchange.

## OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	Bid	Asked	Net Ch'ge
<b>ACTIVE STOCKS</b>			
Auto Body Co. ....	..	7¾	..
Bower Roller Bearing Co. ....	..	18½	..
Chevrolet Motor Co. ....	136	138	+4
Continental Motor Co., com. ....	5¾	5½	..
Continental Motor Co., pfd. ....	94¼	..	+ ¾
Edmund & Jones Co., com. ....	14	17	..
Edmund & Jones Co., pfd. ....	75	90	..
Ford Motor Co. of Canada. ....	..	170	..
Hall Lamp Co. ....	..	14	..
Michigan Stamping Co., com. ....	..	124	..
Packard Motor Car Co., com. ....	92	95	-1
Packard Motor Car Co., pfd. ....	18¼	19¼	..
Paige-Detroit Motor Car Co. ....	..	11½	..
Prudden Wheel Co. ....	14	15	- ¾
Reo Motor Car Co. ....	..	..	..
<b>INACTIVE STOCKS</b>			
Atlas Drop Forge Co. ....	..	25	..
Kelsey Wheel Co. ....	25	..	..



## Aircraft Production Purchases

WASHINGTON, Aug. 7—Following is a list of purchases contracted for by the Bureau of Aircraft Production:

July 11, 1918.

United States Gage Co., 67 Wall Street, New York City, 475 gages.  
Bower Roller Bearing Co., Detroit, Mich., 2000 outside wheel bearings, 2000 inside wheel bearings.  
Curtiss Aeroplane & Motor Corp., Buffalo, N. Y., spares for Curtiss V-2-3 engines, bearings exhaust and intake valves, pistons, crankshafts, etc.  
Western Electric Co., 463 West Street, New York, N. Y., 10 wavemeters.  
United State Gage Co., 67 Wall Street, New York City, services in repairing approximately 2000 gages for oxygen apparatus.

July 13, 1918.

Hartzell Walnut Propeller Co., Piqua, O., 2500 generator propellers.  
John A. Roebling Sons Co., Trenton, N. J., 2,000,000 ft. aircraft wire.  
Burd High-Compression Ring Co., Rockford, Ill., 20,000 compression piston rings.  
American Propeller & Manufacturing Co., Baltimore, 2000 constant speed regulating fans.

July 15, 1918.

Klaxon Co., Newark, N. J., Strombos horns, wooden chests, bicycle wrenches, etc.  
Smith & Hemenway Co., Inc., 114 Colt Street, Irvington, N. J., 800 diagonal cutting pliers, 23,000 side cutting pliers.  
Curtiss Aeroplane & Motor Corp., Buffalo, N. Y., spare parts, aileron guides, tubular braces, front and rear instrument boards, hanger brackets, rudder guides, bolts, pins, washers, etc.  
Burd High-Compression Ring Co., Rockford, Ill., 30,000 Burd compression piston rings.  
Disco Electric Mfg. Co., 500 Howard Street, Detroit, Mich., 1000 synchronizing generators.

July 16, 1918.

American Chain Co., Bridgeport, Conn., 1000 chains.  
Disco Electric Mfg. Co., 500 Howard Street, Detroit, Mich., 5310 synchronizing generators.  
Engel Aircraft Co., Niles, Ohio, spares for JN4-D planes, axles, engine-bed bearers, cowls, elevators, landing gears, etc.  
Engel Aircraft Co., Niles, Ohio, 10 JN4-D airplanes.  
Stromberg Motor Devices Co., Chicago, spares for Hispano-Suiza engines, 40 sets of carburetors and spares.  
General Electric Co., Schenectady, N. Y., 25,000 regulator tubes, 30,000 ballast lamps.

July 18, 1918.

Western Electric Co., 463 West Street, New York City, 10,000 radio telephone head sets.  
Western Electric Co., 151 Fifth Avenue, New York City, electrical supplies, 1500 splicing lamps, 320 grips, 17,612 bridle rinks.  
Bristol Co., Waterbury, Conn., 1000 air speed indicators.  
Westinghouse Electric & Mfg. Co., 803 Hibbs Bldg., Washington, D. C., 2000 airplane radio telegraph transmitting sets.

July 19, 1918.

Western Electric Co., 151 Fifth Avenue, New York City, 10,000 antenna systems.

July 22, 1918.

Pierce-Arrow Motor Car Co., Buffalo, N. Y., 1000 300-hp. Hispano-Suiza engines.

July 23, 1918.

Goodyear Tire & Rubber Co., Evans Bldg., Washington, D. C., auto supplies, 19 tires.  
Splitdorf Electrical Co., Newark, N. J., parts for Dixie magneto, model 825; breaker

## Contracts

covers, lock cups, condensers, magneto wrenches, breaker-fastening stud nuts, etc.

July 24, 1918.

The Holt Mfg. Co., Peoria, Ill., 50 caterpillar truck adapters for F. W. D. trucks.

July 25, 1918.

Linde Air Products Co., 42 So. Boulevard, New York City, 600,000 cu. ft. of free oxygen.  
Penrod Walnut & Veneer Co., Kansas City, Mo., 210,000 ft. walnut lumber.  
Thomas-Morse Aircraft Corp., Ithaca, N. Y., spares for 150 S-4-C gunnery planes, axles, cowls, elevators, landing gears, rudders, upper and lower wings, etc.  
Fay & Bowen Engine Co., Geneva, N. Y., 6000 center camshaft bearings.  
Dyneto Electric Corp., Syracuse, N. Y., 55 electric generating sets.

July 26, 1918.

General Rim Co., 47 West Thirty-fourth Street, New York City, license agreement. The right under patent No. 1,135,424, in the Government to make or to have made, and to use and sell during the period of the war and for war purposes only, wire wheels covered by said patent.

July 27, 1918.

Curtiss Aeroplane & Motor Corp., Buffalo, N. Y., Spares for 124 JN4H advanced training planes equipped with dual control and forward gun; axles, engine-bed bearer sets, dual controls, cowl systems, elevators, landing gears, radiators, rudders, etc.

## Contracts Awarded by Bureau of Aircraft Production

WASHINGTON, Aug. 12—The Bureau of Aircraft Production has placed contracts as follows:

A. L. Randall Co., 150 North Wabash Avenue, Chicago, Ill., carrier-pigeon baskets and equipment.

Wellington, Sears & Co., 66 Worth St., N. Y., 150,000 yards of balloon cloth.

Eastman Kodak Co., Rochester, N. Y., 50. graflex magazine aero cameras.

General Electric Co., Kellogg Bldg., Washington, D. C. (attention of Mr. C. E. Rowe), 7500 red bulbs; 15,000 white bulbs.

George W. Hartzell, Piqua, Ohio, 68,000 feet walnut lumber.

John B. Ransom & Co., Nashville, Tenn., 40,000 feet walnut lumber.

Coffman Mfg. Co., Washington C. H., Ohio, 25,000 feet walnut lumber.

## Italy Orders "Eagles"

DETROIT, Aug. 8—Italy has ordered twelve of the new "Eagle" boats from the Ford Motor Car Co. The boats are to be used against the Austrian fleet in the Adriatic Sea.

## Navy Department Contracts

WASHINGTON, Aug. 7—Following are contracts which have been placed by the Bureau of Supplies and Accounts of the Navy Department:

Cleveland Pneumatic Tool Co., Cleveland, drills.  
Ingersoll-Rand Co., New York, drills.  
Chicago Pneumatic Tool Co., New York, drills.  
Ford Motor Co., Detroit, truck chassis.  
Carolina Aircraft Co., Raleigh, N. C., flying boats.  
Curtiss, A. & M., Corp., Buffalo, flying boats.  
Lang Propeller Co., Jamaica, N. Y., propellers.  
Ford Motor Co., Detroit, two ambulances.  
Maxwell Motor Co., Detroit, trucks.  
Studebaker Corp., Detroit, motor truck.

## Army Ordnance Department Contracts

WASHINGTON, Aug. 7—Following is a list of contracts and purchase orders recently placed by the Army Ordnance Department:

International Harvester Co. of New Jersey, Chicago, body castings.  
Commerce Motor Car Co., Detroit, books.  
The Standard Parts Co., Cleveland, perfection heaters.  
Atwater-Kent Mfg. Works, Philadelphia, machine-gun sights.  
The Nash Motors Co., Kenosha, repair parts for Quad trucks.  
Motor Trucks (Ltd.), Brantford, Ontario, machining shells.  
American Brass Co., Waterbury, and Michigan Copper & Brass Co., New York, blasting machine.  
Briscoe Motor Corp., Jackson, rifle grenades.  
Michigan Motor Specialties Co., Detroit, cartridge clips.  
Nash Motors Co., Kenosha, water pump.  
Nash Motors Co., Kenosha, instruction books.  
Chicago Pneumatic Tool Co., Philadelphia, heavy-duty electric drills.  
North & Judd Mfg. Co., New Britain, tongueless bar buckles and check D bronze for cavalry bridles.  
Nash Motors Co., Kenosha, repair parts for Nash Quad trucks.  
Cleveland Tractor Co., Cleveland, commercial tractors.  
Hutchins Car Roofing Co., Detroit, tool fastenings for repair trucks.  
Electric Auto-Lite Corp., Toledo, panoramic sight extensions.  
Electric Auto-Lite Corp., Toledo, sight levels.  
C. A. Shaler Co., Waupun, vulcanizing outfit for artillery repair trucks.  
Studebaker Corp., South Bend, artillery wheel fastenings and hubs.  
The Four Wheel Drive Auto Co., Clintonville, various equipment on F. W. D. trucks.  
L. S. Starrett Co., Athol, miscellaneous tools for repair shop trucks.  
Firestone Tire & Rubber Co., Washington, demountable tires for Nash Quad trucks.  
Cleveland Pneumatic Tool Co., Cleveland, gaskets for mobile repair shop.  
The White Co., Cleveland, 1-ton truck chassis.  
The Four Wheel Drive Auto Co., Clintonville, repair parts for F. W. D. trucks.  
International Harvester Co. of New Jersey, Chicago, and Stewart-Warner Speedometer Corp., Chicago, rifle grenades.  
Dayton-Wright Airplane Co., Dayton, bomb release mechanisms.  
Doehler Die Casting Co., Brooklyn, die castings.  
Grant Motor Car Corp., Cleveland, machining shells.

## Calendar

## RACING

Aug. 17—Sheepshead Bay.  
Sept. 2—Uniontown. Uniontown Speedway Assn.  
Sept. 7—Chicago. Chicago Speedway.  
Sept. 21—Sheepshead Bay.  
Oct. 5—Cincinnati. Cincinnati Speedway.

## ASSOCIATIONS

Oct. 7-12—Milwaukee. American Foundrymen's Assn. and 5 allied organizations. Milwaukee Auditorium.

## SHOWS

Aug. 16—Claverack, Columbia Co. Tractor demonstration (near Fair Grounds) State Food Commission. Calvin J. Huson, Director.  
Aug. 20—North Rose, Wayne Co. Tractor demonstration. State Food Commission. Calvin J. Huson, Director.  
Aug. 28—Gates Center, Monroe Co. Tractor demonstration (State Fair) Food Commission. Calvin J. Huson, Director.

Aug. 28-30—West Raleigh, N. C. Tractor demonstration (Farmers' Convention, College Farm). Dr. R. Y. Winters in charge.  
Sept. 2-7—Indianapolis, Indiana, State Fair. Indianapolis Automobile Trade Assn.  
Sept. 5—Medina, Orleans Co. Tractor demonstration (State Fair) Food Commission. Calvin J. Huson, Director.  
Sept. 9-14—Milwaukee. Milwaukee Automobile Dealers.

Inc. Fourth Annual Wisconsin State Fair. Hart J. Ruddle, Mgr.

## ENGINEERING

Sept. 2—Cripple Creek, Colo. American Institute of Mining Engineers.  
Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

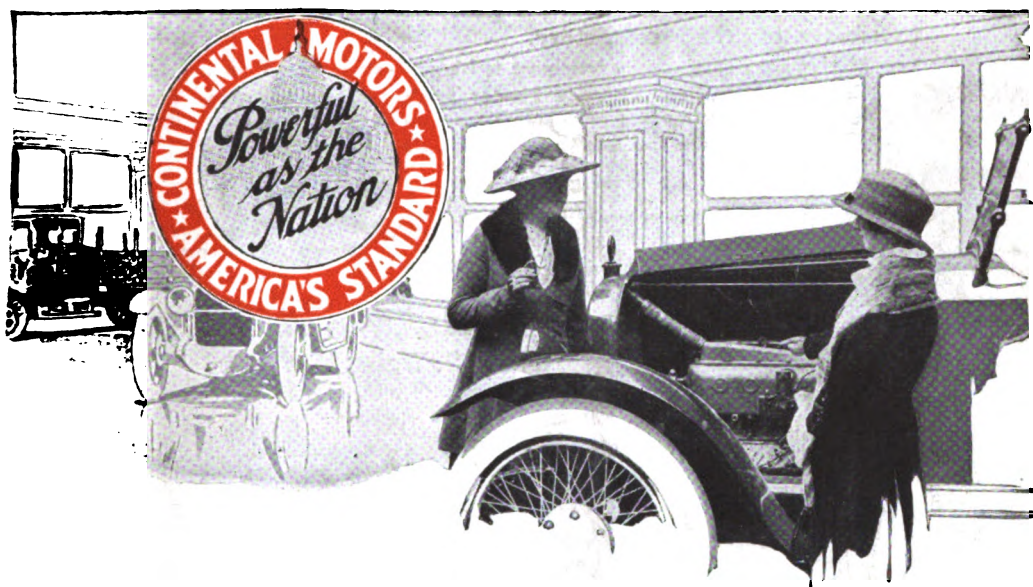
AUG 26 1918

# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

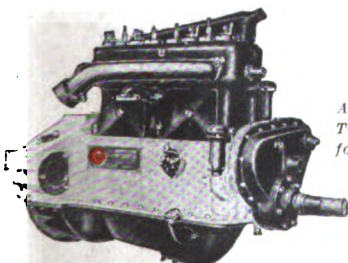
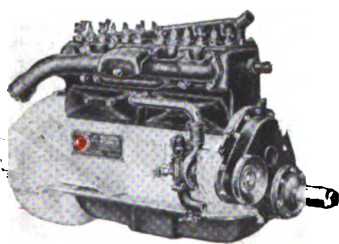
PUBLISHED WEEKLY  
NEW YORK, AUGUST 22, 1918

Ten cents a copy  
Three dollars a year



*"There's the Continental Red Seal Motor!  
Now I know it's a good car."*

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Passenger Car Mo-  
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Red Seal Name-  
plate.



America's Standard  
Truck Motor. Look  
for the Red Seal  
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When you buy an automobile or truck, the Continental Red Seal assures you 100% motor value, guaranteeing its power, its speed, its economy, its reliability.

But it does more than that. The Red Seal also provides strong evidence that you possess not only a good motor, but a good car or truck.

For certainly the manufacturers that use the Continental Motor in their product have thereby proved their intention to buy recognized value—not experiments of doubtful quality. When Continental leads the specifications, it is reasonable to assume that the other units in the product are likewise reliable.

Naturally, therefore, these manufacturers are among the most prosperous in the motor vehicle industry. They enjoy the confidence of the buying public. They secure and retain the best dealers. Their automobiles and trucks sell successfully, because they are manufactured successfully.

Look for the Red Seal on the motor in the car or truck you buy. It's your guarantee of motor quality—as well as assurance of a good car or truck.

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Offices:  
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Factories:  
Detroit—Muskegon

Largest Exclusive Motor Manufacturers in the World

# Continental Motors

STANDARD POWER FOR AUTOMOBILES AND TRUCKS



# MASTER TRUCKS

The biggest thing we can say about Master Trucks—the one thing that ought to interest you—the dealer—who is looking for a profitable truck line—is that the slogan

## Master of the Load on Any Road

really tells the Master story.

Master construction in every part is bigger—stronger—than necessary.

Consequently when you sell a Master Truck you are not spending your profits in service. We want a few more good dealers who want a full line of trucks that have made good.

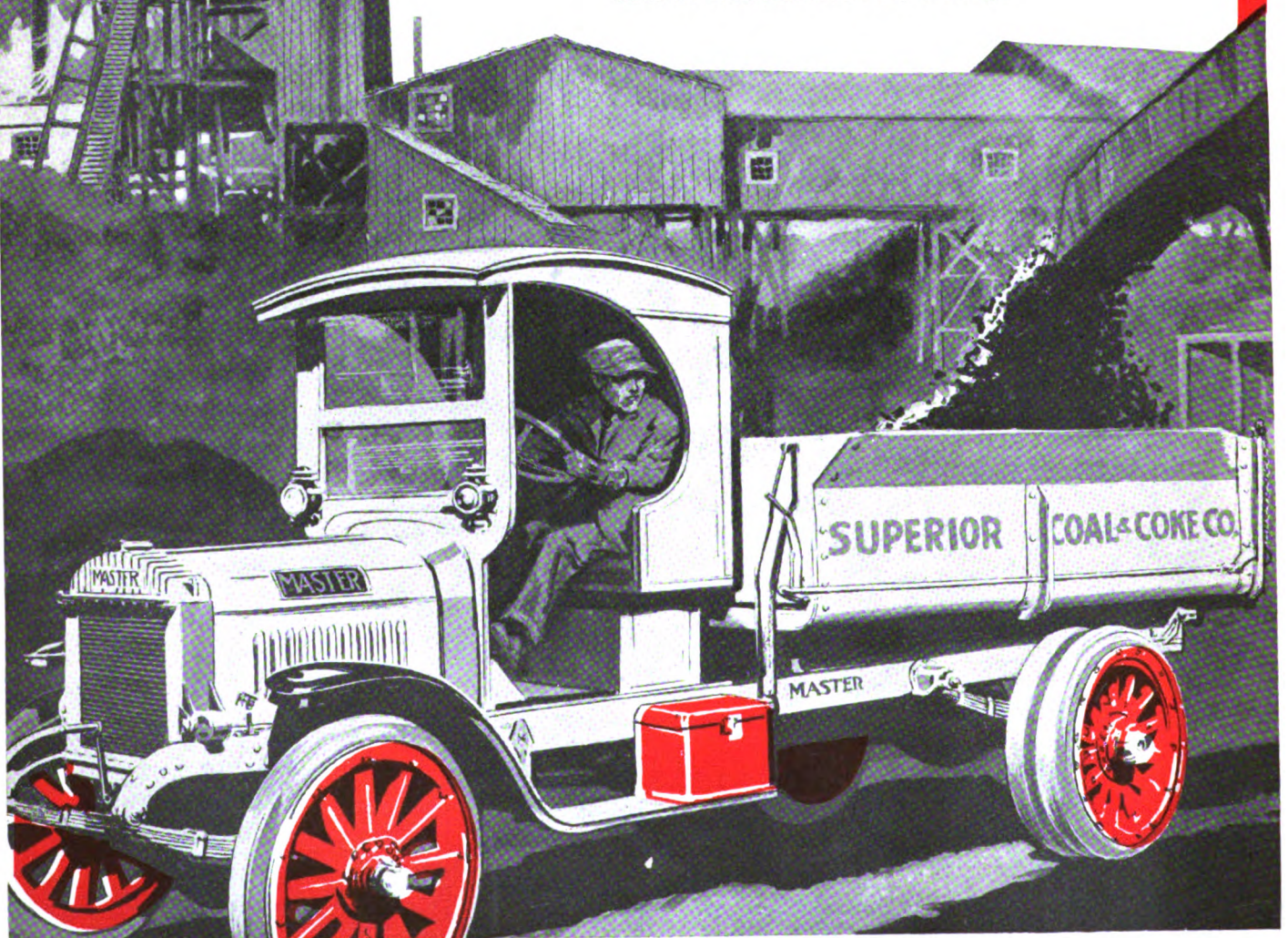
Master Trucks are made in the following sizes:

2 ton "M", internal gear drive  
2 ton "O", long wheel base internal gear drive  
2 ton "W", worm drive

2 ton "WL", long wheel base worm drive  
3½ ton "A", worm drive  
5 ton "B", worm drive  
6 ton Tractor "T"

### MASTER TRUCKS, Inc.

3141 S. Wabash Avenue, Chicago





# AUTOMOTIVE INDUSTRIES

## THE AUTOMOBILE

VOL. XXXIX

NEW YORK—THURSDAY, AUGUST 22, 1918—CHICAGO

No. 8

## Motor Transport Corps Under Brig.-Gen. Drake

President and Secretary Baker Reinstate Old Organization—  
New Corps Will Have Control of All Motor Apparatus  
Except Ambulances, Tanks and Tractors

---

New Régime Fathered Standardized War Truck Program  
A Year Ago

---

SHAKE-UP IS A REBUKE TO LOBBYING AND POLITICS PLAYED  
IN LAST EIGHT MONTHS

By Allen Sinsheimer

**W**ASHINGTON, Aug. 20—The Motor Transport Corps of the United States Army, completely controlling all motorized vehicles excepting creeper-type tractors, has been formed by a Presidential order.

This department is directly responsible to General Peyton C. March, Chief of Staff, and to the General Staff. It is headed by Brig.-Gen. C. B. Drake, who was formerly a colonel under Brig.-Gen. Chauncy B. Baker, who was in charge of the original Motor Transport Section of the Quartermaster Department.

The new order abolishes the present Motor Transport Service of the Quartermaster Corps, which is headed by Col. Fred Glover. Colonel Glover will remain with the Quartermaster Department. Col. E. S. George, who was second in command under Glover, will be transferred

back to the Signal Corps or possibly to the Air Service.

Col. James F. Furlow, who was lieutenant-colonel under General Baker, will be second in command of the new Corps. Colonel Furlow is now a colonel in the General Staff and will be detailed from it, together with Lieut.-Col. Seamon, to the Motor Transport Corps. Lieut.-Col. Seamon will be third in command. It is likely that General Drake will have the title of Director, and Colonel Furlow, Deputy Director. It is considered probable that the original AA  $\frac{3}{4}$ -ton truck and the A  $1\frac{1}{2}$ -ton truck will be reinstated in the program, and will be ordered in large quantities. The B 3-ton truck will, of course, be retained.

The new Corps will have complete charge of the technical supervision of all motor vehicles, design, production, procurement, storage and supply of them and the



**COLONEL  
C. B. DRAKE**

*of the General Staff,  
who will be Brigadier General in  
charge of the Motor  
Transport Corps*

parts, and their operation, maintenance and salvage. Provision is made in the order giving complete control of all motorized vehicles to the Corps except those used for special purposes by various army departments, such as ambulances for the medical department, over which the Motor Transport Corps will merely maintain supervision after they have been produced and delivered to the medical department.

The Motor Transport Board, which was created earlier this year and is composed of a representative of each army division interested in or using motorized vehicles, will be retained to participate in the design or construction of vehicles by suggestion. Officers of the Motor Transport Corps will be detailed to each army division, corps and department to be in command of the Motor Transport Corps within the limits of that division.

All existing contracts for motor vehicles, motor vehicle equipment and supplies, maintained, operating and repairing of motor vehicles will be taken over by the Motor Transport Corps, which will make all future purchases and disbursements.

This complete reorganization and shake-up is pregnant with significance. It marks the end of a year which has been filled with upheavals in the military truck field. A year ago the military trucks and other motorized vehicles were under the control of the Motor Transport Section of the Quartermaster Corps, chief of which was General Baker. Christian Girl was in charge of production. In the summer of 1917 General Baker, assisted by numerous engineers from the automobile industry, developed the design for three types of trucks to be manufactured by truck makers of this country, and which were regarded as trucks especially designed for our army. They comprised the AA  $\frac{3}{4}$ -ton, the A  $1\frac{1}{2}$ -ton and the B 3-ton models. The B truck was designed

and completed first. The first models were delivered in Washington late in 1917 and received officially by President Wilson and Secretary of War Newton D. Baker. Eighteen thousand of these have been ordered and more than 10,000 delivered.

Opposition developed to the standardized trucks, as these were known because of their standardization of parts and uses. Some truck manufacturers claimed that the trucks were not equal to their privately made commercial trucks. Some objected to the low margin of profit. Others were anxious to foist their own products on the Government.

There was considerable propaganda. There were reports pro and con about the stability of the trucks. Politics were played. Changes in organization came. The Motor Transport Service was formed a few months ago and tests were held of all makes of trucks. The B truck was retained under the new régime. The original A was discarded and replaced by the White  $1\frac{1}{2}$ -ton truck. The original AA was discarded and replaced by the G. M. C. truck.

After ten weeks of control the Motor Transport Service has been disorganized in part and the old organization reinstated.

The organization which was under Mr. Girl, who resigned last spring, is to be retained by General Drake. Capt. E. R. Finkenshtadt will remain in charge of B truck production; George Randles will supervise operations; Captain Miller will retain control of production of passenger cars, trailers, motorcycles and bicycles; and Guy Morgan will have charge of spare parts, tire and accessory purchases. D. C. Hess will remain in charge of priorities. The various branch offices at Chicago, New York, Cleveland and Detroit, it is expected, will be retained in their present form.

The new order is regarded here as decisive and as a rebuke to those who have interfered by means of lobbies and politics during the past year with the motorization program of the army.

General Drake has been connected for many years with the military motor truck development and problems. He is by the new order directly responsible to the Chief of Staff, and, since the order creating the Motor Transport Corps and appointing General Drake was signed by the President and the Secretary of War, these two high officials are practically in a position of vouching for him. Consequently, as a high army official put it to-day, "The election is now over," and hereafter it may be expected that motorized vehicle purchases, procurement and production will be conducted without outside influence and that those individuals who persist in using political methods may expect scant consideration.

Following is the complete general order creating the new Motor Transport Corps:

## Text of Presidential Order Creating Motor Transport Corps

General Orders {      WAR DEPARTMENT  
No. 75                      Washington, August 15, 1918.

1—There is created during the existing emergency, a Motor Transport Corps.

2—There will be detailed a Chief of the Motor Transport Corps.

3—In this order, unless special exceptions are made, the term motor vehicle will be construed to include all bicycles, motorcycles, automobiles, trailers and trucks, by whatsoever staff corps or service they may have been originally supplied and for whatsoever purpose. All motor vehicles with cargo-carrying chassis are classed as

trucks. Tractors of the caterpillar type, designed primarily for traction purposes and tanks, are excepted from the provisions of this order, the Ordnance Department being charged with the responsibility for their supply and maintenance.

4—The functions of the Motor Transport Corps are:

a—The technical supervision of all motor vehicles.

b—The design, production, procurement, reception, storage, maintenance and replacement of all motor vehicles, and accounting for same.

c—The design, production, procurement, storage and supply of spare and repair parts, tools, accessories and supplies of all motor vehicles, and accounting for same.

d—The establishment and operation of all Motor Transport Corps garages, parks, depots and repair shops.

e—The procurement, organization and technical training of Motor Transport Corps personnel.

f—The salvage and evacuation of damaged motor vehicles.

g—The homogeneous grouping of motor vehicles.

h—The operation, in accordance with instructions from the proper commanding officer as to their employment, of groups of motor vehicles of "First Class" as defined in paragraph 5 below.

i—The preparation of plans for hauling cargo and personnel over military roads, or roads under military control will be under the control of the Motor Transport Corps.

j—The procurement, supply, replacement and preliminary training before assignment to combatant organizations, of personnel for operation of motor vehicles of the second class, will be made by the Motor Transport Corps.

5—With respect to the control exercised over them by the Motor Transport Corps motor vehicles are grouped into two classes, viz:

**First Class:** Those the operation of which the Motor Transport Corps controls in the United States and overseas, and for the efficient functioning of which as transportation units it is directly responsible.

**Second Class:** Those over which the Motor Transport Corps exercises merely technical supervision in the United States and overseas.

The first class includes all cargo-carrying or passenger-carrying motor vehicles used for general transportation purposes and the motorized portion of such reserve trains as may be held for general transportation purposes in rear of an army, under control of the army commander.

The second class includes all motor vehicles not included in First Class. Substantially these will be such motor vehicles as are assigned by Tables of Organization to organizations such as divisions, corps, troops and army troops.

The Motor Transport Corps controls the operation of First Class vehicles, but merely maintains a technical supervision over the operation of Second Class vehicles. This technical supervision will, however, be interpreted very broadly by all concerned. Bulletins will be published from time to time concerning the proper methods of operation, care and maintenance of motor vehicles. Motor Transport Corps officers will keep themselves constantly informed as to how motor vehicles of the organization to which they are attached are being used and will report to the proper commanding officers any abuse which they discover. The commanding officers to whom such reports are made will hold to strict responsibility any officers who have motor vehicles under their control which have been in any way damaged or injured on account of disregard of the proper methods of operation, care and maintenance laid down by such bulletins.

When vehicles are placed in the Second Class, the Motor Transport Corps officer supervising them has no authority to determine the use to which they are put; he merely guarantees that they shall perform as efficiently as possible whatever work the commanding officer chooses to assign them.

When vehicles are placed in the Second Class, the commanding officer of the unit to which they are allotted is directly responsible for their efficient functioning, to the same degree as is the Motor Transport Corps officer for vehicles in the First Class.

6—All garages, parks, depots, repair shops and similar establishments of the Motor Transport Corps will be manned and operated by Motor Transport Corps per-

### COLONEL J. F. FURLOW

who will be second  
in command of the  
newly organized  
Motor Transport  
Corps



sonnel, and their commanding officers will report direct to the Motor Transport Corps officer on the staff of the unit or of the organization to which they are attached. Any such establishments which may now be in existence are hereby placed under the control of the Motor Transport Corps in the manner stated above.

7—Motor vehicles and their spare parts, motor vehicle shops and shop equipment, tools and accessories purchased by other staff corps or services will be turned over to and invoiced to the Motor Transport Corps and assigned by the Motor Transport Corps in accordance with the Tables of Organization, and as the best interests of the service dictate, regardless of their original source of procurement; except that ambulances and non-cargo and non-personnel carrying motor vehicles such as mobile repair shops, especially designed for Ordnance, Signal Corps and Engineering Corps, gun mounts, rolling kitchens, laboratory trucks, wireless trucks, photographic trucks, searchlight trucks, water sprinklers, will be held by the Motor Transport Corps subject to the orders of the staff corps or service for which they have been purchased. In the case of such ambulance and non-cargo carrying vehicles, the Motor Transport Corps will provide parking facilities for their reception and furnish facilities for the maintenance of the chassis and of such other parts as may be arranged for between the Motor Transport Corps and the other staff corps or service concerned. Property accounting for all motor vehicles and for chassis of special vehicles above mentioned will be made to the Chief of Motor Transport Corps.

8—All questions which may hereafter arise affecting the design or construction of motor vehicles procured by or for any staff corps or service, in so far as concerns the chassis, or any element with the supply or maintenance of which the Motor Transport Corps is concerned, will be decided by approved recommendation of the Motor Transport Board, appointed by Special Orders, No. 91, War Department, 1913, with a view of securing standardization of design and type and of facilitating repair and replacement.

9—The chief of each staff department now purchasing or operating motor vehicles will submit on or before August 31, 1918, a list of all personnel and organization who are performing Motor Transport duty under provisions of paragraphs 4 and 5 preceding. He will submit with the list the names of technical personnel which he desires to retain for use under provisions of paragraph 7 preceding. All personnel and organization except that approved to be retained, will be transferred to the Motor Transport Corps on August 31, 1918.

10—In each army, corps and division, the army artil-  
(CONTINUED ON PAGE 346)



# Agricultural States Leaders in Cars and Trucks

## Cars and Trucks in United States July 1, 1918

ALL DUPLICATE REGISTRATION  
TIONS DEDUCTED

New York	422,853
Ohio	415,962
Illinois	362,742
Iowa	325,000
Pennsylvania	324,184
California	291,667
Michigan	236,981
Indiana	207,381
Texas	198,369
Minnesota	188,709
Kansas	185,000
Wisconsin	182,700
Missouri	164,790
Nebraska	159,500
Massachusetts	156,798
New Jersey	124,519
Washington	100,722
Oklahoma	91,700
Georgia	89,481
Connecticut	75,900
South Dakota	71,800
Colorado	71,600
North Dakota	68,824
Virginia	65,000
North Carolina	61,946
Maryland	61,012
Kentucky	57,543
Oregon	57,066
Tennessee	51,900
South Carolina	47,950
Montana	46,865
Alabama	44,859
Florida	42,846
Arkansas	39,000
Maine	38,439
Louisiana	37,600
Mississippi	37,500
Dist. of Col.	36,969
West Virginia	34,371
Idaho	27,810
Rhode Island	26,399
Utah	23,850
New Hampshire	21,230
Arizona	21,180
Vermont	19,765
New Mexico	15,745
Wyoming	14,150
Delaware	11,129
Nevada	7,625

Total ..... 5,466,931

Total Now in Use in U. S. Is 5,466,931,  
an Increase of 525,665 in Six Months

THE gain of 525,665 motor vehicle registrations between January 1 and July 1 of this year when analyzed shows that this gain is not made up in the large population areas but rather through the grain belt of the Mississippi Valley and the Solid South, which started its motor boom over a year ago.

The registration figures for the first six months of this year afford the first real opportunity of studying the use and distribution of motor vehicles under war conditions. Registration begins in most states with the opening of the year, and the registration figures of July 1 as compared with January 1 afford a definite basis of studying trends as influenced by the war.

The total motor vehicle registration as of July 1, 1918, was 5,466,931 net, that is, not including any duplicate registrations. For the first time the five and one-half million figure was almost reached. The registrations last January showed that 4,941,276 motor vehicles were in registered use. The figures as of July 1 show a 10 per cent increase.

These figures include automobiles, trucks, motor buses and trailers where the latter are registered. From this figure all duplicate registrations have been subtracted, so that 5,466,931 pretty accurately represents the vehicles in use on July 1.

For the first time several states show a reduction in registrations as compared with January 1 of this year, a fact which might indicate that

there are in such states many cars that have not been registered and which obviously cannot be in service but are perhaps in storage. It is quite surprising that of the six states that have a smaller registration, or show a shrinkage in the last six months, three are typical agricultural states, two of them manufacturing states and one falls into a miscellaneous classification.

The six states showing an actual loss include Massachusetts and New

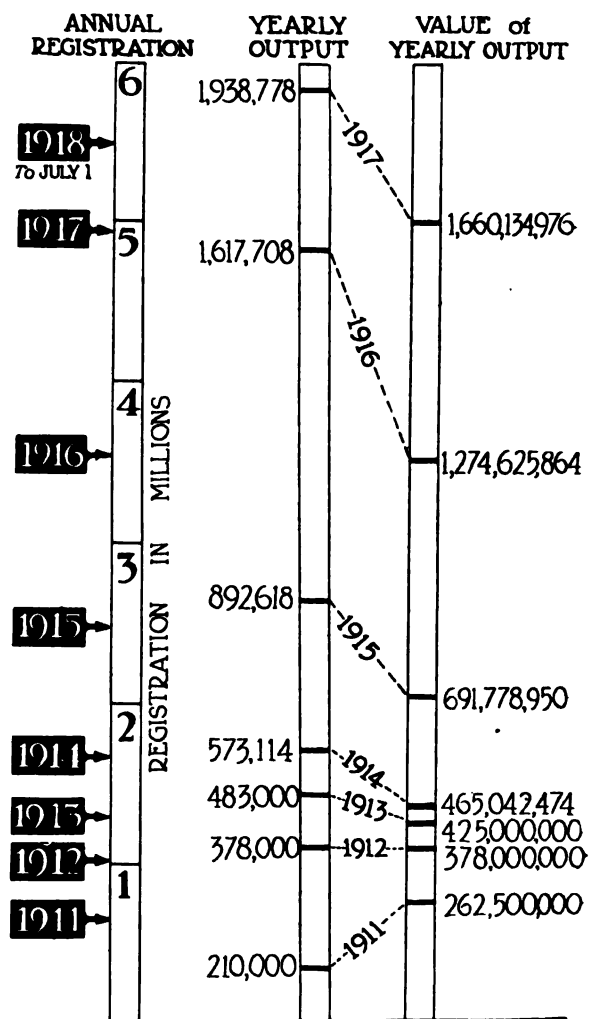
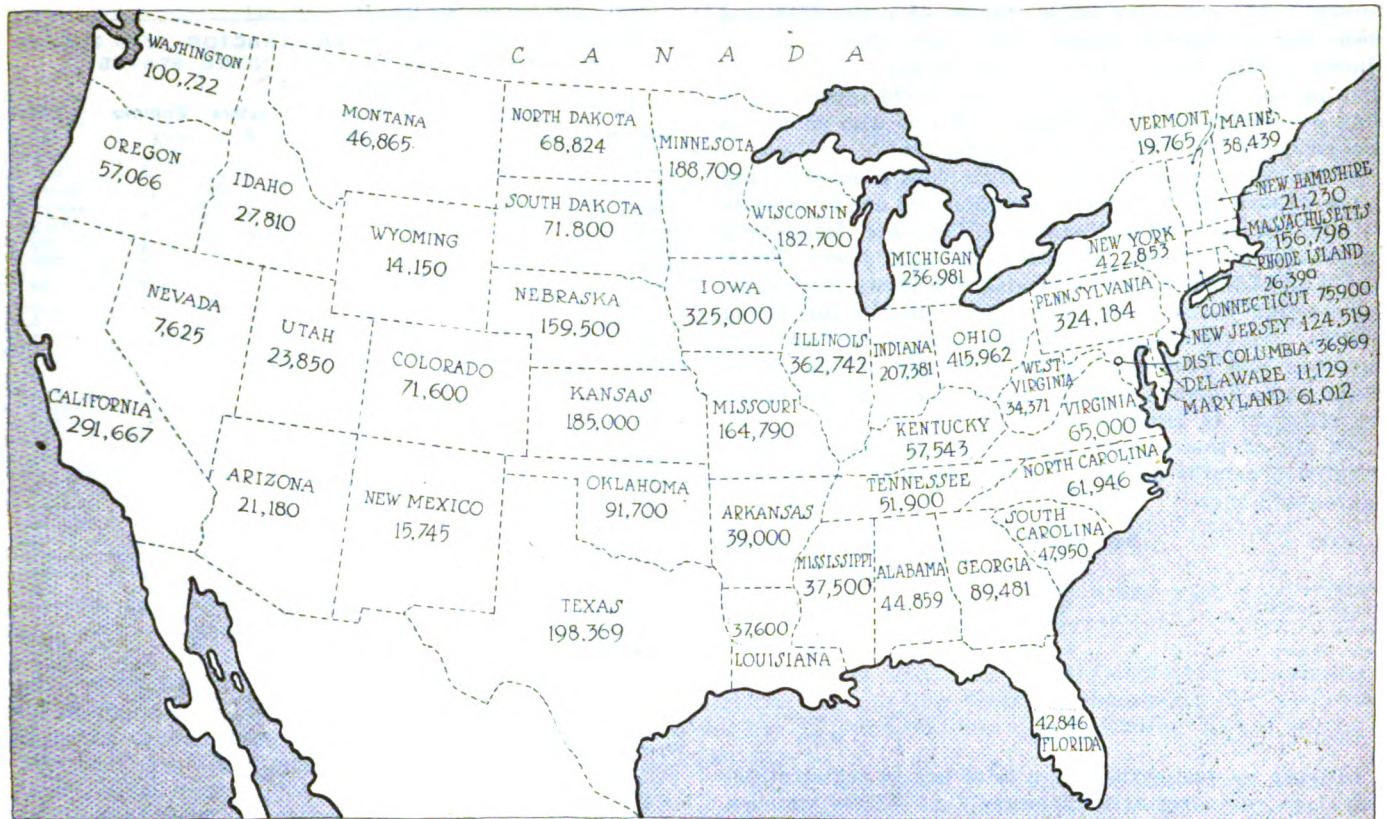


Chart showing the yearly increases in registration, output and value of cars and trucks since 1911



*Distribution of cars and trucks in the United States, all duplicate registrations being deducted*

### Automobile, Truck and Motorcycle Registrations in the United States to July 1, 1918

State or Territory	Gross Registration	New Registration	Registration Up to Jan. 1 1918	Gasoline Passenger Cars in Use	Gasoline Commercial Cars in Use	Electric Passenger Cars in Use	Electric Commercial Cars in Use	Non-Resident Registration*	Re-Registered**	Chauffeurs Registered	Total Fees	Motorcycles Registered†
Alabama	44,859	11,986	32,873	36,844	8,015	.....	.....	.....	.....	.....	131,513	.....
Arizona	21,804	1,914	19,890	.....	.....	.....	.....	.....	624	318	390,000	.....
Arkansas	39,000	10,138	28,862	37,500	1,500	.....	.....	.....	.....	.....	3,115,924	21,309
California	314,918	69,052	245,866	.....	.....	.....	.....	.....	23,251	9,900	3,115,924	4,500
Colorado	73,200	6,350	66,850	.....	.....	.....	.....	1,000	.....	12,400	308,530	4,000
Connecticut	75,900	1,258	74,642	62,300	13,600	.....	.....	.....	.....	85,000	1,129,712	683
Delaware	11,658	958	10,700	.....	.....	.....	.....	.....	529	13,677	156,802	1,920
Dist. of Col.	36,969	15,771	21,198	31,634	4,736	599	.....	.....	.....	9,851	137,083	1,494
Florida	43,746	4,530	39,216	39,243	4,503	.....	.....	.....	900	3,609	328,539	3,005
Georgia	89,876	17,025	72,851	85,326	4,550	.....	.....	.....	395	4,300	310,473	600
Idaho	28,800	4,084	24,716	.....	.....	3	.....	.....	190	750	525,509	.....
Illinois	362,742	22,450	340,292	.....	.....	.....	.....	.....	.....	38,186	2,571,505	7,563
Indiana	209,346	17,154	192,192	.....	.....	.....	.....	.....	1,965	3,804	1,170,732	7,000
Iowa	325,000	48,787	276,213	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kansas	185,000	25,658	159,342	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kentucky	57,543	10,143	47,400	.....	.....	.....	.....	.....	.....	.....	.....	1,212
Louisiana	38,000	6,350	31,650	.....	.....	.....	.....	.....	400	.....	.....	400
Maine	39,538	.....	41,499	35,929	3,609	.....	.....	.....	1,099	46,873	502,297	1,178
Maryland	63,827	2,884	60,943	57,985	5,411	221	210	.....	2,815	8,173	751,142	4,180
Massachusetts	166,384	.....	174,274	136,684	29,700	.....	.....	.....	9,586	26,368	1,843,595	10,074
Michigan	242,712	16,019	226,693	219,292	23,420	.....	.....	285	6,446	19,420	2,569,137	6,505
Minnesota	188,709	.....	192,000	.....	.....	.....	.....	.....	.....	4,000	943,545	4,128
Mississippi	37,500	5,850	31,650	.....	.....	.....	.....	.....	.....	.....	.....	.....
Missouri	170,001	18,974	151,027	.....	.....	.....	.....	.....	5,211	18,110	1,335,914	3,320
Montana	47,350	4,801	42,749	.....	.....	.....	.....	.....	.....	485	320,088	722
Nebraska	159,500	11,499	148,001	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nevada	7,625	740	6,885	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Hampshire	22,433	166	22,267	.....	.....	.....	.....	703	500	8,200	290,070	1,940
New Jersey	137,322	.....	141,918	124,006	13,116	300	.....	.....	12,803	168,287	1,420,037	10,307
New Mexico	15,745	1,659	14,086	.....	.....	.....	.....	.....	.....	.....	.....	249
New York	422,853	11,903	410,950	335,245	67,330	.....	.....	.....	.....	122,873	3,571,410	24,838
North Carolina	62,071	6,121	55,950	.....	.....	.....	.....	125	.....	.....	326,979	1,432
North Dakota	68,824	6,831	62,993	.....	.....	.....	.....	.....	.....	.....	424,985	1,537
Ohio	425,789	83,159	342,630	.....	.....	4,265	.....	.....	9,827	.....	.....	20,182
Oklahoma	91,700	.....	100,199	.....	.....	.....	.....	.....	.....	.....	.....	1,182
Oregon	57,066	8,434	48,632	52,324	4,692	.....	50	.....	.....	.....	.....	.....
Pennsylvania	344,877	19,724	325,153	319,498	25,379	.....	.....	.....	20,893	.....	3,538,057	21,907
Rhode Island	26,399	1,257	25,142	21,413	4,986	.....	.....	.....	.....	20,200	139,564	1,435
South Carolina	48,350	10,028	38,322	.....	.....	.....	.....	.....	400	.....	.....	971
South Dakota	78,000	10,842	67,158	.....	.....	.....	.....	.....	6,200	.....	275,153	1,008
Tennessee	54,000	5,500	48,500	.....	.....	.....	.....	.....	2,100	.....	.....	800
Texas	214,580	.....	219,721	.....	.....	.....	.....	103	16,083	14,867	1,754,576	2,422
Utah	24,600	3,024	21,576	.....	.....	.....	.....	.....	750	1,300	.....	1,125
Vermont	20,431	64	20,367	18,795	1,627	8	1	.....	666	3,390	362,964	406
Virginia	65,000	9,339	55,661	.....	.....	.....	.....	.....	.....	3,680	.....	2,000
Washington	100,722	6,900	93,822	87,756	12,966	.....	.....	.....	.....	.....	758,620	5,099
West Virginia	36,400	5,094	31,306	.....	.....	.....	.....	608	1,421	3,363	603,072	986
Wisconsin	182,700	18,169	164,531	177,000	5,700	.....	.....	.....	.....	.....	1,862,565	6,000
Wyoming	14,150	1,649	12,501	.....	.....	.....	.....	.....	.....	.....	69,170	240
<b>Total</b>	<b>5,596,499</b>	<b>529,135</b>	<b>5,067,364</b>	<b>1,878,774</b>	<b>234,840</b>	<b>5,302</b>	<b>261</b>	<b>3,424</b>	<b>124,344</b>	<b>652,083</b>	<b>\$33,992,489</b>	<b>191,914</b>

NOTE.—Steam cars and trucks are included with the gasoline vehicle statistics, as segregation is not carried out by registration officials. \*Number of registered owners by citizens of other States. \*\*Number of vehicles re-registered, owing to transfer of ownership, etc. .... Statistics not available. †This is an independent column, having no relation to the figures given in any other.

Jersey, both containing large centers of population and both manufacturing rather than agricultural states. Massachusetts had on July 1 7,890 fewer registrations than on January 1. New Jersey had 4,596 fewer July 1 than on January 1. The State of Maine also showed a decrease of 1,961 during the same period.

The remaining three states which show a decrease fall in the Mississippi Valley classification and are practically out-and-out agricultural states. They are Minnesota, Texas and Oklahoma. Minnesota is 3,281 lower, Texas 5,161; and Oklahoma 9,499. Oklahoma shows the largest registration decrease of all six that are in the losing column. Unquestionably the dry weather in the past year has had something to do with the falling off in Texas and Oklahoma, but no reason can be advanced for the reduction in Minnesota.

All six of these losing states showed large gains in the first six months of 1917, as the following comparative figures will show:

State	Gain first six months 1917	Loss first six months 1918
Oklahoma	19,728	9,499
Massachusetts	6,061	7,890
Texas	2,313	5,161
New Jersey	44,253	4,596
Minnesota	30,500	3,281
Maine	3,618	1,961
Total	106,473	32,388

In these six states there is a total loss in registrations July 1 as compared with January 1 of 32,388 vehicles. When these figures are contrasted with those for the first six months of 1917, when there was a registration gain of 106,473, the influence of the war on certain sections becomes at once apparent.

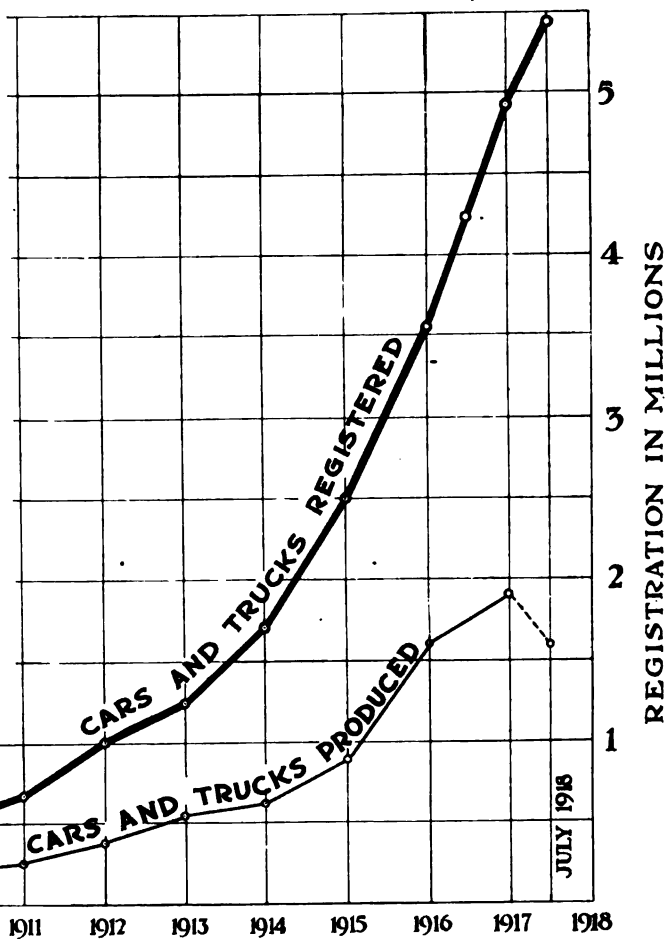
In the cases of New Jersey and Massachusetts unquestionably the drop in registration is largely due to the falling off in sales in the large population centers in each state. New Jersey is just across the Hudson river from New York City; in fact, a very large percentage of the business men and women of New York City live in Jersey and their automobiles would come under Jersey registration. Massachusetts has the Boston population.

Next to the falling off in registration in six states is the almost phenomenal gain made by the State of Ohio, which has almost ousted New York from its premier position. Ohio has literally outraced all of the other states in registration since the first of the year. It shows a gain of 83,159 as compared with January 1. The significance of these figures increases when con-

#### DISTRIBUTION OF CAR, TRUCK, TRACTOR AND ENGINE MANUFACTURERS IN THE UNITED STATES AND CANADA

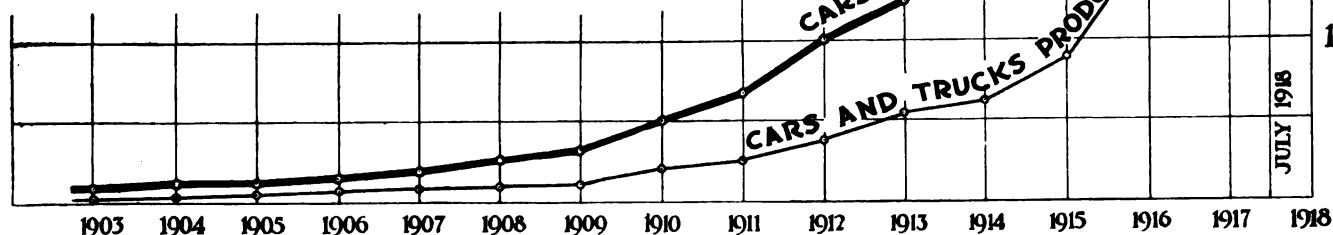
State	Cars	Trucks	Tractors	Engines	Total
California	4	9	8	..	21
Colorado	1	..	..	..	1
Connecticut	2	2	..	3	7
Delaware	1	..	..	..	1
District of Columbia	1	..	..	..	1
Georgia	3	..	..	..	3
Illinois	17	35	18	4	74
Indiana	26	14	7	5	52
Iowa	..	6	7	1	14
Kansas	1	1	1	..	3
Kentucky	2	2	1	..	5
Louisiana	1	..	..	..	1
Maine	..	..	1	..	1
Maryland	1	1	..	..	2
Massachusetts	5	14	3	1	23
Michigan	40	44	13	17	114
Minnesota	7	11	23	2	43
Missouri	4	6	7	..	17
Nebraska	1	2	1	1	5
New Hampshire	..	1	..	..	1
New Jersey	3	6	1	1	11
New York	16	37	6	7	66
North Carolina	..	1	..	..	1
North Dakota	..	..	1	..	1
Ohio	27	38	13	6	84
Oklahoma	3	2	1	..	6
Pennsylvania	8	28	5	6	47
Rhode Island	1	1	..	..	2
South Carolina	1	..	..	..	1
South Dakota	..	..	2	..	2
Texas	2	2	1	..	5
Virginia	2	..	1	..	3
Washington	1	4	3	..	8
West Virginia	1	..	..	..	1
Wisconsin	6	12	17	8	43
Canada	17	10	4	..	31
Total	198	295	145	72	700

5,466,931



#### MOTOR VEHICLE EXPORTS IN FIRST SIX MONTHS OF 1918

Month	Cars	Value	Trucks	Value
January	4,325	\$3,841,871	1,156	\$3,328,870
February	3,551	3,078,191	765	1,917,638
March	4,249	3,981,016	620	1,526,387
April	6,104	3,958,560	655	1,392,125
May	2,801	2,907,390	866	1,958,603
June	3,098	2,808,463	829	2,001,488
Total	24,128	\$20,575,491	4,891	\$12,125,111



Registration and production in curves showing the development year by year from 1903. The former has risen steadily and consistently, but the production curve has been slightly irregular



## Dealers, Garages, Machine Shops and Supply Houses in Operation

								Cos. Hav- ing										Cos. Hav- ing													
		Repair-			Supplies			Exclu- Supply				Repair-			Supplies			Exclu- Supply													
State	Dealers	Garages	shops	Jobbers	sively	Depts.	Totals	State	Dealers	Garages	shops	Jobbers	sively	Depts.	Totals	State	Dealers	Garages	shops	Jobbers	sively	Depts.	Totals								
Alabama	191	119	83	3	26	51	473	New Jersey	699	946	446	1	88	256	2,436	Arizona	131	107	64	..	12	47	361	New Mexico	95	95	36	..	7	47	280
Arkansas	208	120	74	1	20	50	473	New York	2,023	2,435	1,175	14	334	678	6,659	California	1,309	1,413	967	17	170	450	4,326	North Carolina	317	257	112	1	25	104	816
Colorado	351	329	180	2	24	141	1,027	North Dakota	477	324	177	1	10	141	1,093	Connecticut	486	478	291	7	85	156	1,503	Ohio	1,738	1,322	648	26	143	509	4,384
Delaware	70	71	27	..	6	21	195	Oklahoma	464	344	143	2	29	149	1,181	Florida	293	267	159	2	36	117	874	Pennsylvania	1,803	1,817	824	18	216	681	3,839
Dist. of Col.	51	53	32	2	18	10	166	Oregon	237	233	112	2	27	75	686	Georgia	321	297	170	2	61	105	956	Rhode Island	95	137	87	5	..	18	342
Idaho	174	124	70	1	15	66	450	Pennsylvania	1,803	1,817	824	18	216	681	3,839	Idaho	174	124	70	1	15	66	450	South Carolina	225	130	68	2	19	57	501
Illinois	2,066	1,970	1,093	17	133	622	5,901	Rhode Island	95	137	87	5	..	18	342	Illinois	2,066	1,970	1,093	17	133	622	5,901	South Dakota	449	340	151	2	11	109	1,062
Indiana	1,013	822	369	10	66	308	2,588	South Carolina	225	130	68	2	19	57	501	Indiana	1,013	822	369	10	66	308	2,588	Tennessee	237	153	114	3	28	76	611
Iowa	1,645	1,383	768	8	67	699	4,572	South Dakota	449	340	151	2	11	109	1,062	Iowa	1,645	1,383	768	8	67	699	4,572	Texas	820	653	284	12	90	217	2,076
Kansas	957	873	440	8	33	357	2,668	Tennessee	237	153	114	3	28	76	611	Kansas	957	873	440	8	33	357	2,668	Utah	107	71	49	3	13	26	269
Kentucky	306	245	99	3	25	78	756	Texas	820	653	284	12	90	217	2,076	Kentucky	306	245	99	3	25	78	756	Vermont	180	161	96	..	9	75	521
Louisiana	165	90	52	4	20	36	367	Utah	107	71	49	3	13	26	269	Louisiana	165	90	52	4	20	36	367	Virginia	303	203	120	2	47	76	751
Maine	361	292	124	3	18	128	926	Vermont	180	161	96	..	9	75	521	Maine	361	292	124	3	18	128	926	Washington	417	332	182	6	51	100	1,088
Maryland	235	244	111	2	29	73	694	Virginia	303	203	120	2	47	76	751	Maryland	235	244	111	2	29	73	694	West Virginia	261	158	69	..	17	72	577
Massachusetts	838	943	419	17	142	239	2,598	Washington	417	332	182	6	51	100	1,088	Massachusetts	838	943	419	17	142	239	2,598	Wisconsin	1,029	900	406	10	47	327	2,719
Michigan	957	835	349	8	96	297	2,542	West Virginia	261	158	69	..	17	72	577	Michigan	957	835	349	8	96	297	2,542	Wyoming	80	67	38	..	9	23	217
Minnesota	1,113	843	449	15	41	279	2,740	Wisconsin	1,029	900	406	10	47	327	2,719	Minnesota	1,113	843	449	15	41	279	2,740	Ter. of Hawaii	11	8	10	..	5	9	43
Mississippi	157	98	37	..	15	44	351	Wyoming	80	67	38	..	9	23	217	Mississippi	157	98	37	..	15	44	351	West Indies	28	24	3	..	4	9	68
Missouri	835	670	382	16	62	216	2,141	Ter. of Hawaii	11	8	10	..	5	9	43	Missouri	835	670	382	16	62	216	2,141	Canada	970	853	357	21	75	211	2,487
Montana	263	224	127	2	15	93	724	West Indies	28	24	3	..	4	9	68	Montana	263	224	127	2	15	93	724	Mexico	8	10	3	..	2	2	25
Nebraska	356	680	270	11	21	231	1,569	Canada	970	853	357	21	75	211	2,487	Nebraska	356	680	270	11	21	231	1,569								
Nevada	53	56	25	..	4	18	156	Mexico	8	10	3	..	2	2	25	Nevada	53	56	25	..	4	18	156								
New Hampshire	194	217	103	..	10	98	622									New Hampshire	194	217	103	..	10	98	622								
								Total	28,619	25,836	13,040	292	2,589	9,106	79,482																

trusted with New York State, where the gain in the same period is only 11,903 registrations. Ohio has more than seven times this gain.

Not only has Ohio outstripped New York State in gains in the 6 months, but it is close on the heels of the Empire state in total registrations. Ohio now has registered as of July 1 415,962 and New York State on the

same date had 422,853. If Ohio continues to gain on registrations for the second 6 months of the year as she has in the first, she will be leading New York by January 1.

Ohio, of all states in the Union, has made greatest gains. Next to her comes California with a registration gain in the same 6 months of 69,052. Iowa, one of the premier farming states and the leading state in number of automobiles in relation to number of population comes third in registration gains this year, its figures showing a gain of 46,787. These three states are by long odds the leaders in registration gains this year, in fact, the others can scarcely be classed as a good second in the running. Pennsylvania, which in 1917 was a big gainer, only shows 19,724 more registrations on July 1 than on January 1 this year as compared with over 35,000 increase a year ago.

It is difficult to reason out just why Ohio should so far outstrip New York, Pennsylvania, Illinois and other states if it is not that the state is a leader in agriculture, and is also a strong manufacturing state, holds a high position in mining and has crude oil interests as well. It seems to be the general prosperity of all of these fields that have combined to put the state in the first place in registration gains.

Apart from the Ohio leadership the utilitarian aspect of the automobile is well evidenced by the fact that practically the fifteen states that lead in registration gains are agricultural states. The list is headed by Ohio, California and Kansas, all three agricultural leaders; and following them come a group of farming states such as

(Continued on page 339)

## Increase in Registration

State	Increase Cars	Per Cent Increase
Ohio	83,159	24
California	69,052	24
Iowa	46,787	17
Kansas	25,658	16
Illinois	22,450	6
Pennsylvania	19,724	6
Missouri	18,974	18
Wisconsin	18,169	11
Indiana	17,154	8
Georgia	17,025	23
Michigan	16,019	7
Dist. of Columbia	15,771	74
Alabama	11,986	36
New York	11,903	2
Nebraska	11,499	7
South Dakota	10,842	16
Kentucky	10,143	21
Arkansas	10,138	35
South Carolina	10,028	26
Virginia	9,339	17
Oregon	8,434	17
Washington	6,900	7
Colorado	6,350	9
Louisiana	6,350	6
North Carolina	6,121	11
Mississippi	5,850	18
North Dakota	5,831	9
Tennessee	5,500	11
West Virginia	5,094	13
Montana	4,601	10
Florida	4,530	10
Idaho	4,084	13
Utah	3,024	14
Maryland	2,884	4
Arizona	1,914	9
New Mexico	1,659	12
Wyoming	1,649	13
Connecticut	1,258	1
Rhode Island	1,257	5
Delaware	958	8
Nevada	740	10
New Hampshire	166	7
Vermont	64	3
*Maine	..	..
*Massachusetts	..	..
*Minnesota	..	..
*New Jersey	..	..
*Oklahoma	..	..
*Texas	..	..
Total	530,568	..
Average Increase	..	12

## Registration and Population

State	Pop. July 1, 1917	Cars and Trucks	Pop. Per Car
Iowa	2,224,771	325,000	6
Nebraska	1,284,126	159,500	8
Dist. of Colum.	369,282	36,969	9
South Dakota	716,972	71,800	9
California	3,029,032	291,667	10
Kansas	1,851,870	185,000	10
Montana	472,985	46,865	10
North Dakota	765,319	68,824	11
Arizona	263,738	21,180	12
Minnesota	2,312,445	188,709	12
Ohio	5,212,085	415,962	12
Colorado	988,320	71,600	13
Indiana	2,835,492	207,381	13
Michigan	3,094,266	236,981	13
Wisconsin	2,527,167	182,700	13
Wyoming	184,970	14,150	13
Nevada	110,738	7,625	15
Oregon	861,992	57,066	15
Washington	1,597,400	100,722	15
Connecticut	1,265,373	75,900	16
Idaho	445,176	27,810	16
Illinois	6,234,995	362,742	17
Utah	443,866	238,850	18
Vermont	364,946	19,765	18
Delaware	215,160	11,129	19
Maine	777,340	39,439	19
New Hampshire	444,429	21,230	20
Florida	916,185	42,846	21
Missouri	3,429,595	164,790	21
Maryland	1,373,673	61,102	22
Texas	4,515,423	199,369	22
Rhode Island	625,865	26,399	23
Massachusetts	3,775,973	156,798	24
New York	10,460,182	422,853	24
New Jersey	3,014,194	124,519	24
Oklahoma	2,289,855	91,700	24
New Mexico	423,649	15,745	26
Pennsylvania	8,660,042	324,184	26
Georgia	2,895,841	89,481	32
South Carolina	1,643,205	47,950	34
Virginia	2,213,025	65,000	34
North Carolina	2,434,381	61,946	39
Kentucky	2,394,093	57,543	41
West Virginia	1,412,602	34,371	41
Tennessee	2,304,629	51,900	44
Arkansas	1,766,343	39,000	46
Louisiana	1,856,954	37,600	49
Alabama	2,363,939	44,859	52
Mississippi	1,976,570	37,500	52
Total	103,640,473	5,466,931	22
Average for U. S.	..	..	..

# Comment on Some Tractor Problems

Tractors Shown at Salina Indicate New Tendencies in Design—Steering Gear a Weak Link—Seating Accommodation for Driver and Control Arrangement



*Wallis tractor with boiler plate oil pan and gear housing also serving as frame*



*Port Huron three-plow tractor with Erd engine*



*Above — The small Avery with four-cylinder engine. On right—Rumely Oil-Pull hauling three groups of six disks each*



A MEETING like that held at Salina recently affords many opportunities for a comparative study of design. It was the big event in the tractor world this year, and practically every concern that amounts to anything in the tractor industry was represented. In addition to the older models with 1918 improvements there were quite a number of entirely new designs. We show herewith a collection of photos taken on the field, which merit inspection by the tractor engineer and manufacturer.

As regards steering of the regular wheeled tractors, there are three different methods now in vogue. There is first the three-wheeled tractor with a single central steering wheel, which commends itself on account of its simplicity. While some of the most successful of the older types come under this heading, all of the new designs have four wheels. There is a possibility that the farmer looks upon the three-wheeled tractor much like the automobile prospect looked upon the three-wheeled motor car offered during the early years—as a makeshift and a freak. Of course, that the three-wheeler lost out in the automobile field is no proof that it does not possess merit as a tractor, but the great predominance of four-wheelers tends to confirm those who are prejudiced against the three-wheeler in their opinion, and adds to the sales resistance that must be overcome by the sponsors of the three-wheeler.

## The Steering Problem

Some manufacturers have endeavored to secure the simple steering arrangement of the three-wheeler with the four-wheeled construction. They were evidently impressed with the advantages of the three-wheeler but wanted to reduce sales resistance. This led to the adoption of the construction employing two front wheels rather close together on a solid axle adapted to be rocked around a central vertical pivot.

Steering gears are evidently one of the weak points of the tractor. This may be partly accounted for on the ground that automobile steering gears, designed for





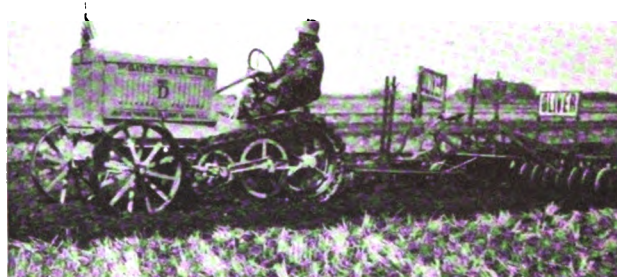
*Emerson-Brantingham pulling three plows*



*Driver's stand on Parrett is used for women drivers*



*The new Avery pulling four plows*



*Bates steel mule hauling disk roller*

much lighter work, have been applied to tractors because they could be purchased advantageously. On the other hand, where tractor manufacturers make their steering gears themselves the design frequently has not received the attention it deserves. It is absolutely essential that a tractor steering gear be completely housed in, and the provisions for oiling its bearings and other wearing surfaces should be most carefully worked out. The chief cause of trouble with steering gears seems to have been due to the fact that often they are not sufficiently rugged to withstand the maximum strain rather than excessive wear, for in plowing, at least, the tractor is largely self-steering.

There is a tendency noticeable to approach the smooth outside lines which are so much appreciated in the passenger automobile. No one expects the tractor to serve as an ornament, but it is a fact that in the evolution of any machine the higher the state of perfection reached the more "sightly" or "attractive" the machine usually becomes.

#### Location of Driver

There is quite a variation also in the seating arrangements for the driver. Some designers place the driver in a comparatively high position, evidently with the object of enabling him to see the ground close in front of the tractor. The problem of seat location is, of course, closely related to that of control arrangement. Some day, no doubt, we will have standardized tractor control the same as we now have standardized control for passenger cars and motor trucks, but that day seems still a great ways off. All control devices should be arranged so that they can be conveniently operated from the driver's seat; it should not be necessary for the driver to go through contortions or acrobatics to change gear or apply the brake, but these functions should be capable

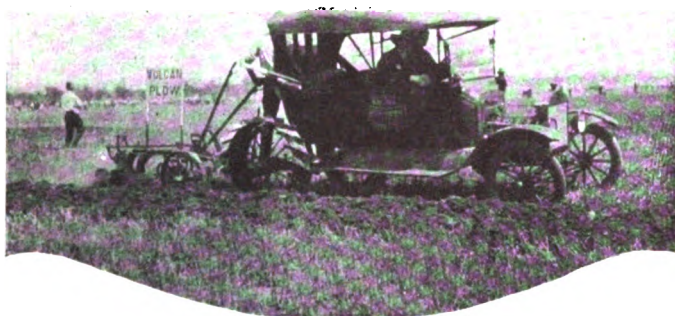


*Plowman tractor hauling two plows*



*Rumely 12-24 tractor pulling four disk plows*



*Three sizes of Russell tractor in line**Fordson tractor pulling two plows**Converted Ford car pulling two plows, very shallow**Happy Farmer pulling four plows*

of being performed in a natural, easy way. The demand for ease of operation will increase as the labor shortage becomes more acute and boys and women will largely have to operate the tractors.

Many of the tractors demonstrated at Salina were provided with cabs, and it is quite conceivable that when the temperature in the shade ranges between 100 and 110 degrees, or during a rain, they are quite a comfort, but under normal atmospheric conditions the average driver would probably prefer to sit out in the open.

#### Improvement of Details

In a tractor we cannot expect the finish and general finesse that we have become accustomed to in automobiles, yet it is evident that there is much need for improvement in design. Many tractors in the past have been built unduly heavy because the designers were under the impression that they needed weight for traction anyhow and there was no sense in cutting weight. However, the weight is only one of the factors determining the limiting traction and not all of the weight of the tractor is effective in increasing the traction. On the other hand, every pound of unnecessary weight that is lugged around means just so much waste of fuel.

What is needed is a thorough discussion of tractor design by men familiar with present day practice. An interchange of ideas and experiences would greatly help to accelerate the progress of this most essential device. The individual designer, of course, will gain much valuable information from the service department regarding weaknesses developing in the field, but an exchange of ideas and experiences among different designers would broaden the view of each.

**A** FIRE-ALARM system, the detector part of which consists of a very fine copper tube cleated around through various parts of the building, is made by the Aero Fire Alarm Co., 26 Cortlandt Street, New York City. If a fire occurs, the air in the tube is heated, causing it to act on a diaphragm which connects an electric circuit and rings the alarm.

*The Velie tractor**Hession tractor pulling three plows**Peoria 12-25 tractor with Climax engine*

# The S. E. 5A Single Seater Fighter

Mechanical Details of British Machine Which Has Been Adopted by Our Army Authorities Weighs 1554 Lb. Without Load and Is Equipped with 200 Hp. Hispano Engine

**I**N the Aug. 8 issue of AUTOMOTIVE INDUSTRIES we published a photograph of the British S.E.5A (Scouting Experimental) plane. Some further details are now available, a technical description of a captured machine having appeared in the German air-craft periodical *Luftwaffe* for March.

The machine described was built by Vickers, Ltd., and carried the number B-507, besides an A to designate the squadron it belonged to, as well as a white circle. The propeller was marked S. E. 5A, which suggests the idea that the machine is a development of the S. E. 5, which was fitted with a 150-hp. Hispano engine.

The wing surface is equal to 246 sq. ft., and both wings have a span of  $26\frac{3}{4}$  ft. There is only a single inter-plane strut on each side of the body. The chord of the wings is 5 ft., and the gap from the top of the fuselage amounts to 1.65 ft. There is no sweep-back, but both the upper and lower wings have a dihedral angle of 1.71 degrees. Both sets of wings are of equal size, the upper set being mounted on the center section over the fuselage, and the lower set on to wing stubs. The field of vision is increased by cutting away a portion of the wing near the body. The upper wings have an angle of incidence of 5 deg. mean, while the lower wings have an angle of incidence of 6 deg. near the body and 5 deg. at the struts.

Both spars of the wings are of I section, while the spars of the wing stubs, which run through the fuselage, consist of  $1\frac{3}{4}$ -in. steel tubes, with a wall thickness of 0.169 in. There is nothing unusual in the design of the ribs, these being along conventional lines of British construction. There are no compression members or struts between the spars, but instead some of the ribs are of solid section between the spars. The internal wiring of the wings, between the fuselage and the struts, is of ordinary drawn wire, whereas the internal wiring of the overhanging portion of the wings is of swaged wire.

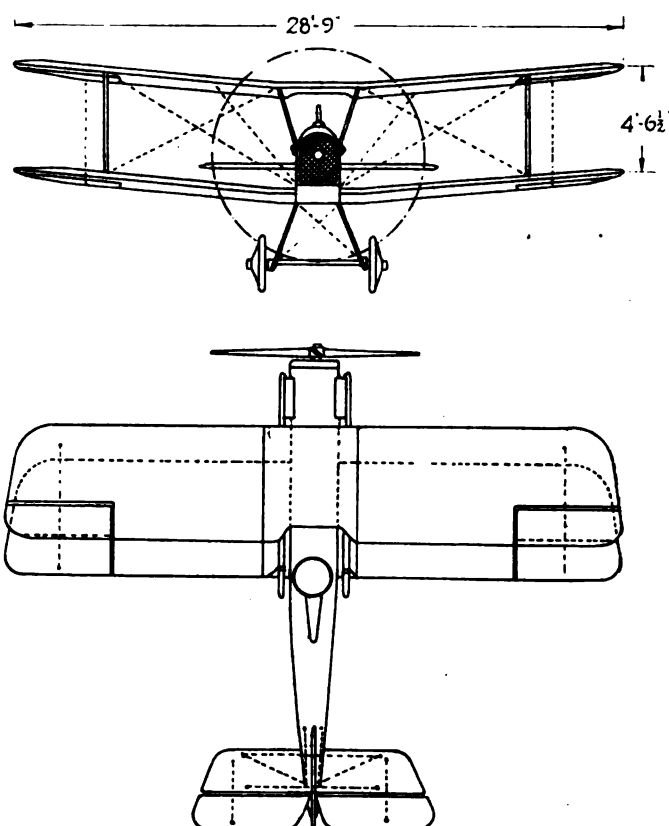
The trailing edge of the wings consists of a wood strip. Further, there are two auxiliary ribs between each pair of main ribs from the leading edge to the main spar. The fabric is sewed to the ribs, and is painted yellow on the under-surface of the wings, and brown above, as is the fabric of the fuselage. Grummets are put in place on the under side, near the trailing edge of the wings.

The center section struts are covered steel tubes. The spruce struts of the wings rest in long stampings, which serve also as attachment fittings for the vertical wiring. Stream line wire is employed for the plane cross wiring, with double wires for flying and single wires for landing. The two spars of the upper planes are strengthened between the center section and the struts by two wires each. Unbalanced ailerons are hinged to the rear cross-bar of both upper and lower planes.

The body is of the usual strut and wire design, having semicircular frames and fairings on top, and three-ply wood planking of 0.16 in. thickness to the pilot's seat. Both the longerons and struts of the fuselage are of I-section, with the exception of the vertical struts behind the pilot's seat, which are of circular section.

The tail-plane is curved on both sides, and is fixed to the body in such a manner that the angle of incidence can be varied during flight, between the limits of plus 4.5 deg. and minus 3 deg. In order to make this possible, the front spar is made turnable, while the rear spar, with its wiring, is fixed to a tube, so arranged that it can be shifted relative to the stern post of the fuselage. This tube rests with a piece of thread in a gear nut, which latter in turn is supported by the stern post.

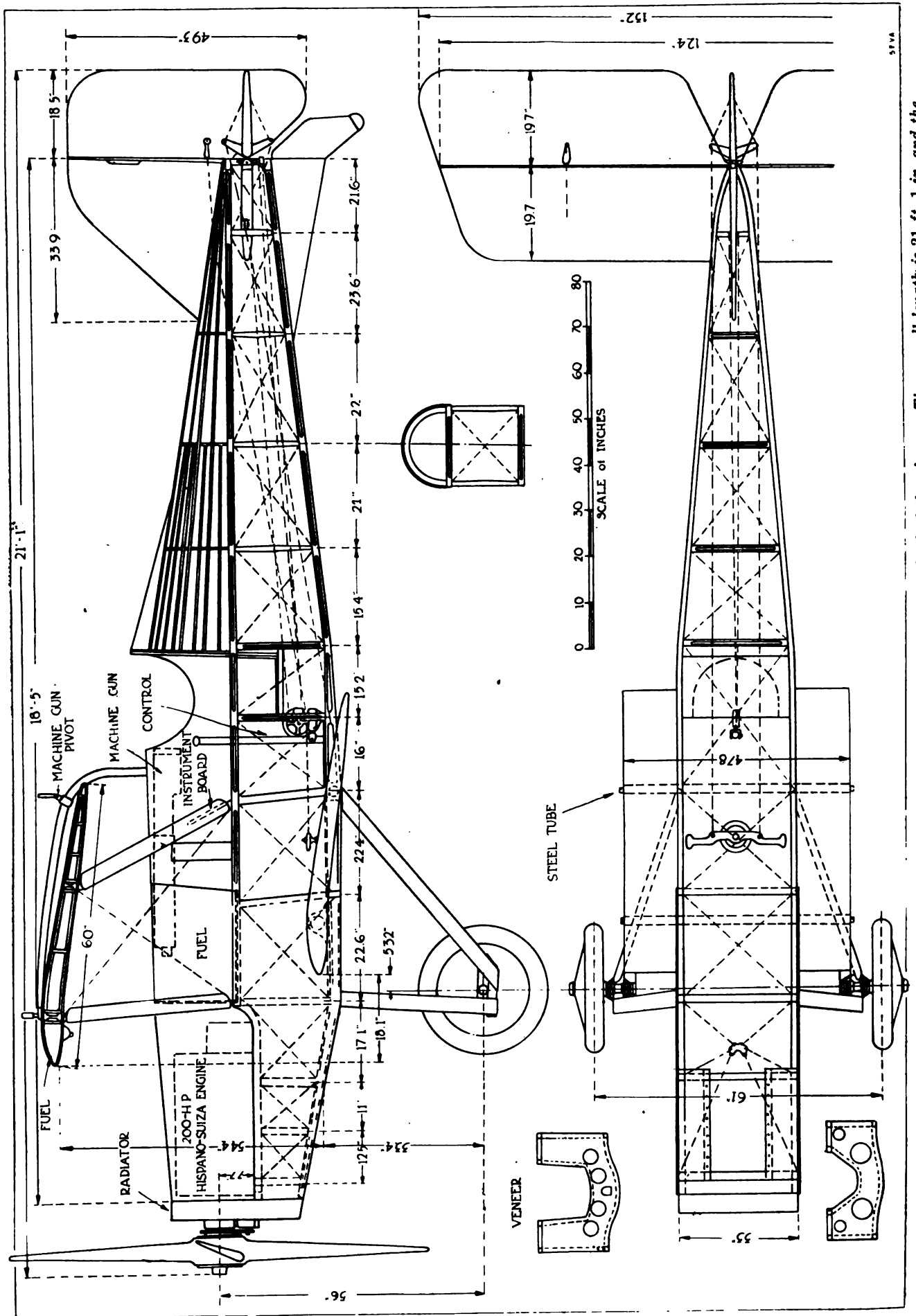
When the nut is turned from the pilot's seat by means



Front view and plan of S. E. 5A biplane

of a hand wheel and cable, the tube is displaced upwards and downwards, transmitting the same motion to the rear spar of the tail-plane, thus changing its angle of incidence. The elevator, which is hinged to the fixed tail-plane, takes part in this motion. The wires for operating the elevator are led through the fuselage and tail-plane, the obvious object being to reduce the air resistance. However, this arrangement necessitates two turns of 20 deg. in the wire. Both the main and the tail-plane are fitted with Cellon windows.

The landing gear is of conventional design. The one-piece axle rests between two auxiliary axles. There is no limit to the spring action. The tail-skid is somewhat unusual, in that it is arranged in a rotary manner be-



The S. E. 5A, adopted by the U. S. Army. The elevation shows the 18.1-in. positive lead of the planes. The overall length is 21 ft. 1 in. and the total weight is 1554 lb. without load



hind the stern post and is connected with the rudder cable through the intermediary of springs. A brass skid bow is sprung by means of two helical springs, which are prevented from side-wise motion by inserted telescope tubes.

According to the name plate, the Wolseley-Hispano-Suiza engine on August 30, 1917, delivered 206 hp. at 2005 r.p.m. A reduction gear, giving a speed reduction of 4 to 3, is used between the engine and the four-bladed propeller. The exhaust gas is connected through two exhaust pipes, one on either side of the body, to the rear of the pilot's seat. The engine is so arranged that it is readily accessible after the bonnet has been removed. The radiator forms the front of the fuselage.

### Fuel Supply for Two Hours' Flying

The main fuel tank, having a capacity of 32 gallons, is placed behind the engine on the upper longeron of the fuselage. A gravity tank of 4.5-gal. capacity is arranged in the center section between the leading edge and the main spar. The oil tank, which has a capacity of  $3\frac{3}{4}$  gal., is supported on the engine frame below the rear edge of the engine. The fuel supply carried is sufficient for about two-hours' flying.

Following is a list of the equipment carried in the pilot's compartment: To the right there are a box of light pistols, a switch for the self-starter, a switch for the two magnetos, a three-way valve for the two fuel tanks, a three-way valve for the hand and engine-driven air pump, a radiator thermometer, a fuel gage placed on the rear side of the main tank and a pressure gage to indicate the air pressure.

On the left are a gas lever, a lever for adjusting the fuel supply according to the altitude, a lever for operating the radiator shutters, and a clip for three light cartridges. Below there is a hand-pump for the hydraulic-machine-gun gear, and two boxes for drums for the movable machine-gun and self-starter.

A square windshield of Triplex glass is placed in front of the pilot's seat. Behind this is a box which is accessible from the outside. The fixed Vickers machine-gun is located to the left of the pilot inside the fuselage, and its cartridge belt is of metallic construction. The machine gun is fired by means of a hydraulic mechanism.

Connection is made to the engine at the forward end, the connecting means consisting of a copper pipe. There is also a drive through gearing from the propeller.

On the bow-shaped iron band, lying on the center section, rests a Lewis gun, which can be lowered during flight to permit of vertical firing.

The weight of the machine without load amounts to 1554 lb., which is made up of the following items:

	Lb.
Engine .....	495.0
Exhaust system .....	26.6
Self-starter .....	8.0
Radiator .....	52.4
Cooling water .....	68.2
Propeller .....	58.5
Main fuel tank .....	39.1
Gravity fuel tank .....	14.3
Oil tank .....	8.6
Engine equipment .....	14.1
Body with seat and plate covers .....	332.0
Elevator control .....	4.2
Landing gear .....	90.0
Tail skid .....	8.1
Control gear .....	11.9
Planes with wiring .....	247.0
Wire bracing .....	46.2
Body equipment .....	30.8

Total .....1554.0

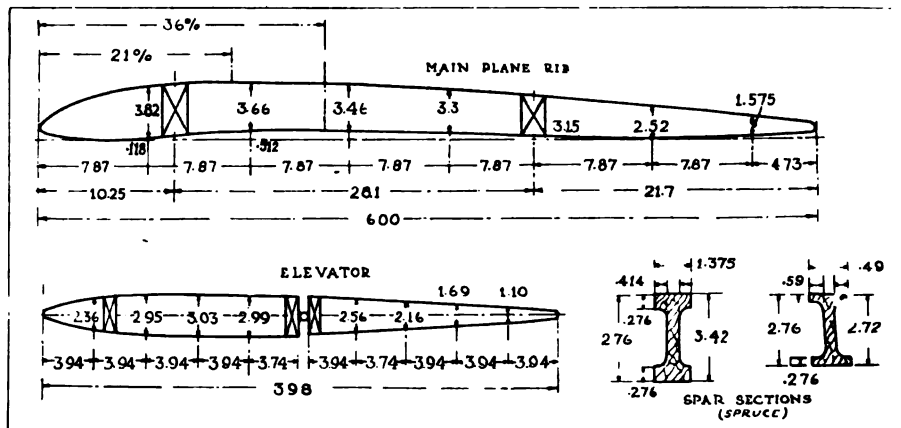
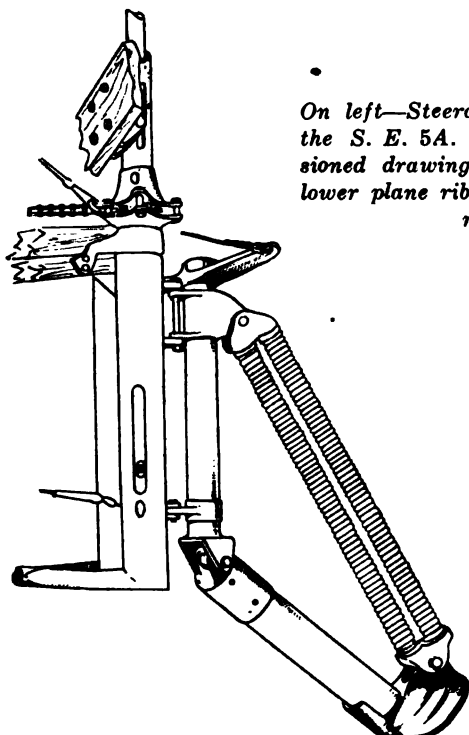
When the tanks are completely filled the plane carries 244 lb. of fuel, so that the total useful load can be figured at 550 lb. and the total weight, loaded, of the plane at 2104 lb. The wing load is thus  $2104 \div 246 = 8.55$  lb. per square foot and the load in relation to horsepower  $2104 \div 200 = 10.52$  lb. per horsepower.

## Asbestos Production

DOMESTIC asbestos to the amount of 1683 short tons, valued at \$506,056, was sold during 1917, according to the U. S. Geological Survey. This represented an increase of about 13 per cent in both quantity and value over 1916. Arizona produced the greater part of the domestic asbestos used. The proportion of crude spinning fiber to that of lower grades is much larger there than in Canada. As a result, the average price of American fiber in 1917 was \$301 a ton, while the average price of that produced in Canada was only \$50 per ton.

The impression which has been prevalent for some time that the Arizona fiber contains less iron than that obtained in Canada has recently been confirmed by an analysis made by R. E. Zimmerman, of Pittsburgh. Mr. Zimmerman's investigation also indicates that thin films of calcite among the fibers cause the harshness of certain parts of the asbestos from Arizona.

On left—Steerable tail skid of the S. E. 5A. Below—Dimensioned drawings of upper and lower plane rib and of elevator rib



# Selection, Training and Supervision of Women Workers

**More Than 600 Carefully Chosen Female Operatives Now Employed at Nordyke & Marmon Plant—How High Employment Standards Are Maintained—Training Methods**

**A**FTER six months' experience with women on extremely varied kinds of work and many different operations in its production departments, the Nordyke & Marmon Co. of Indianapolis has arrived at the conclusion that there are many advantages to be derived from the employment of women by manufacturing establishments.

It seems to be the unanimous opinion of the various superintendents, foremen, female supervisors and officials of the company, so far as conclusions can be formed on the data available, that for one thing it is easier to break in women as beginners; that is, that they learn more rapidly than the grade of men now available. But in weighing this conclusion one must keep in mind that the company has made it a point to employ only women who are distinctly above the average of female factory workers.

The Nordyke & Marmon Co., when it turned its attention to female labor in the great emergency, started out with the purpose of employing only those who measured up to certain high standards, physical, intellectual and moral. Women employees were carefully selected from applicants, and it is the belief of the examining physicians and others who had charge of the work of selection that the average of the women employed was unusually high.

## More Than 600 Women Now Employed

Women between the ages of 20 and 40 are employed throughout the plant in all three of its main divisions; the automobile, aviation engine and flour mill divisions. The only variation made from these age limits is in the case of mail carriers, for which positions girls of 18 years and up are taken on. More than 600 women are now employed throughout the plant, and it is believed,

## Departments in the Nordyke & Marmon Plant in Which Women Are Employed

<i>Tool crib</i>	<i>Miscellaneous Steel</i>
<i>Rocker arm</i>	<i>Connecting-Rods</i>
<i>Cylinder</i>	<i>Welding</i>
<i>Miscellaneous Aluminum</i>	<i>Crankcase</i>

*In all of these departments Government work is being performed.*

because of the requirements of Government work, that this number will be materially increased shortly, the expectation being that eventually, and it might be said, as soon as possible, the company will have about 1000 women on its pay-roll.

In the selection of women employees, while mental and moral characteristics are given careful consideration, the physical standard set for successful applicants may be said to be the controlling one. Each applicant is thoroughly examined by the plant physician. The examination covers the following points: Height, weight, eyesight, hearing, color perception, rate of pulse, respiration, evidence of incurable diseases, and immoderate use of stimulants, evidence of abdominal diseases, scars, deformities, examination of the nose, mouth, teeth, tonsils, throat, palate and tongue, mentality, general physical condition and personal appearance.

The high standards are maintained after employment by careful supervision, directed by the company's superintendent of women and a staff of supervisors. Another

## What Women Are Doing in the Nordyke & Marmon Plant

### AUTOMOBILE DIVISION

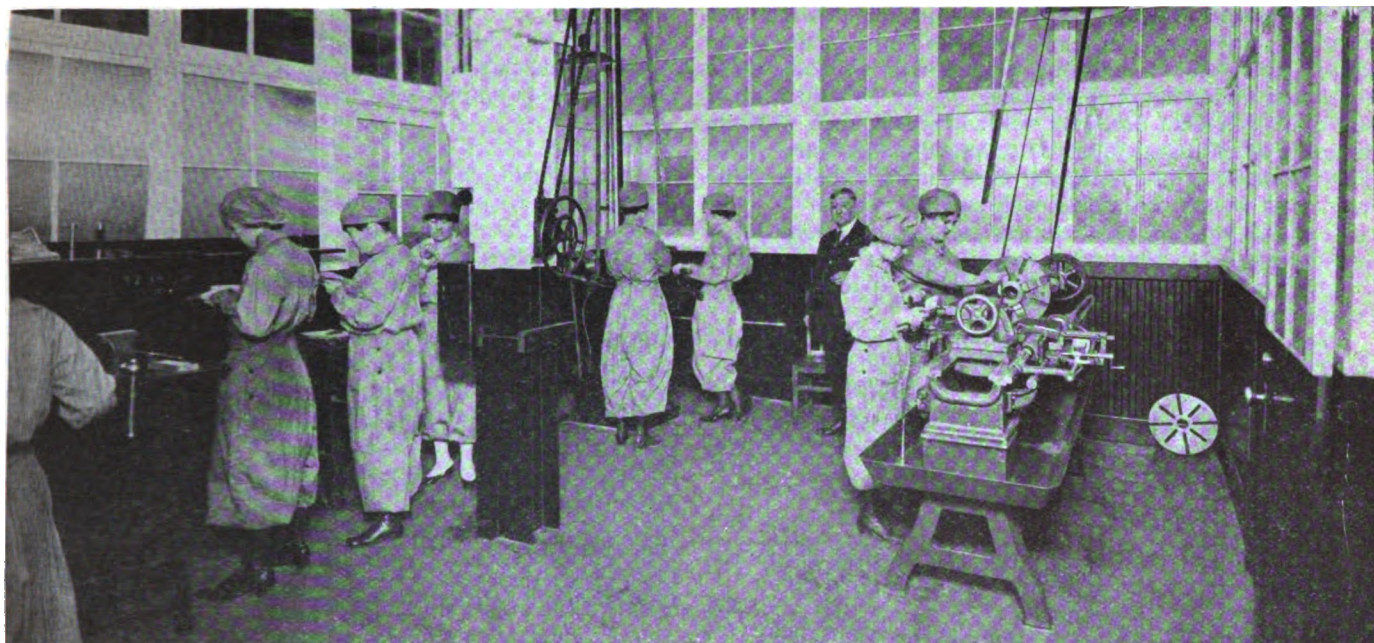
*Operating:*  
*Hand milling machines.*  
*Drill presses.*  
*Grinders.*  
*Sewing machines.*  
*Inspecting.*  
*Assembling light parts.*

### AVIATION ENGINE DIVISION

*Operating:*  
*Small drill presses.*  
*Speed lathes.*  
*Milling machines.*  
*Grinders.*  
*Profile machines.*  
*Welding: acetylene and arc.*  
*Scraping small aluminum parts and crankcases.*  
*Inspecting engine parts received from outside.*

### GENERAL

*Floor sweeping (by colored women).*  
*Laundry work (on women's factory suits)*  
*Shipping.*  
*Time-keeping.*  
*Messenger service.*  
*Clerical work in production departments.*



*In the training room for women at the Nordyke & Marmon plant all applicants are given sufficient instruction to acquaint them in a general way with the machines they will operate and to overcome "stage fright" usually experienced by beginners plunged immediately into the production department*

contributing factor to the maintenance of the high standards of employment is that every effort is made to make the plant attractive to the better class of women and the girls and to provide the best of working conditions. As the superintendent of women points out, the female employees find new, modern factory buildings with good light and ventilation, good discipline, a clean, moral atmosphere, rest rooms equipped with comfortable chairs, lounges, magazines, piano, etc., dressing rooms, adequate safety devices for all hazardous work, first aid equipment, good restaurant facilities and supervision administered in a protecting, helpful and kindly spirit.

Undoubtedly another factor which conduces to the maintenance of a high standard is the payment of a very fair compensation for services. Beginners receive 22½ cents per hour for 8½ hours per day, 5½ days per week, and are paid time and one-half for overtime and double time for Sunday and holiday work.

### Hours and Wages

The average female employee works from four to six weeks at this rate of pay. Piece work rates offer the opportunity to earn from \$15 to \$25 per week. In departments where piece work is not practicable and it therefore becomes necessary to work on a straight hour basis, the company has, in several instances, increased the rate of pay without waiting for requests from those women who have shown themselves capable of getting ahead and of producing at a higher rate.

About 75 per cent of the women who have been employed so far by the Nordyke & Marmon Co. have completed at least the common school grades, and many of them have been through high school. Some are college women. It is the belief at the plant that the capacity of these women to learn is increased by the intense interest which they take in their work and the patriotic desire to serve their country at this particular time. Many of the women employed have husbands, brothers or other relatives fighting at the front.

It was found in the welding department that women did not pick up the intricacies of the job as quickly as men, but the slowness in learning in this case is more

than offset, according to the foreman of the department, by the fact that many of the women become eventually better welders than the men. They make better looking welds and apply themselves more thoroughly to the work. It has been found necessary to explain the operation of welding more frequently to women than to men, which is accounted for possibly by the fact that the average man has had more experience in similar work. So far, women in the welding department have not developed the capacity of men to turn out a quantity of work, but it is not felt that conditions have been right so far for a fair and sufficient test.

### What the Company's Experience Indicates

Other indications which have been observed in this particular organization are:

*That among women employees a larger percentage make good after their original employment than among men employees.* (For example, the foreman of the connecting-rod department has put himself on record to the effect that out of 30 women, who have been tried out, he has been obliged to reject only five as unfit for the work.)

*That women make better inspectors than men when employed in inspecting small parts.*

*That women spoil less stock than men, thereby materially reducing the loss by scrap.* (It has been found that after the first three or four days most women operators spoil very little stock.)

*That women are more inclined to stick to their jobs closely and are more attentive than men.*

*That they are willing and glad to work overtime.*

*That the attendance of women is extremely good and cases of tardiness are infrequent.*

*That women maintain better discipline than men, owing probably to the novelty of their employment and their desire to learn a new vocation.* (It is admitted that conditions in this regard may change as the women become better acquainted with their surroundings.)

*That with equal experience, women are better at clerical work than men.*

*That there is little if any difference in the output capacities of men and women.* (Several of the foremen



the Nordyke & Marmon plant have said that they can see no difference in the capacities of men and women, while others hold that eventually women will produce more than men under equal conditions. It can be said that so far women are not doing as well as men on such work as scraping crankcases, which is unquestionably hard work. The foreman of the scraping department reports, however, that women are doing well on light work.)

*That the rate of turnover among women seems to be considerably less than that among men.* (The company admits that sufficient data are not yet available for a comprehensive analysis.)

*That the physical limitations of women is the only marked disadvantage and that apparently these limitations will confine them chiefly to the lighter kinds of work.* (The company believes that the larger number of women cannot be given heavy work and that this kind of work must continue to be done by men.)

### Employment Records

The following table, taken from the records of the employment department, is correct as of August 3:

Total number of women applicants.....	3769
Total number of women examined by physician, about .....	1589
Total number of applicants rejected on examination, about .....	304
Total number of women actually working Aug. 3...	661
Total number who have quit since March 11.....	275
Total number of women hired (the sum of the foregoing two items).....	936

### Supervision

The organization in charge of the women working in the Nordyke & Marmon plant comprises one superintendent of women, who has as assistants one supervisor of employment and eight supervisors of factory workers. The maintenance of discipline and a proper moral standard is the chief duty of the shop supervisors. These supervisors also see that the operators are continually supplied with stock, that their machines are kept in proper operating order, and they communicate to the proper authorities all complaints of women operators bearing on alleged unfair time studies upon which piece

work rates are based. These supervisors do not inspect operators nor do they personally provide stock or repair machines, but they do see that these things are done by male employees.

### Uniforms

The company has adopted a uniform system for female operatives, the suits being made in four styles each style indicating a rank or kind of employee as follows: Supervisors and forewomen wear plain machine operators, blue and white stripes; inspectors, blue and white checks; stenographers, clerks, timekeepers, brown and white checks.

The regulation costume consists of blouse and breeches, buttoned at the waist. The company provides costumes and they are sold to the women at \$2.75 a suit, to be paid for at the rate of 50 cents per week. "Liberty Laundry" is operated by the company, and these costumes are washed weekly free of charge.

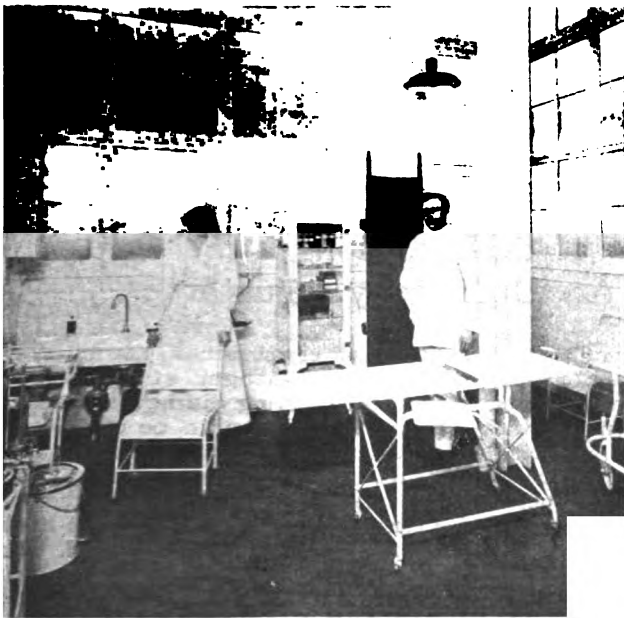
### The Training School

For the instruction of women applicants for employment in the aviation engine division, a preparatory school was established on March 25, 1918. Before this school was inaugurated, women had been employed at the plant for a short time and an experiment in instruction had been made which did not turn out satisfactorily. The plan was to make use of the Manual Training High School in Indianapolis and to have the women supervisors of operators receive instruction there in night courses. After three or four nights the idea was given up owing to the fact that neither the applicants themselves nor the requirements of the company were satisfied.

After this, a schoolroom was established in the aviation engine factory, adjacent to the women's rest room and as near as possible to the office of the superintendent of women. A room, 12 x 24 ft., was used. In charge of the instruction was placed a competent and conscientious man who has the faculty of imparting knowledge and creating a keen interest in their work on the part of the women who apply for positions. He had had no teaching experience but was endowed with natural ability and had some experience as a director of work for women factory workers. Besides this he had a ge-



*The rest rooms, equipped with comfortable chairs, lounges, magazines, pianos and other recreational agencies, are by no means the least factors which conduce to the maintenance of a high standard of quality among the company's women employees*



ompletely equipped first aid room at the Nordyke & Marmon plant

perience extending over a quarter of a century, a large part of which he had charge of women s.

equipment of the schoolroom consists of one up-rill press, one milling machine (hand), one power and the following small tools: micrometers, inside outside calipers, thread gages, ring gages, plug dies, drills, reamers, wrenches, files, etc.

#### Method of Instruction

In the training classes a distinction is made as between those who are to become inspectors and those who are to be trained into machine operators. All applicants are, first, instructed in the elementary principles of the equipment and tools. Welding is not taught in the school, as it has been found that this can be done best in the welding department, and it is there done under the supervision of a special male instructor provided by the manufacturer of the welding equipment used.

Except those applicants detailed to the welding department, all who enter the employ of the Nordyke & Marmon receive instruction in the schoolroom for from four to eight hours in the morning of the first day of employment. They are instructed, each for one week period and in groups or classes of from four to eight, according to daily conditions and requirements.

It has apparently been established that this amount of instruction is sufficient for beginners of average intelligence, provided they have had a reasonable amount of mathematical training. Perhaps the chief benefit derived from this training, at least the effect which is immediately noticeable, is the elimination of the "stage fright" experienced by nearly all new employees.

This in itself is really worth while, as it is found in shops which use the shop training method that much valuable time is lost and much good work is destroyed as a result of this "stage fright." The new employee, as she does with the calipers, micrometers and other tools, and learning something about the various machines, is not expected to happen when she does this, or the other thing, to a lathe or drill press, tends to make the new employee much more at ease during her experience in the production department.

It is, of course, quite impossible to give applicants an extensive or prolonged training in such a short time,

but the sole object is to instill in them a perception of the simple principles governing the use of small tools and the operation of the simpler forms of machines. It is the experience of the Nordyke & Marmon Co. that this amount of instruction is sufficient to give the student a good beginning on simple operations in the factory and after it she learns rapidly, becoming her own instructor, as it were.

#### Training Follow-up

The small tools needed for the equipment of each operative are furnished by the company and sold to them at the rate of 50 cents per week.

After passing through the training department or school, the women are assigned to work in the plant on the same day that they begin their connection as employees of the company. They are visited by the instructor for additional instruction and for the purpose of determining whether or not they are making the headway which they should. From time to time they return to the school to be reviewed and to have errors corrected.

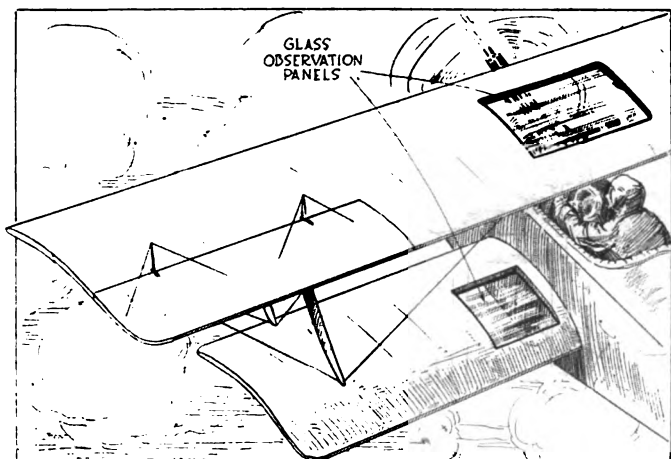
It has been found that practically all of the women employed learn very rapidly; in fact, up to a recent date only two out of the many hundreds taken on had given up through discouragement or inability to learn, and they were assigned to other kinds of work where the use of tools was not required.

#### Fitting the Woman to the Job

An effort is always made where dissatisfaction is manifested to keep employees from leaving the company, and frequently women are changed from one operation to another in an effort to find work more congenial to them. They are moved from one kind of machine to another and from one department to another. It is sometimes necessary to make three or four transfers before the kind of work for which a woman is best fitted is discovered.

It should be emphasized in closing that the Nordyke & Marmon Co. realizes that its experience with women operatives is not sufficiently extensive as yet to permit of the formation of definite conclusions. What has been written here is to be taken as a record of what has been done by the company and a statement of what this experience indicates.

#### Eliminating Blind Spots in Airplanes



Transparent sections in upper and lower wings prevent interruption of vision by structural portions of plane. These are non-breakable glass panels formed to follow the streamline shape of the wings and allow the pilot to look directly overhead and downward on either side of the fuselage

# Technical Details of the Redden Universal Attachment

Designed to Convert Any Passenger Car of the Overslung Type Into a Motor Truck—All Fittings Required Are Universally Adjustable

IN converting a passenger car into a motor truck, there are required an extension of the frame, a new rear axle, and means for transmitting the power from the rear axle of the passenger car to the equipment axle. Reference was made in the news columns of a recent issue of AUTOMOTIVE INDUSTRIES to a new universal attachment placed on the market by the Redden Motor Truck Co. of Chicago, and we are now in position to give some technical details of this attachment.

Fig. 1 illustrates the frame extension. The side members of the passenger car frame extend backward to a cross member of the attachment frame, the rear ends of the former being secured to the latter by means of bolts or rivets. The side members of the Universal Attachment are bent inward at a slight angle, at their forward end, and are secured to the side members of the passenger car frame by means of steel bars which are bolted to the passenger car frame and provisionally secured to the Universal Attachment by means of "U" bolts. These "U" bolts, however, are used only to hold the parts together while they are being drilled for rivets. By moving the attachment frame member farther out along the connecting bar, the frame extension can be fitted to passenger car frames of different widths, thus making the frame extension universal.

Another part of the Redden equipment is a universal axle hanger. This is used to clasp the passenger car axle housing firmly when it is used as a jackshaft. The passenger car

axle housing is not cut off or shortened, nor is its construction changed in any way. A hanger of the type shown is necessary on account of the varying diameters of axle housing and the variety of shapes that have to be taken care of.

Referring to Fig. 2, showing a section through the hanger, it will be seen that the latter comprises a hub made of three parts, one being the hanger proper, and the other two being caps. The inside corrugated face of each part has a larger radius than the outside radius of the axle used. This radius is made such that it will permit of taking in the largest

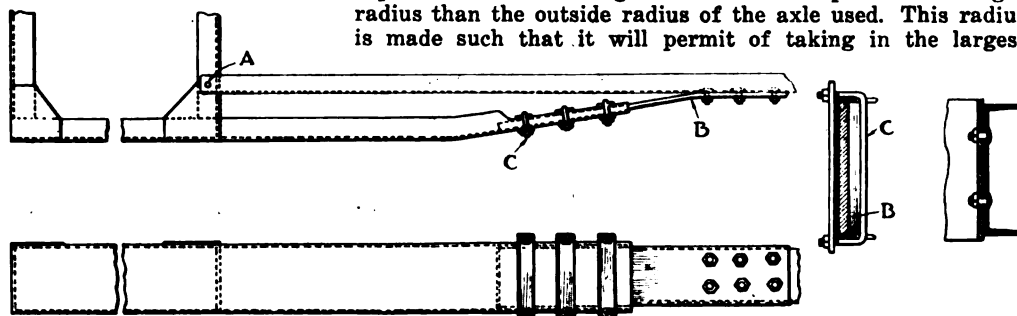


Fig. 1—Frame extension. A, bolt joining rear end of car frame to cross member of extension; B, extension bar; C, U-bolt

diameter of passenger axle housing in actual use. The axle housing is always clasped at three points as shown. The caps are firmly held to the bracket and each other by means of bolts passing through lugs. On the bracket are two lugs designed to take the forward end of the radius rod. It will be readily seen that by separating the caps an equal distance from the hanger and from each other, a larger size of axle housing can be clamped in place. Herein lies the universal feature of the hanger.

No change is made in the passenger car axle driving shaft, and, in fact, its hub is left intact. It is necessary,

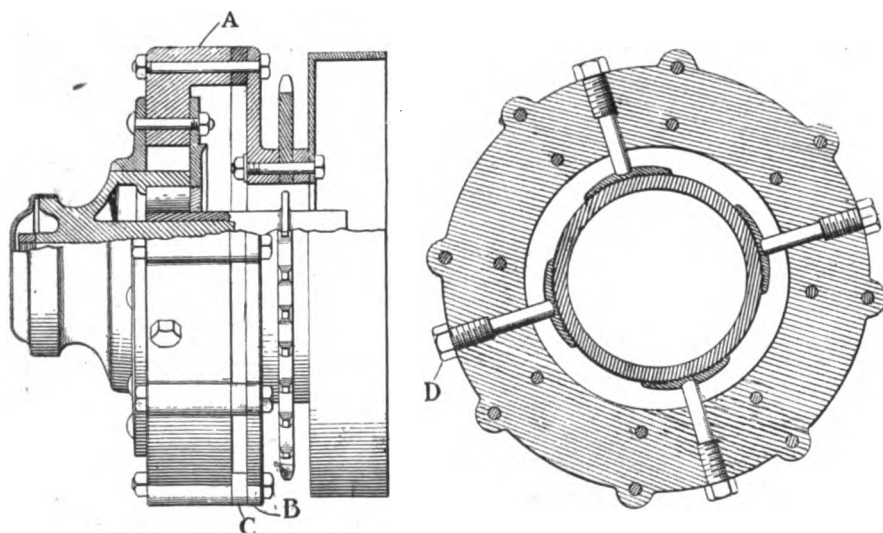


Fig. 3—Attachment of sprocket wheel and brake drum

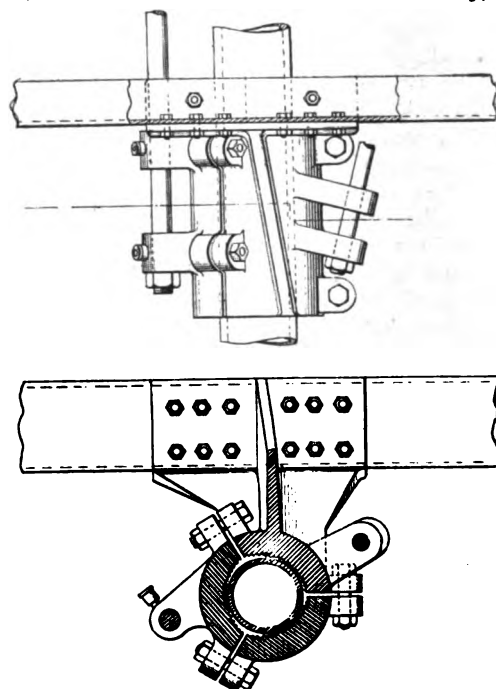


Fig. 2—Axle hanger



however, to remove the wheel proper with the spokes from the hub and substitute in its place what is known as a spoke replacement flange, as shown at A in Fig. 3. This is clamped in place by means of the hub bolts. It is held firmly by the hub flanges, and in turn supports the jackshaft sprocket flange B. This latter is accurately placed in an axial direction by means of varying thickness of washers C. The jackshaft sprocket flange, by means of attaching bolts, carries the jackshaft sprocket and the service brake drum. All of these members form a compact bellhousing or exterior hub. From this hub the power is transmitted to the rear wheel by means of a driving chain.

It is realized that it will be necessary to fit different types of hub barrels, and some means of universal adaptation must be made. This is taken care of by means of the adjustment bolts DD which force a steel jaw radially against the hub, clamping it at four points, regardless of the diameter.

The three parts described, viz., the frame extension, the axle hanger and the jackshaft sprocket flange housing, are the three main universal parts of the Redden Universal attachment. They permit of fitting the attachment to any make of passenger car, with the exception of the underslung type.

In the design of the Redden trailer an attempt has been

made to reduce the weight to a minimum consistent with reliable service. The same type of axle is used as in the Universal attachment. Each set of wheels, front and rear, carries a sub-frame, and the main frame is attached to the sub-frames by means of a king bolt. Each pair of wheels possesses a fifth wheel, allowing both front and rear axles to turn. The two sub-frames are connected to each other by means of a cross bar arrangement which gives to both the same turning radius. These cross bars are in the form of a turn buckle, permitting of adjustment to insure the proper tracking of front and rear wheels. Very strong spring shackle bolts and spring shackle rods are provided.

The sub-frame is composed of 2½ by 4 in. pressed steel channels, put together with double gusset plates and three cross members. The fifth wheels rest on rollers attached to the sub-frame, making them easy turning.

Wheels are fitted with roller bearings. They are of the artillery type and equipped with S. A. E. Standard solid tires 34 by 3½ in. in size. The drawbar is directly attached to the axle, and the trailer is reversible.

The main frame consists of heavy pressed steel channels, held together by 6 cross members. The entire equipment is capable of carrying a safe load of 4000 lb.

## An Effective Safety Display

A NOVEL way of keeping before the men in the shop the idea of safety is being employed by the Willys-Overland, Inc., Toledo. A large, movable display board is placed in each department alternately in such a position as to be before the men whenever they come to and go from work.

This board, measuring about 7 ft. in height and 5 ft. in width, has mounted upon its black background scores of sample tools—those which have been used so long as to be considered unsafe and should be discarded, and the new tools which should replace them. The hazards with the use of poor tools are many, and it is the aim of this bulletin board to point out to the workers the chances they are taking through the use of tools other than those recommended by the company.

### Use of Each Tool Described

Under each specimen tool is a card either stating what results may follow the use of the tool and recommending the use of another tool, or giving statistical data relative to accidents occurring throughout the factory following the wilful use of such improper tools. The following are interesting excerpts:

*725 days lost because of tools slipping from heads of bolts, nuts, screws, etc.*

*1013 days lost because of flying particles. Wear goggles.*

*87 days lost because of flying chips cutting with simple tools.*

*178 days lost because of ladders slipping.*

*100 days lost due to simple tool accidents of various kinds.*

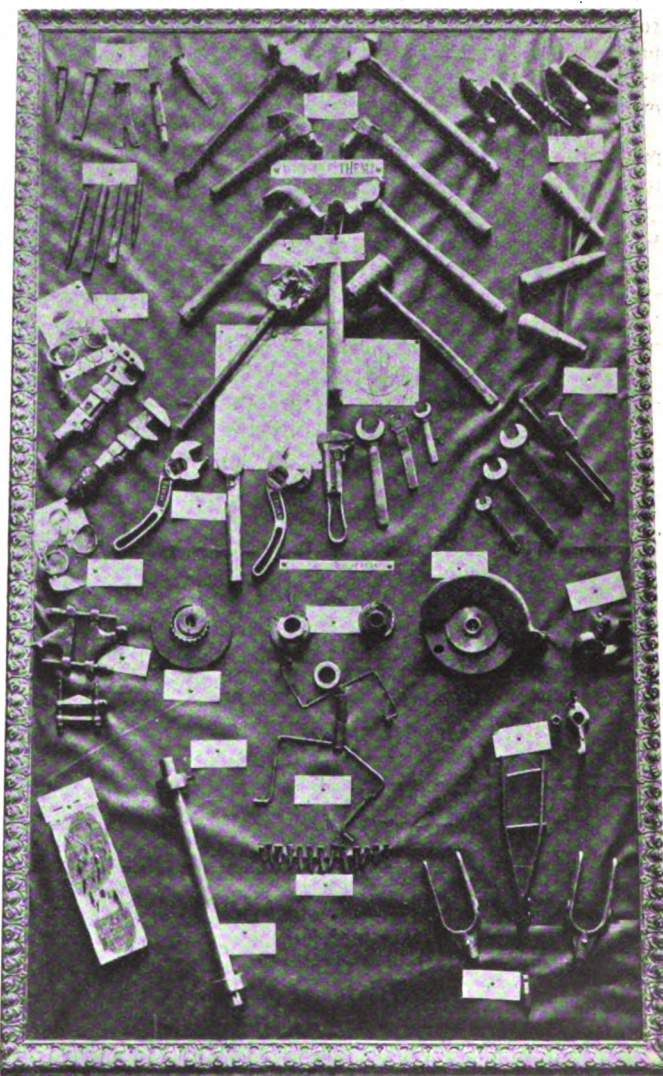
*328 days lost because of glancing blows from hammers.*

*1068 days lost due to flying objects from glancing blows of hammers.*

*Turn down nails. It is a dangerous practice to allow boards to lie around with the points of nails upturned, ready to pierce some one's foot.*

The board stays in each department about 2 weeks, and it will take about 2 months for it to complete visits to all the factory departments. Another board is being prepared. It will be entirely different. It will have statistics and pictures showing the results that follow failure to report small or minor injuries. The company desires to emphasize the fact to the workmen that

all injuries, no matter how insignificant they may seem, should be reported immediately.



Safety display board which is set up in the various departments of the Willys-Overland Co. to warn operatives against the use of poor tools

# The Problems of Aerial Bombing

Details of Bombs, Bombing and Bomb Carrying—The Difficulties of Aerial Navigation and Night Flying as Set Forth by British Army Experts

**D**URING a recent week the British Royal Flying Forces dropped over 3000 tons of bombs on German cities and fortifications. This is more than was used in any like period previously by any two of the warring countries. Night bombing by airplane is receiving growing recognition as the probable road to victory. Consequently the science of bombing and night flying is receiving much consideration and the problems and activities are given publicity in the effort to secure the utmost efficiency. The following descriptions of the bombs used and the difficulties of night bombing were secured from British officials in this country who speak from personal experiences.

Bombing has been used for war purposes since 1912 when Italy dropped bombs during the Tripoli campaign, but it was not until the present war had been in progress for two years that bombing attained any high degree of perfection. In the first years of the war pilots were frightened when ordered to take up a bomb and did so only under extreme pressure.

Each nation has developed its own types of bombs. The actual shapes differ, but the general idea is similar, being a pear-shaped bomb with wings on the stem end. The wings prevent the bombs from falling heels over head in the air, insure correct aim and explosion when they "strike." The "skin" of the pear, as it is called by the British flying officers, is usually made of steel, which is best, but in some instances is constructed of cast iron. The "flesh" is a high explosive, such as T. N. T. or amatol, or one of their derivatives. The "core" is known as the exploder or detonator. The "stalk" and the remainder of the pear at the bottom are the fuses on which depends the explosion.

## How Bombs Are Used

Bombs are used for two purposes, to attack the enemy troops in the open or under light cover as in billets, and to destroy supply stores, factories, ammunition dumps or cities behind the lines. Small bombs are used for the first. They are about 20 pounds in weight, have a case  $\frac{1}{2}$  inch thick and when exploded burst into thousands of fragments about  $\frac{1}{4}$  inch to  $\frac{1}{2}$  inch square each, which fly out in all directions. Another bomb sometimes used for this work weighs 112 pounds. It is not as efficient. The British forces using the small bomb did remarkable execution against the Germans in the drive in March of this year.

Bombs weighing 230 pounds and 500 pounds are being used for the destruction of cities, factories and supply stores. Larger ones are expected to be developed in the near future as the carrying power of raiding machines increases. The big bombs are also used by flying boats against submarines, and for this work are so made that they explode well under the surface of the sea.

The large bombs used for attacking towns are constructed with thick cases so that heavy fragments of the metal are hurled and create considerable damage. These bombs carry two fuses, a nose fuse and a tail fuse, and can be made to explode by either at the will of the pilot.

The nose fuse bursts the bomb on percussion—at the time it hits the ground or any other hard object. The tail fuse is so arranged that it can be set to explode the bomb not immediately as it strikes, but after it has penetrated some distance. For example, when bombing railroads or a building containing ammunition the pilot desires to have the bomb penetrate before bursting. By exploding after the bomb has penetrated the ground for 4 or 5 feet below the surface of a railroad track it insures a deep crater and more extensive destruction.

## Carrying Bombs on Airplanes

The carrying of the bombs has developed considerably from the early days when the bombs were tied on to an airplane anywhere by means of wire, which was cut at the critical moment with a pair of pliers. Special racks were designed in the first years attached to the bottom of the fuselage or beneath the planes, which made possible the accurate sighting and simplified the release of the bomb. With the development of machines of greater lifting power the bombs were hung up by their noses inside of the planes, from which position they are released automatically as the bomb sight swings over the objective.

Bomb sights are not yet near perfection. The difficulties encountered with them may be explained by comparison of their use with machine gun aiming. The machine gun provides a fixed point from which the pilot shoots at moving objects. But the bomb, moving along as fast as the machine is, must be released before the plane is over the target. This makes the speed of the airplane an important factor. In addition, the speed of the wind is very important and difficult to gauge and further, unless the airplane is flying on an absolutely level keel, the pilot is unable to know what point is vertically below him, and is not certain when he is over the target.

Bombing of cities, factories, supply stores and ammunition dumps is best accomplished at night, because the bombing planes are comparatively slow in flight and by day offer good targets both to anti-aircraft guns and enemy fighting planes.

## The Problems of Aerial Navigation

As a rule when a squadron leaves its aerodrome it circles around until it attains 15,000 feet, which is the usual cruising height. They then proceed at about 30 miles per hour toward the objective, which may be 30 miles distant, and must maintain their course despite darkness, varying winds, clouds, fogs or anti-aircraft barrages. This involves problems of navigation and difficulties of navigation form one of the most serious obstacles to effective night bombing. For comparison consider the navigation of a ship across the ocean at 20 knots with currents of 5 knots carrying the ship off the course. This is an extremely difficult situation, but is simple in contrast to the complications of successfully piloting an airplane at 90 m.p.h. with wind currents at 25 to 30 m.p.h. and varying at different heights.

Navigation by night is considerably more difficult than

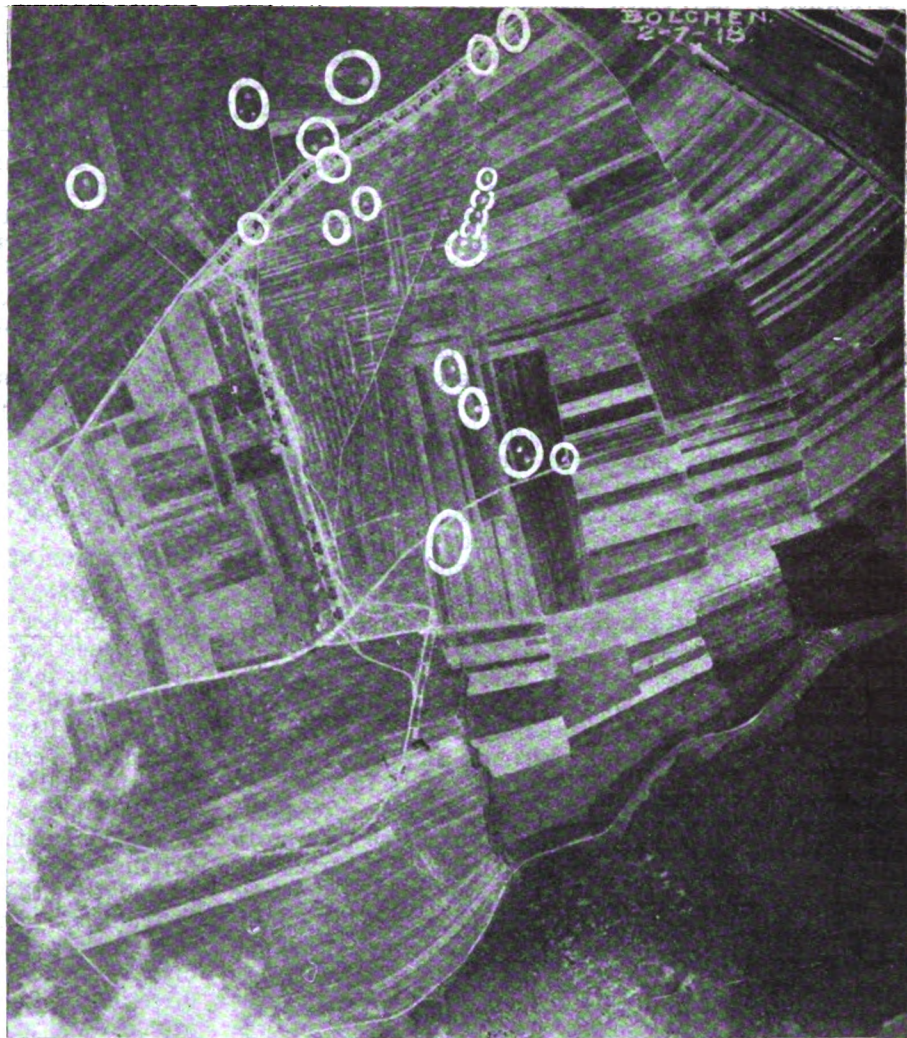


## Topographic Records of Bombing Results and Guides for Future Bombing

Graphs like these are used by bombing squadrons, together with maps, to determine objectives. They are the products of the double operation of bombing and reconnaissance.

*It—A bombing raid by one airplane on the Bolchen aerodrome. Three hangars were badly damaged by direct hits and holes were torn in the landing field.*

*Bombing of Thionville, with its railways, railway building and station. The bridge hit is exceptionally good and shows exceedingly good aim.*





navigation by day, chiefly because it is often impossible for the pilot to see the ground. The Germans when raiding London, always choose nights with bright moonlight, when the ground features can be seen in outline. Under the moonlight, woods and forests appear as black patches, rivers and lakes show as silver colored threads or patches. These help, when they are frequent enough, to check the direction of the flight. Otherwise, without the ground features, the pilot has only his compass to direct him, and the compass is not yet perfected.

After considerable study of aerial navigation, from 1911 to the present time, a British naval officer, Captain Creagh Osborne, has developed this division of air flying to a comparatively high degree. The compass is affected by the steel and iron used in the construction of the airplane or in its cargo.

The errors caused by the weight and the metal are termed "deviation" and this is corrected, so far as possible, by specially trained men, with the aid of magnets, prior to the flights. Excellent examples of the difficulties encountered are shown in the fact that when an airplane carries a full load of bombs and the compass is adjusted correctly, the needle becomes incorrect when the bombs are discharged, owing to the iron casings on them. This makes the return trip of a bombing expedition very difficult. Again the deviation caused by the proximity of a machine gun can be corrected but will again be in evidence after the gun has been fired.

The compass, of course, does not show the true or geographic North Pole, but instead points to the magnetic North Pole located in the regions north of Canada. Consequently, the pilot using a map and the true north must estimate the variation and add or subtract the angle between the directions of the true and the magnetic poles in his calculations. This variation changes according to geographical positions and calculation on a long flight of 500 to 1000 miles must be made several times. Thus, before making a long distance flight the pilot takes his true course from the map. He converts this into the magnetic course by estimating and applying the variations, then calculates the wind drift and then applies the deviation. This gives him the direction in which to fly by compass to gain his objective. With all these calculations he must still continue to change his course as the wind changes in strength and direction, and must from time to time check his position by taking observations of visible points on the ground, such as the lights of distant cities. Despite all of these difficulties and obstacles, night raids are being carried on in radii of 200 miles with practically little trouble.

The subject of aerial navigation is being treated seriously in England, which country has gone so far as to establish inland lighthouses similar to coast lighthouses to facilitate training in night navigation.

### Flying Without Landmarks

Besides the above explanations of the navigation problems, which were made by Major H. O. D. Segrave of the British Military Mission in this country, additional details were given by Lt. W. A. Robson of the Royal Air Forces in the following statement. Lt. Robson's remarks further illustrate the problems that must be met and overcome to make night bombing a certain operation.

"The purpose of aerial navigation," said Lt. Robson, "is to enable the airman to find his way in the air; and, in particular, to find his way when he is unable to see the ground.

"Aerial navigation is a science which has been enormously developed during the war; in fact, before the outbreak of hostilities, very little attention had been paid to it; for pre-war cross-country flying was per-

formed under condition in which the pilot always had a view of the ground, so that he relied upon landmarks and a compass to guide him on his way.

"If through untoward circumstances, such as a sudden fog arising, he lost sight of the ground, then he had to find his bearings by guess-work; no provision was made for such an eventuality.

"In those now remote days flying itself was the pre-occupation and the arrival of the aviator at any precise destination was not a matter of first class importance, as it now is. Further, flying was not regularly undertaken at such vast heights and in all weathers—in fog and cloud and mist—as it is to-day; and night raids and long sea patrols were not thought of.

"Finding one's way with the earth in view is a simple matter. All that is required is a compass and a map. A compass course can be flown nowadays with a fair degree of accuracy; and miscalculations can quickly be adjusted by landmarks; for no stretch of country exists which does not furnish its clues to a keen observer.

### The Matter of Drift

"It is when flying has to be carried out without the ground in view that difficulties arise. Chief among these is the question of drift. If a machine is to fly from a given point to a town 60 miles east, and there is a steady wind blowing 20 miles an hour northeast, it is a simple matter to allow for drift and calculate the direction of the compass course which the pilot must steer. But the direction and velocity of the wind may change considerably during the journey.

"If the ground is visible the distance the aircraft is drifting out of its course owing to change of wind can be judged either by the eye or by means of a simple instrument. This instrument consists of a flat calibrated glass disc marked with thin parallel lines. The disc is turned so that these lines are parallel with the direction of flight. Objects in the direct line of flight are observed as they appear beneath the glass disc; and the drift is easily determined. But obviously no such instrument can be used when the ground is not visible to the airman.

"Meteorology frequently enables the pilot to deal successfully with such situations by rule of thumb; and every British flying officer undergoes a meteorological course as part of his training.

"Another difficulty which besets the airman navigating without assistance from below is the question of speed. An air speed indicator records the rate at which he is rushing through the air; and that, indeed, is the vital fact so far as the stability of his machine is concerned. But it does not tell him how fast he is traveling in relation to the ground. For while his air speed may be 120 miles per hour, his ground speed will be only 80 miles per hour, if he is flying in the face of a 40 mile wind. An anemometer will tell him the speed and direction of the wind at the time of leaving his aerodrome. But, as previously stated, the velocity of the wind frequently changes; and of these changes he has no certain knowledge.

"Earlier in the war, night-flying was far more dangerous than it now is, on account of the difficulties connected with aerial navigation at night. Enormous progress has been made in this direction by the Royal Air Force both in regard to the Home Defense work in England and the work performed by the Night Bombing Squadrons in France. The former is clearly evident from the manner in which the German craft which have frequently attempted raids on England during the last 9 months have again and again been effectively repulsed, often with heavy losses.

# Machine Forging in Automotive Plants

Methods Employed in the Production of Upset or Annular Forgings—Absence of Waste in Materials and the Elimination of Machining Operations Important Advantages

**T**HERE are many steel parts in automobiles, motor trucks, tractors, etc., which are made from bar stock but require enlargement beyond the section of the original bar. Also, parts of annular form are made from bars of much smaller diameter. These operations are performed in a forging machine which is primarily a hammer, but which also acts as a punch.

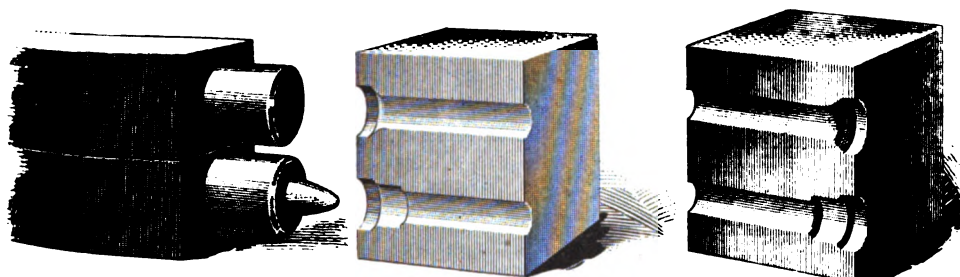
Perhaps the most common upsetting job is that required for forming the flywheel flange on a crankshaft, as practically every portable engine employs this method of flywheel fixing. There are, however, numerous other parts in motor trucks, tractors, etc., that can be advantageously made in the forging machine. For instance, clutch shafts and transmission shafts are sometimes formed with flanges to which the clutch drum or cone and the gear wheels are secured respectively. Bevel pinions are forged directly onto the shafts by merely upsetting the ends; worms are similarly forged integral with their shafts. Rear axle shafts are upset at the ends so that the keying, squaring or fluting for the joint with the differential gear and wheel hub will not reduce the strength of the end below that of the major portion of the shaft. In so-called three-quarter floating axles large disks are even forged on the ends of the shafts to secure the shaft rigidly to the wheel. Of the smaller parts of the automobile and motor truck that are formed in the forging machine may be mentioned spring bolts with integral grease cups and races for ball and roller bearings.

Designers of automobiles, tractors, etc., often are not as familiar with this class of work as they should be, and some information on the subject, based upon a recent publication of the National Machinery Co., Tiffin, O., may be of assistance.

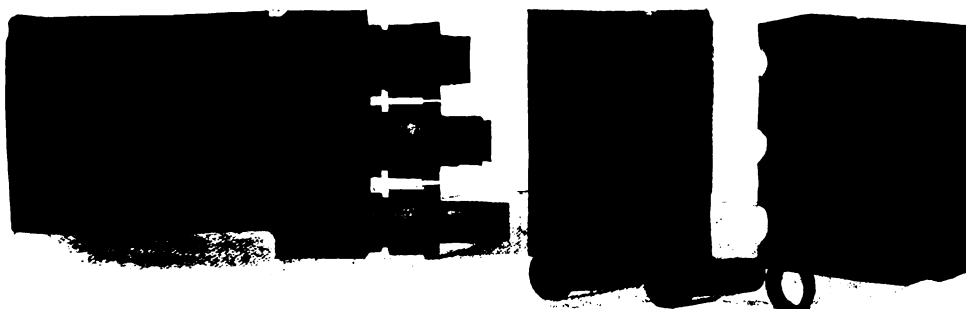
The forging machine consists essentially of a very substantial bed or frame with guides for two slides, the grip slide which grips the bar stock, and the heading slide. The heading slide is operated through a crank and connecting rod. The bar stock, after the end to be upset has been heated, is gripped in the gripping die which is made in halves and provided with a quick-acting opening mechanism. Practically every job has to undergo a number of successive operations, and the gripping die has a number of parallel openings or impressions equal to the number of operations and the header slide an equal number of headers.

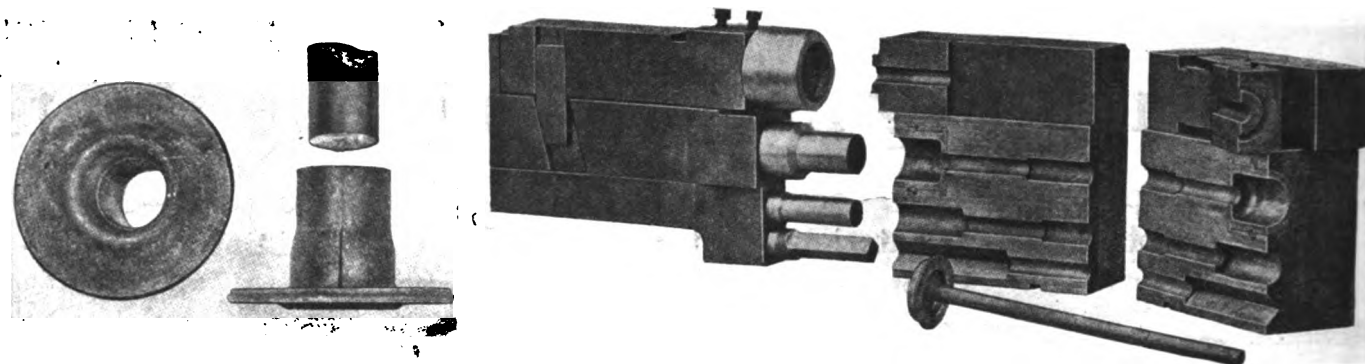
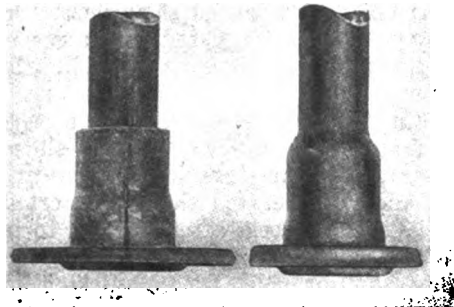
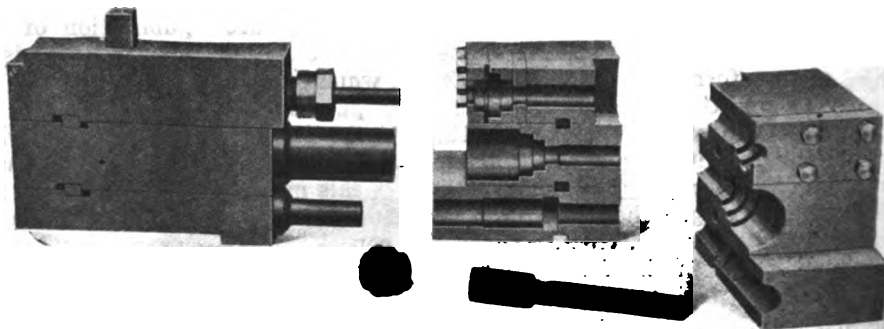
## Forging a Spring Bolt with Grease Cup

A rather simple forging machine job is that of forging a spring bolt with integral grease cup. Formerly these bolts were made from bar stock equal in diameter to the maximum diameter of the head or grease cup, in automatic lathes, but the upsetting process economizes both stock and labor. The waste of stock is the more important because high grade material, such as nickel steel, is generally used for these pins. When made in automatics, with many designs, more material needs to be cut away than remains in the finished bolt, and the amount of labor wasted is quite large. By the upsetting process the bolts are made from stock about 0.020 in. larger in diameter than the finished shank of the bolt. The bolt forging illustrated herewith is made from 13/16 in. diameter stock in a forging or heading machine, whereas formerly it was made from 1 3/8-in. stock in an automatic. The present process involves two operations. In the first operation a flange is formed on the end of the bar, equal in diameter to the largest diameter of the cup. In the second operation this flange is pierced and the metal behind the flange is expanded to form the cup. As a rule, these spring bolts are made from blanks previously cut to length, and the material is heated before being placed in the machine, so that the upsetting will cause no crystallization and resulting weakness. The bolts can be made



Above: Dies and heading tools for forging spring bolt. On right: Spring bolt. Below: Dies and headers for bearing race



*Dies and tools used in forging axle shaft with driving flange**Steps in the manufacture of a wheel hub forging**Dies and headers used for forging gear blank*

of stock so close to the finished shank size that no machining is required, the shank being reduced to the finished dimension by grinding.

Roller bearing races also form a comparatively easy job for the forging machine. The race herewith illustrated is the outer one of the bearing,  $3\frac{3}{4}$  inches in outside diameter, and it is made from open-hearth steel bar stock  $2\frac{1}{2}$  inches in diameter. There is no waste of material in the process; that is, all of the metal in the bar goes into the forgings, with the exception of the last end of the bar.

### Gripping Dies

It will be seen that the gripping dies have three impressions, and the process involves three operations. For the first operation the bar is gripped in the top step of the dies. It will be seen that this step is made with threads or corrugations, as it has to hold the bar firmly against the pressure of the header. In the other steps this is not necessary because the pressure on the work is then transferred to the gripping die through the shoulder or shoulders of the upset.

In this particular operation only a moderate gather of material is required, which is easily effected in a single stroke of the header. In the design of the dies it is necessary to closely calculate the amount of gather required, and the dies must be set accordingly. It is interesting to know that the length of the bar projecting from the gripping portion of the gripping die must not be greater than three diameters, if the projecting part is unsupported, as otherwise it will buckle and upset unevenly. Therefore, if more gather than this is required, several successive upsetting operations are ordinarily necessary.

In the next operation in forming the race, the tapering race surface is formed, and in the final operation the race is "given another squeeze" and is separated from the bar by being punched through. For this last operation the race or upset on the bar is gripped in an annular impression in the gripping die, so that the punch may be withdrawn from the race after the latter has been separated from the bar.

Forging these race blanks is not an unusual job, except for the high degree of accuracy called for. No machine work is done on the races; they are finished by grinding only, and to make this practicable a limit of 0.020 in. was set on the finish. It is stated that this limit is not only adhered to, but the majority of the rings show variations of less than 0.010 in.

A most interesting part made on the forging machine is the rear axle shaft with integral driving flange as illustrated. This is made from  $1\frac{3}{8}$ -in. chrome nickel steel stock, and the finished blank has a diameter of 5 in. The amount of material in the hub flange is equivalent to a length of  $10\frac{7}{8}$  in. of the  $1\frac{3}{8}$ -in. diameter bar stock. In gathering such a large amount of stock, care must be exercised to secure a forging free from seams or cold-shuts. Practice has shown it to be advisable to make this forging in a four step die.

It was pointed out above that if an attempt were made to upset an unsupported length of bar stock of more than three diameters, the stock would buckle and thus spoil the work. In order to obviate this trouble, the projecting length of the bar must be guided in some way, so that it cannot buckle more than a certain amount. Also, where a large amount of gather is required, successive upsetting steps are necessary. In these successive steps it has been found advantageous to use alternate square and round guides.

### Upsetting Stock Pockets

The first upset is in a square pocket in the grip die. This pocket is slightly larger across the flat than the diameter of the stock, thus guiding the stock in upsetting and preventing buckling. The second and third upsettings are in round pockets in the grip die, and these operations are performed at the same heating. Before the final operation is begun, the stock is reheated. One of the reasons for this is that the final operation is rather intricate, the recess on the inside of the flange being formed at this time. In order to make it possible to readily withdraw the finished blank from the die, the left half of the die is hinged, so that after the recess has been formed and the grip has opened, the movable half



the die automatically backs out by virtue of its hinged swinging action. The forging remains in the stationary die, and is lifted out by the operator. While it is possible to make forgings of this type in three steps, rigid inspection is maintained, it is advisable to use a four step die, as the rejections will then be fewer in number.

Another interesting part made in the forging machine is a motor truck wheel hub as pictured in one of the illustrations. This is made in three operations, in a three step die.

### The First Operation

The first upset operation is illustrated at the right. The center portion of the hub is here upset and the flange started. In the next operation the flange is upset to full diameter, and a piercer of the heading tool partly pierces the hub. On the third and final operation the hub is punched, and freed from the bar, the steel punched remaining on the end of the bar, thus preventing waste. In making this hub forging, bar stock of  $2\frac{5}{8}$  in. diameter is used, and the flange is upset to  $8\frac{1}{4}$  in. diameter and  $\frac{1}{2}$  in. thickness.

In the manufacture of gear blanks of chrome nickel and similar alloy steels, economy in material is of the greatest importance at the present time. Where small quantities are involved, the blanks in the past have sometimes been cut directly from the bar, and in other cases they are forged in the drop hammer. In both cases there is a waste of material in the first due to the machining, and in the second because of the tongue hold and flash. In the forging machine such blanks may be produced absolutely without waste. The gear blank illustrated at the right, which is of more than ordinarily complicated form, can be forged in three operations. In the bottom

groove of the die the stock is gathered into a cylindrical upset, which in turn is raised to the middle groove of the die, where the gear blank is formed to the final dimensions. In the top step of the die, the punch pierces the hole and detaches the gear from the bar.

In order to prevent buckling when large amounts of stock have to be gathered, guides can be formed either in the gripping die or in the header. For instance, the limit of length of unsupported stock which can be gathered or upset in one blow without injurious buckling is three diameters of the bar, but if the stock is gathered in a pocket in the gripping die not more than one and one-half times the diameter of the bar, then the length upset in one blow may be somewhat greater.

Where large amounts of stock have to be gathered it is usual to form a pocket in the end of the gripping die of about 1.3 times the diameter of the bar. In the next operation the diameter of the pocket can be 1.7 times that of the bar and so on. A still better plan is to make the first pocket of square section, with the sides only a little wider than the diameter of the bar. Then there is very little chance for the bar to buckle while being upset, yet there is considerable space in the corners of the square for the metal to gather in. The next pocket would be made round, of a diameter a little larger than the length of the diagonal of the square across the corners.

### Special Forms of Stock Gathering Pockets

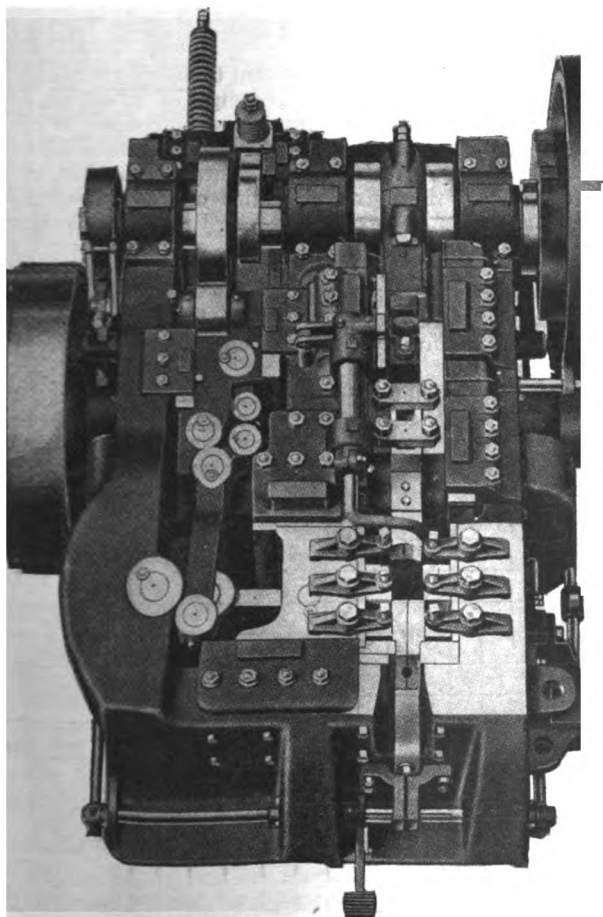
The whole aim in the design of dies is to reduce the number of operations required to produce the finished forging to the smallest possible number consistent with the accuracy and the quality of material demanded. The more stock that can be gathered in a single blow the fewer, generally will be the operations required. When the bar protrudes from the gripping die too far, it tends to buckle, and the buckling is most pronounced, naturally, at the middle of the protruding portion. Therefore, at this point the guide must come close to the bar. Therefore, if a large amount of stock is to be gathered in a single blow, the pocket in the gripping die is made cylindrical at the outer end for a little more than one-half its length, and the remaining portion of the pocket is cone-shaped, the diameter being gradually increased. The bar is gripped in the die so that its end projects slightly beyond the end thereof, and when buckling occurs it is soon stopped by the wall of the pocket. The heading tool is of such diameter that it enters the end of the pocket in the gripping die. Owing to the friction between the die and the bar after the latter has come in contact with the wall of the pocket through buckling, the outward end of the bar will upset first, the stock will gradually carry back in the die and a uniform frustrum-shaped upset will be produced.

### The Happy Farmer Tractor

THROUGH the kindness of the La Crosse Tractor Co., La Crosse, Wis., we are now able to give further information regarding one feature of the Happy Farmer tractor which was not brought out with due prominence in the descriptive article which appeared in the July 18 issue of AUTOMOTIVE INDUSTRIES.

The use of a patented device in the bottom of the crank-case makes it impossible for the small amount of kerosene which may work past the piston rings and thus mix with the lubricating oil to reach the bearings.

As was pointed out in the descriptive article, the crank-case is drained automatically, the oil being conducted to the transmission and differential gear cases and thence to the outer roller pinions and bull wheels.



National Heavy-Pattern forging machine



# The F O R V M



## Problems of Gear Standardization

By B. F. Waterman

*Chairman, General Standardization Committee, American Gear Manufacturers' Association*

IN the May 30 issue of AUTOMOTIVE INDUSTRIES, on page 1053, appears an article under the above title which sounds a note which I am sure is foreign to the purposes of the American Gear Manufacturers' Association. After stating that "such standardization presents great opportunities for both good and evil," the writer goes on to say that "from the point of the gear manufacturers good only can result, but there may be danger to those whose interests lie in the search of mechanical efficiency or the development of new and improved methods of transmitting power."

It is this fear that standards may be adopted that will tend to discourage improvements in gear design that is unwarranted.

It may be stated here that any attempt to limit improvements in the design of gears or their application, or any standard having this effect, would be fatal to the success of any gear manufacturer who attempted to impose it upon his customers.

Most of the members of the American Gear Manufacturers' Association are just what their name implies—"manufacturers of gears"—and use but very few themselves, most of their products being made to customers' specifications.

In the report of the "General Standardization Committee" read at the last annual meeting the intentions of the association were clearly set forth as follows: "This association has considered it advisable, for the advancement of the gear industry, to appoint as one of its standing committees a General Standardization Committee, to consider and develop from the mass of data which now exists in various forms, standards for use in this industry, and which will be of value to all who may have to do with gears, either as manufacturers or as users."

It was stated further that "what we produce must fill certain standards of quality. What these are must be determined by ourselves and the users of the gears. It would be folly for us to set standards of quality if they do not fit the conditions of use to which the gears will be put, and there will always be conditions that any standard we make will not fit."

Also, at this meeting a resolution was adopted as follows: "Recognizing the desirability of co-operation in order to prevent conflict and the putting of more than one standard before the public, the American Gear Manufacturers' Association is willing and anxious to co-operate with other organ-

izations interested in the standardization of apparatus where gears are used and in the betterment of conditions in the industries which may use gears."

Surely this speaks well for our intentions, and users of gears need not fear that the standardization of gears will retard, in the least, any new improvements in the growing field of gear transmission.

The other points in this article are well taken, except an expression in the last paragraph, as follows: "His (the user's) interest is in one phase opposed to that of the maker." This cannot be so any more than in any other line of manufacture. The user's interests and the manufacturer's are the same, and those manufacturers who realize this the most vividly will enjoy the greatest success. Ease of manufacture and increased production in no way affect the issue. It is true that the standards that may be adopted will make the manufacture of gears easier to accomplish, but there can be no increased production unless we please our customers.

In this letter it has been the writer's endeavor to impress those who are interested in gears and their standardization that the American Gear Manufacturers' Association's object is to advance the gear manufacturing industry and the use of gears to a point where everyone having to do with gears will be able to obtain those best suited for any purpose, either from the manufacturers of them or, if they see fit, to make them themselves from the same standards.

## Throttle-Controlled vs. Constant-Compression Engines

By P. S. Tice

WITHOUT the least desire or intent to decry the endeavors of those in this country who are engaged in efforts to design and produce engines for automotive purposes along the lines discussed by Mr. Sargent in the June 27 issue of AUTOMOTIVE INDUSTRIES, I feel that Mr. Sargent in that article has done the throttle-controlled engine a grave injustice in the economy figures he has assigned to it as characteristic.

Mr. Sargent's values for the fuel consumptions in this type engine, as given in his Fig. 1; are so excessively high as to make one wonder when and under what conditions of adjustment they were obtained. Such values can be obtained, of course; but they are by no means characteristic of modern practice.

It seems to me that in comparisons of this nature such figures as are published to point the comparison should be of the same order of practice, and not, as in Mr. Sargent's paper, a side-by-side presentation of an extremely good curve

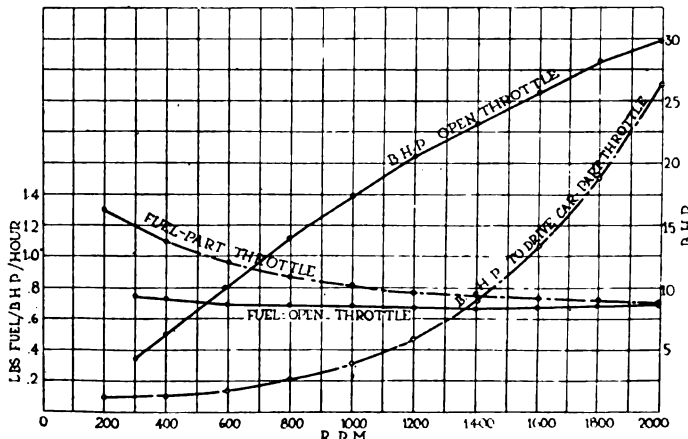


Fig. 1—Fuel consumption and horsepower curves

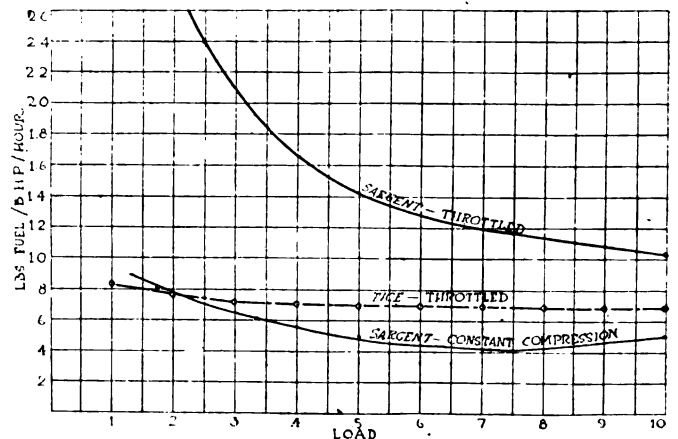


Fig. 2—Fuel consumption as related to load

from a "constant compression" engine and an almost impossibly inferior one from a "throttled" engine.

Referring to the two curve sheets attached, Fig. 1 shows corresponding fuel consumption and horsepower curves from a small four-cylinder automobile motor, for the two conditions of open throttle and part throttle necessary to drive the car on a level cement road.

It will be seen that the maximum fuel consumption occurs at idling, when the throttling is greatest. In Fig. 2, I have plotted reproductions of Mr. Sargent's two curves, and with them to his co-ordinates the part load consumptions of Fig. 1.

While for all loads except the extremely small ones Mr. Sargent's curve for the "constant compression" engine is superior, the really enormous discrepancy between the "throttled" curve which I have drawn in and that offered by Mr. Sargent is at once apparent.

The curve marked "Tice-throttled" is I believe representative of our best modern practice in throttle-controlled engine performance.

## The Engine for the Fuel of To-morrow

By W. L. Dempsey

THE four-cycle gas engine made the automotive industry and 70 deg. gasoline made the four-cycle engine. We still have the four-stroke engine, but 70 deg. gasoline is a memory, and in a few years more it will be history.

Let it never be forgotten that the four-cycle engine is an explosive engine depending always on a dry gas for its power, and that the dryness of a charge varies directly in proportion to the heat applied at standard pressure. It may also be stated that the thermal and mechanical efficiency of a four-cycle engine is in direct proportion to the dryness of a proper charge.

The enormously increasing demand for hydro-carbon fuel caused by a like increase in the manufacture and use of the four-cycle engine for pleasure cars, motor trucks, tractors and aeroplanes has compelled the refiners of crude oil to introduce methods of distillation such as the Burton, Rittman, Dewey and others that require average maximum temperatures of from 500 to 600 deg. Fahr. or even higher.

Since practically all engines are water cooled, the high temperatures necessary to fully gasify the fuel are seldom obtained, so that a large proportion of the fuel is not only wasted, but seriously affects the operation of the engine, by carbon deposits, oil dilution, etc. Since water can absorb and retain not more than 212 deg. Fahr. of heat, a water jacketed carburetor serves only to vaporize the lighter part of the fuel, while the heavier part, that part which requires more than 212 deg. of heat to gasify, is either drawn into the cylinder in a raw state or remains accumulating in the carburetor. It seems to the author that the carburetor manufacturers could greatly improve their product by providing means for the application of heat to both the air and fuel sufficient to maintain uniform temperatures at all speeds of 400 to 600 deg. Fahr.

Any liquid hydro-carbon fuel of whatever density or volatility may be economically and successfully used as a motor fuel in a four-cycle engine of variable speeds provided sufficient heat is applied to transform it into a dry gas and provided sufficient air is furnished to insure complete combustion of the fuel. The dividing lines between gasoline, naphtha and kerosene are just about as definite, distinct and visible as are the outlines of a camouflaged ship far out at sea. The only accurate and exact way to define the quality and volatility of a hydro-carbon liquid fuel seems to be to give the minimum and maximum degrees of heat at which it was distilled. The gasoline of to-day was kerosene yesterday and will possibly be petroleum ether to-morrow.

The automotive industry will live, it will grow and thrive, but the heart of the industry is the engine and it is sorely afflicted. The fuel situation has changed radically and fundamentally, and the engine must change with the fuel to save the industry. It will be a four-stroke engine no doubt, but changed how? Will it be a four-cycle dry gas explosive en-

gine or will it be a four-stroke or two-stroke slow burning constant speed oil engine? That is the question. That it must change and be improved to adapt it to the fuel available all will admit, but how? There is the rub.

The writer believes that the motor of to-morrow will be a four-stroke variable speed dry gas explosive motor capable of successfully using a liquid hydro-carbon fuel of any degree of density down to perhaps 30 deg. Baume, and distilled at a maximum temperature of 700 deg. Fahr. such an engine must provide means for:

First—The complete gasification of the fuel by the application of an amount of heat greater than that at which the fuel was originally distilled.

Second—Means for surcharging the cylinder at the end of the charging stroke with an amount of oxygen equal to or greater than that which is dissipated in the act of gasification.

Third—Means for the retardation of the rise in temperature due to compression sufficiently to obtain efficient compression pressures, by the introduction of cooling elements into the cylinder at the beginning of the compression stroke.

Fourth—Means for the equalization of the temperature of the piston and cylinder walls so that a proper clearance between them may be maintained at all temperatures without danger of seizing or looseness.

Fifth—Means for the complete expulsion from the cylinder of all the products of combustion which would result in lower internal temperature and thereby increasing the temperature range.

## Tanning by Means of Chromium Salts

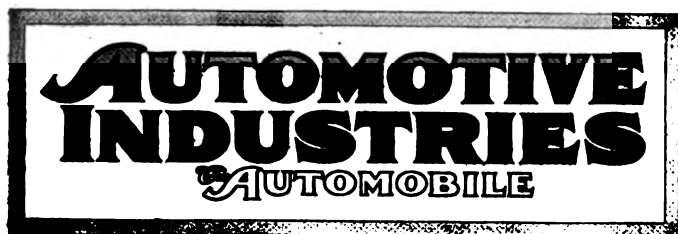
PREVIOUS to the war, tanning by means of chromium salts was an industry almost exclusively American and German. The Central Empires, particularly, had monopolized the important market of British India. Chrome leather is used largely in the industries, in automobile work for clutch facings and universal joints.

The British Government recently had the chrome tanning situation looked into with the intention of introducing the process either in England or Hindustan, and *The Board of Trade Journal* of May 9 gives some details regarding the processes of chrome tanning and the history of their development. The action of the basic chromium salts is due to their property of furnishing colloidal solutions which are slowly absorbed by the skins, the fibres of which are separated and modified in their chemical composition in such a way as to obviate any swelling due to the action of water.

As far back as 1858 Knapp described a process making use of a mixture of alum, chromium and carbonate of soda; this method of operation has remained in use to this day under the name of the single bath process. In the United States, August Schultz in 1884 introduced the double bath process. The skins are impregnated with a solution of bichromate of potash, acidified by means of hydrochloric acid. Then the chromic acid absorbed by them is reduced by means of sulphurous acid obtained by immersion in an acid solution of sodium hyposulphite. It is probable that in this second operation the chromic acid forms with the hyposulphite a colloidal compound of the formula  $\text{Cr}_2\text{O}_3$ ,  $\text{CO}_2$ ,  $\text{H}_2\text{O}$  and tetra thionate of soda,  $\text{Na}_2\text{S}_4\text{O}_6$ . This reaction is indicated by the brown color which the skins assume. This color later becomes lighter and gives way to a bluish tint, probably due to the action of the hydrochloric acid, with the production of the chromium chlorate and precipitation of colloidal sulphur. The incorporation of free sulphur in the latter makes it more supple and gives it a better color than is obtainable with the single bath process. The latter nevertheless is preferred on account of its easier application.

The advantages of tanning with chromium salts are as follows: The time required for the operation is shorter and the capacity of production of tanneries is therefore increased. It furnishes impermeable dense leathers which are very much in demand for box calf and chevreaux glace. Their tenacity makes them especially applicable to certain uses. On the other hand, the property of chrome salts to form lacquers with certain pigments renders the process particularly interesting for the production of colored leathers.





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## Do We Want to Sell Cars in Australia?

AUSTRALIA is and has been for many years one of the best customers of the American automobile industry. Even during these times of shipping shortage and output curtailment, she has bought a relatively large number of our cars. During the twelve months ending with June 30, 1918, 4307 cars valued at \$3,410,557 were sent on the long journey to this distant antipodal continent. Under more favorable shipping and production conditions, her purchases would have been much larger.

Australians buy our cars not because they like us, but because, through our quantity production methods made possible primarily by the great size of our own country, with the resulting huge home demand, we have been able to sell them cars which do exceedingly well what they expect them to do, at prices, including duty and shipping charges, which are less than those charged there for the cars made in other countries.

We do not mean to say that American cars have sold in Australia merely on a price basis, for this is not true. But it can be said without departing from facts that it has been a matter in which price has governed to a considerable extent, and quality in a smaller amount. We should be curtailing our powers of observation to a self-injuring degree if we did not make note of the fact that when the Australian wants to spend money for something he thinks extra fine in the motor car line he buys a British car and pays a higher price for it.

Up to now we haven't minded this very much because bulk sales have been somewhat in our favor, but, after the war, conditions will be different and if American manufacturers are to retain their hold on the Australian market they must alter their selling methods and begin right now whether they have cars to ship or not.

There are two factors which will sooner or later affect the Australian market unfavorably from the American makers' point of view. One of these factors will become effective almost as soon as the war stops, but the other will develop more slowly and develop to an extent dependent very largely upon what we do.

British manufacturers who made motor cars before the war on what, to our way of thinking, was a limited scale, have built great plants and developed huge organizations since the war began. We referred to one case in AUTOMOTIVE INDUSTRIES about a week ago. With a pre-war payroll of some 2500 names, what was then a large British car manufacturing concern now has more than 20,000 employees and a plant that has grown in proportion. What is that concern to do after the war?

There is a new conception of quantity production among British manufacturers and they have the facilities for tremendous outputs. Is it reasonable to suppose that they will stand by serenely and watch some one else pocket the profits from a huge export business in low and moderate priced cars? Isn't it safe to assume and wise foresight to conclude that the American car will have to face much keener competition in Australia and elsewhere, after the war? We know that our product has quality and are not afraid of competitors, but if we do not begin now to go after our Australian trade harder than we ever went after it before, we shall find when the war is over that someone has beaten us to it, as it were.

The other thing we must keep in mind with regard to our Australian trade is that during this period of relative inaction on that continent when nothing very much leaves there and no more arrives, when planters are considering whether they should plant less wheat and other food products on account of the inability to ship what they have already raised, the thoughts of the people have been turned away from agriculture to an extent, to the possibilities of industry. Manufacturing is being taken up as never before. Mines are developing and steel mills are being built. Some day there may be, probably will be, an Australian motor car industry. How rapidly it grows and how large it eventually becomes will depend upon how well we persuade the Australians that we can fill their motor car needs.

## Killing the Goose

By David Beecroft

**K**NOCKING is not dead yet. Last week there was a tractor demonstration in New York State at which over 5000 farmers attended to watch ten tractors plow. Each tractor maker was given 15 minutes to put forth the special merits of his tractor to the crowd.

Eight of the ten tractor representatives took occasion to knock the other makes. Only two makers told a clean story, a tractor merchandising story.

The psychological effect of the knocking on the farmers was most apparent. Scarcely had some of these factory representatives stopped their knocking oration than farmers gave evidence of the uncertainty in their minds regarding tractors in general.

One tractor maker's representative took occasion to knock the creeper type. He failed to realize that those 5000 farmers were all capable of judging for themselves. He failed to realize that his job is not against the creeper type, but against the horse. Others knocked ignition systems and general designs.

It will be too bad if the farm tractor makers fall into this old pitfall. The work of the tractor maker is converting the farm from the horse-pace that has been controlled by generations, in fact centuries, and bringing it up to the tractor-pace, which is a matter of a few years. The big job is getting all phases of farm activities onto the tractor-pace basis.

All forms of farm machinery must be brought up to the tractor standard. This must be done in regard to the grade of metals used, in regard to the accuracy of workmanship, and in regard to the general superiority of design.

With all of these problems facing them the tractor makers have no time to knock. They have no time to try to split the industry into two divisions, creeper types on one side and wheeled types on the other side, or any other divisions. If they want to argue the relative merits of these designs let them do so in their organization meetings; they should not talk this to the consumer.

Tractor makers must educate the farmer to the many problems of the tractor. They must educate him to standards of higher efficiency. They must educate him to give more attention to his machinery. They must educate him to a fuller knowledge of the mechanics of tractors. They must educate him in the principles of increased capacity for work through improved machinery.

The work to-day is for the tractor industry to present a united front to the farmer. It is a pernicious policy to knock and cloud the farmer's mind. That knocking directs the farmer's attention from the biggest problem ahead, namely, greater working capacity and greater acre productiveness through tractor cultivation.

Why get on a house top to proclaim to the farmer the imaginary weaknesses of your competitor's machine?

In your effort to kill a sale for a competitor's machine you are taking the surest course to kill a sale for your own machine.

Knocking is as old as the human race and gives promise of continuing as long as the race continues. Knocking reminds you of the biblical phrase: "We spend our years as a tale that is told." We are continuing to do the things that have been done in the past and which should not be repeated.

The farmer attending his first tractor demonstration approaches the tractor as if it were a blank sheet, or a clean sheet of paper. He has no criticism chalked up against it. He wants to see it perform and then he will chalk up good or bad marks against it as necessary. Why then should the representative of the tractor maker start off by his knocking program to literally fill up with black marks this clean sheet that the farmer has on the tractor? It will normally fill up soon enough, but the tractor maker's representative is not content with such speed; he literally wants to fill it in advance, and indirectly is doing his best to kill sales—to kill the goose that lays the golden eggs.

# □ Latest News of the

## Airplane Program Mercilessly Criticized

**Senate Report Condemns All Past Activities—Blames Personnel of Board—Liberty Engine Program Responsible for Delay—Too Many Favors Given Dayton and Detroit—Recommends Creation of Ministry of Aeronautics**

WASHINGTON, Aug. 26—The creation of a Ministry of Aeronautics, with a single head as Secretary of Aeronautics, is the recommendation of the Senate Military Affairs Committee in its long-expected report, issued to-day. The report condemns all of the past activities of the Aircraft Production Board, although it admits the difficulty encountered in aircraft production during the past year.

In summarizing the report states that on April 6, 1917, we entered the war, and on June 8, 1917, an announcement was made that a fleet of 25,000 airplanes was to be created.

On July 24, 1917, \$640,000,000 was appropriated to carry out the aircraft program, which fund has been exhausted either by actual expenditure or commitments.

A further appropriation of \$884,304,758 has been found necessary.

In the opinion of the committee a substantial part of the first appropriation was practically wasted. While much good work has been accomplished, for which the committee states due credit should be given, it must be admitted that our airplane program up to the present presented many aspects of failure. While an army of 3,500,000 men has been made, the aircraft situation is as follows:

Up to Aug. 1, 601 De Haviland 4 observation airplanes have been embarked for France, of which number sixty-seven reached the front by July 1.

On Aug. 7 a squad of eighteen De Haviland 4's flew over the German lines, but the details of their performances have not been received.

We have not a single American made chasse or fighting plane upon the battlefield.

We have not a single American heavy bombing plane on the battlefield.

We have not developed and put in quantity production a successful chasse or fighting plane.

Our attempt to create a fighting plane was centered in an effort to adopt the Bristol fighter and the De Haviland 4 to the Liberty engine. The Bristol was put into quantity production without sufficient test and over \$6,500,000 was expended and the lives of several men sacrificed when the machine was condemned and its manufacture discontinued.

After more than 1200 standard J training planes equipped with a Hall-Scott engine had been manufactured, at a cost of \$6,000,000, the machine was condemned as dangerous and placed in storage.

An oral order was given the Curtiss Aircraft Corp. for 3000 Spad machines. Early in December, 1917, and later in the same month, Col. Clarke and Major Jesse G. Vincent found that the machine could not be operated with a Liberty engine. On Oct. 8 of the same year the contract was cancelled, the reason given being that the single-seater fighter was obsolete; but, states the committee, on April, 23, 1918, contract was let to the Curtiss company to build 1000 S E 5, the English equivalent of the Spad. The cancellation of the Spad contract and the failure of the Bristol left us without a single- or two-seated fighter except the De Haviland 4 which we are equipping for reconnoitering, although it was originally designed as a fighter.

As early as October, 1917, we were in possession of the facilities for construction of the Caproni planes. Expert Italian engineers have been here since June, 1918, but we have up-to-date constructed only one Caproni plane. Nearly a year has elapsed since we might have begun work on these machines and by this time should have been in quantity production.

The Handley-Page bombing plane is another example of our delay. Plans were furnished the Signal Corps as early as the summer of 1917 and contracts were being made until February, 1918. Delivery on these was not begun until August, 1918. The first Handley-Page

plane was flown last July. Tests on it are not yet complete.

Three causes have been pointed out by the committee as being chiefly responsible for the disappointing results up-to-date, as follows:

1—That the airplane program is largely placed in the control of the great automobile and other manufacturers who are ignorant of aeronautic problems.

2—These manufacturers undertook the impossible task of creating an engine which could be adapted to all classes of flying craft. It is not too much to say that our airplane program has been largely subordinated to the Liberty engine.

3—We failed at the beginning of the war to adopt a commonsense course of reproducing the most approved type of European machines in as great numbers as possible. This should have been carried on co-incident with the production of the Liberty engine. This sound policy has only recently been adopted after a lamentable lapse of time.

The committee states this brief summary is not a wholesale condemnation of our airplane program. Much has been accomplished. The committee is glad to report that while it believes there are many things to be remedied, nevertheless, we are approaching a period when quantity production of planes may be hoped for.

The report condemns the construction of the McCook Field at Dayton, Ohio, as

(Continued on page 346)

### Motorcycle Men to Economize

WASHINGTON, Aug. 21—Representatives of the motorcycle industry conferred to-day with the Conservation Division of the War Industries Board relative to a program to effect economies in the use of metals and rubber in the manufacture of motorcycles. The manufacturers agreed to work out technical problems with a view to effecting such



# Automotive Industries



economies and to report within a few weeks through a War Service Committee which is to be organized by the motorcycle industry.

The industry consumes considerable steel, copper tubing, brass tubing, tin plate and rubber and it is now asked to suggest means for the use of substitutes for the metals, particularly copper and brass, which are needed in the war program. The representatives agreed to give the matter close consideration and to make suggestions to the Conservation Division which will form a basis for recommendations by the latter.

The motorcycle industry was represented at the meeting to-day by T. C. Butler, Jr., C. B. Franklin and F. J. Weschler of Springfield, Mass.; F. B. Rodgers, Arthur Davidson, W. S. Marley and August Frey, Milwaukee and A. G. Hale and F. J. Stareck, Cleveland.

## Homes for Shipbuilders to be Erected

WYANDOTTE, MICH., Aug. 20—Two hundred houses for ship builders will be erected in Wyandotte by the United States shipping board.

## Ford Passenger Car Prices Advanced

Touring Car Costs \$75 More and Truck Is Reduced \$50

DETROIT, Aug. 19—The Ford Motor Co. has advanced the prices of its passenger car models, varying from \$65 to \$90, effective Aug. 16. The touring car has been increased \$75; roadster, \$65; coupelet, \$90; sedan, \$80; chassis, \$75. Simultaneous with the announcement of these increases, a reduction of \$50 was made in the price of the truck, which came as a surprise to the trade and upon which the company declined to comment.

On June 10 the company had bona fide unfilled orders on its books for 110,607 cars, divided as follows: Touring cars, 89,242; roadsters, 9824; coupelets, 3013; sedans, 1675; trucks, 5234; chassis, 1619. The company now has unfilled orders approximating 112,000, 85 per cent of which is passenger cars. Present and former prices of Ford cars are shown below.

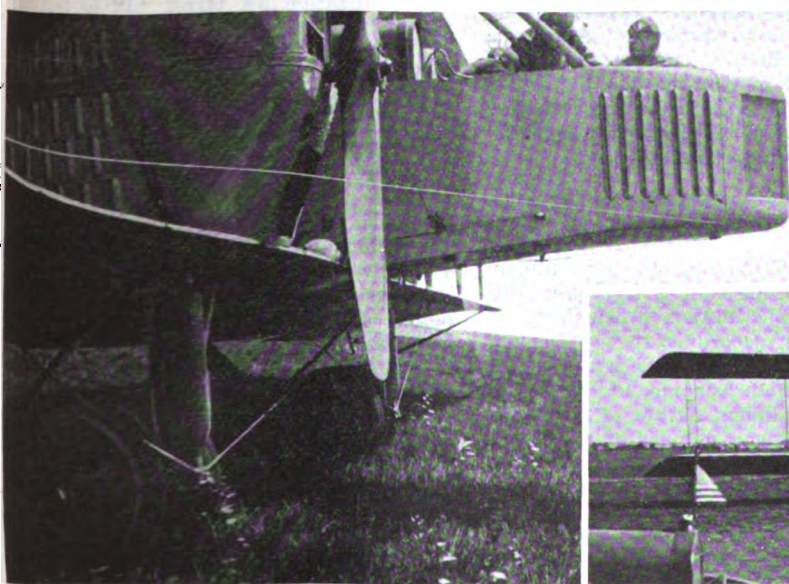
The Ford Motor Co. of Canada has also increased its passenger car prices, effective Aug. 16, from \$85 to \$105. The price of the truck remains the same, \$750. Prices follow:

Model	Old Price	New Price	Increase
Touring	\$585	\$660	\$75
Roadster	555	620	65
Coupelet	770	860	90
Sedan	970	1,055	85
Chassis	535	610	75

Prices are all exclusive war taxes.

Model	Aug. 16, 1918	Aug. 1, 1917	Aug. 1, 1916	Aug. 1, 1915	Aug. 1, 1914	Aug. 1, 1913	Aug. 1, 1912
Touring	\$525	\$360	\$360	\$440	\$490	\$550	\$600
Roadster	550	345	345	390	440	500	525
Coupelet	650	505	505	590	750	...	...
Sedan	775	645	640	740	975	...	...
Town car	Discont'd	Discont'd	595	640	690	740	...
Truck	550	600	...	...	...	...	...
Chassis	475	325	325	360	Not Sold	Not Sold	Not Sold

An American-Built Caproni  
Biplane, Equipped with  
Liberty Engine



Italian officials state that the Caproni is considerably improved by the use of the Liberty engine instead of the engine used in Italy, as it provides about 60 hp. additional



The Liberty engine used is of the Seaplane type, developing about 360 hp. It is of similar design to the military type but develops about 90 hp. less. Major General William L. Kenly, Chief of the Department of Military Aeronautics, U. S. Army, is seated in the machine shown in the large photograph

## Ford Production Is 700,000

85,000 Below the Total for 1917  
—Over 100,000 Unfiled Orders  
—Assembly Plants Shut Down

DETROIT, Aug. 14—During the fiscal year ending July 31 the production of the Ford Motor Co. totaled approximately 700,000 cars, as compared with a total of 785,000 during last year. It is understood that on June 10 there were unfiled orders for 110,607 cars on the books.

The assembly of cars at the company's branches at Washington, Denver, Houston, Los Angeles, Buffalo and Oklahoma City has been discontinued, and the Government has taken over the assembling plants in Philadelphia; Cambridge, Mass.; St. Louis; Pittsburgh; Seattle; Portland, Me.; Indianapolis; Louisville; Cincinnati and Milwaukee for either storage purposes or other war work. The men formerly employed at these plants are working on war production business. The Canadian plant at Ford City, Ont., has been reopened.

### U. S. Rubber Co.'s Earnings Show Big Increase

NEW YORK, Aug. 17—Net earnings of the United States Rubber Co. for the six months ending June 30 amounted to \$10,242,365 after allowances for interest charges, depreciation and reserve for Federal taxes were made. The total earnings for the same period last year were \$7,239,966.

### American de Havillands Make Successful Reconnaissance

WASHINGTON, Aug. 16—Eighteen American-made De Havilland-4 airplanes, equipped with Liberty engines, have made a reconnaissance over the German lines and returned safely, according to a cable from General Pershing to Secretary of War Newton D. Baker. General Foulois, head of the airplane division of the American Expeditionary Forces, personally led the expedition, which also included Lieut. Blair Thaw. This is the first extended use of a complete squadron of Liberty engine equipped planes, and the results were very pleasing to Washington officials.

### Firestone Declares Additional Dividend

AKRON, Aug. 16—In accordance with a resolution adopted in December, providing for the payment of an additional dividend should same be warranted by business development, the Firestone Tire & Rubber Co. has informed its stockholders that as business justifies this payment a special dividend of \$1 per share is declared upon the issued common capital stock of the company. This special dividend is in addition to the dividend of \$1.25 per share, both being

payable on September 20 to stockholders of record September 10.

It is estimated that, after allowing for the restrictions on crude rubber and the production of pneumatic tires, sales for the fiscal year will amount to \$75,000,000. The company is doing an increased solid tire business, and has diverted portion of its plant to war essentials.

### Motorcycles and Bicycles Are Essential

WASHINGTON, Aug. 19—Motorcycles and bicycles have been recognized as essential by the Priorities Division of the War Industries Board, following a meeting between the representatives of these industries with the Board. It was recognized in the meeting that the output of motorcycles is almost entirely absorbed by direct Government purchases, that the remainder is devoted largely to essential commercial purposes and that bicycles have come to be used by workers as a method of transportation.

It was also found that there were opportunities for substantial savings in the use of steel and rubber in these industries and both industries pledged themselves to effect such savings as will be worked out in a program of conservation in co-operation with the War Industries Board.

Subject to those pledges and the carrying out of the conservation plan it was considered necessary to recognize the industries as entitled to their reasonable requirements of materials.

### British Society of Motor Manufacturers Elects New President

BRISTOL, CONN., Aug. 16—Albert Brown, one of the founders of the firm of Brown Brothers, London, England, a company having commercial relations with the automotive industry throughout the world, has been elected president of the Society of Motor Manufacturers and Traders of the United Kingdom. One of Mr. Brown's primary aims is the securing of co-operation between American, French and British business men and with this end in view he has written to President DeWitt Page of the New Departure Mfg. Co. inviting such co-operation and help in getting together.

### Skilled Labor Situation Improves

WASHINGTON, Aug. 16—Curtailement of non-war production is lightening the general labor situation particularly in skilled trades, according to the Department of Labor. Reports received by the Department from Kokomo, Indiana, show that the curtailed output of passenger cars is releasing a number of mechanics for war work. Similar reports from other sections, it is stated, show that conservation of manpower resources is being gained by reduction in the output of so-called non-essentials. The Department of Labor states that despite this improvement the general skilled labor shortage is still serious and can only be relieved by the transfers from non-war industries.

## Organize Wisconsin Tractor Service

Power Farming Association  
Plans Better Co-operation  
with Farmers

MILWAUKEE, Aug. 19.—Plans for bringing tractor service in Wisconsin to a high state of organization and efficiency are now being made by the Wisconsin Power Farming Association, organized by representatives of more than 15 large tractor manufacturers located in or having branches in Wisconsin. A principal activity from the beginning will be to give service to farmers who own tractors in much the same manner as the highly-developed service plans in effect in the passenger and commercial car fields. In line with this policy, it is the intention of the association to make it obligatory upon every dealer in tractors to carry a sufficient stock of parts to enable farmers to keep their machines in service at all times, and more particularly during the rush seasons.

This plan involves also ample provision for quick service in making repairs and replacements, either in an established service station, or on the ground. Details have not been fully developed, but excellent progress is being made and the association hopes to have its plan in operation by the time the fall plowing season begins.

This development in the farm tractor field in Wisconsin is regarded by motor car dealers and garagemen as most favorable to their business, since they have established service stations and generally ample accommodations for carrying stocks of parts, and in addition have a wide experience in furnishing service of this character. Under existing conditions in the passenger car industry, there undoubtedly will be considerable available capacity in many garages open to just such utilization as this. It is felt that the garages in the smaller communities of Wisconsin are particularly well situated in this respect, as they are close to the field of operations of the tractor and can quickly adapt their existing organizations to tractor service without prejudice to the attention required by the present passenger and commercial car demands.

Tractor and motor car men as well, who have made a study of conditions in Wisconsin, say that up to this time the motor car trade has left the tractor business pretty much to the farm implement dealers. One of the reasons ascribed for this fact is that the motor car dealers have been too fully occupied with their ordinary and regular car and truck business to be able to assume the added responsibilities involved in the requirement of tractor sales or distribution rights, with the attendant demand for service.

With the readjustment that is expected to come in the passenger car industry, the way is opened to dealers to enter the tractor business on a broad scale, with

almost every requisite advantage already at hand. At the same time the farm implement trade is rather poorly equipped, relatively speaking. Implement and farm machinery service is an infant, compared to motor car and truck service, and it is nowhere near the state of efficiency that the rapid development of the tractor already requires.

The men who compose the Wisconsin Power Farming Association either are the sales managers of the tractor manufacturers located in Wisconsin, or the state distributors or branch managers. Their business, of course, is to merchandise the product to the greatest possible advantage and the ability to give service is a prime consideration in the selection and retention of tractor dealers. While no intimation has ever been made by any member concerning the availability of motor car dealers in prosecuting tractor distribution, it is known that the position of these dealers, especially with respect to service and maintenance, finds favor among the tractor men and they are willing to give due consideration when the selection of a dealer involves both a farm implement and a motor car representative.

The Wisconsin association has scheduled another meeting for Tuesday, Aug. 27, at the Hotel Medford, Milwaukee, at which time plans will be made for a general tractor meeting during State Fair week, Sept. 9-14. This will be held at the Republican House, Milwaukee, on Friday, Sept. 13, and a general invitation will be issued to dealers and owners to be present to become acquainted with the operation of the tractor service now being formulated.

#### Milwaukee Organizes Branch of National Association of Purchasing Agents

MILWAUKEE, Aug. 17—A Milwaukee branch of the National Association of Purchasing Agents has been organized with a membership of nearly 100, representing as many of the leading industries of Milwaukee and eastern Wisconsin. Officers are: President, Floyd E. Francis, Patton Paint Co., Milwaukee; vice-president, G. H. Money, Federal Rubber Co., Cudahy; secretary, Charles E. Stone, Chain Belt Co. Milwaukee; treasurer, G. A. Platz, Horlick Malted Milk Co., Racine. Among the members are: W. V. Isgrig, Auto Parts Mfg. Co.; H. B. Ibsen, Gemco Mfg. Co., Milwaukee; Robert Stiefoater, Aluminum Goods Mfg. Co., Manitowoc, and E. J. Eggert, Allen-Bradley Co., Milwaukee.

#### 2500 Tractors Operating in Pennsylvania

HARRISBURG, Aug. 17—According to figures furnished by the State Department of Agriculture there are approximately 2500 farm tractors at work in Pennsylvania and the total is increasing steadily week by week. In some districts the number has doubled recently and orders have been placed for many more.

Stanley Porter, production manager of the Jackson Rim Co., Jackson, Mich., has resigned to return to the Hayes Wheel Co. of this city, in a similar capacity.

## Ralph De Palma Wins Five Races

### And Also Breaks Four World's Records at Sheepshead Bay

SHEEPSHEAD BAY, N. Y., Aug. 17—Not content with winning all five of the events on the card in the International Sweepstakes at the Speedway this afternoon before a crowd of nearly 50,000 spectators, Ralph De Palma succeeded in breaking world's records for 2, 10, 30 and 50 miles.

The new records, compared with the former fastest times are:

Distance	Time Today	Previous Record
2 miles	1.05:50	1.12:55 made by Resta last year.
10 miles	5.23:30	5.24:30 made by De Palma July 22 at Chicago.
30 miles	16.31:20	18.56:10 made by Altken several years ago.
50 miles	27.29:20	28.04:53 made by Resta last year at Sheepshead Bay.

De Palma's time for the 20-mile race this afternoon was 10:51:50, the still standing record of 10:50:20 being also to his credit.

The purse of \$27,000 was divided into first, second, third and fourth prizes, the winner of each event receiving 6 points, the second 5 points, the third 4 points and the fourth 3 points. The table below shows the winners of the several prizes, the cars driven and the amounts gained by each driver.

De Palma drove consistently in all the events and as a rule lay in second or third place until close to the finish, when he spurred and passed the others. A notable fact is that there was not a single stop at the pits for tires or for other supplies by any of the cars which finished. The track was in first-rate condition and the starters were sufficiently few to insure perfect racing without crowding, combinations which led the spectators to anticipate the setting up of some new records. Nobody, however, could have prophesied that one man would break four records in a single day.

Flying starts were made in all races, with but a single false start, that of the first race.

Chevrolet experienced hard luck right away, breaking his crankshaft when about half way around the oval and putting his car out of commission for the day. In the second race Chevrolet, by arrangement, used Duray's car, but had to drop out in the fourth lap with a broken valve, a circumstance which prevented Duray from starting in the 50-mile race.

Owing to previous trouble at Columbus,

Vail was unable to tune his car up in time for either the first or second race and although he started in the third his car was obviously not in first-rate form and he dropped out during the fifth lap. In the last race Vail was still having trouble and gave up when lapped by the leaders in the fifteenth.

During the progress of the events the spectators were thrilled by the daring evolutions of a biplane piloted by officers from Mineola.

#### Radio Work Training Schools Established

WASHINGTON, Aug. 19—Training schools for radio work have been established by the Division of Military Aeronautics at West Point, Ky., and Camp McClellan, Ala., field artillery firing centers, and instruction work along these lines will eventually be extended to Ft. Sill, Okla., and Camp Jackson, S. C., and also to field artillery firing centers where observation schools of the Division of Military Aeronautics are now working in co-operation with the Artillery Branch of the Service.

Heretofore advance schooling was to be obtained only when the American troops reached France.

Instruction in radio covers wireless communication between the flyers in the air and the gun crews on the ground below. By means of radio the flyers are able to signal for barrages, the location of batteries, ammunition dumps, infantry, trains and other targets, and also to "spot" for its own particular battery, which means to tell that battery whether its shells are landing to the right or left, over or under the target at which it is firing.

#### New Steel Hangars at Ellington Field

WASHINGTON, Aug. 19—Six new steel hangars, costing between \$9,000 and \$11,000 each, are being constructed at Ellington Field, one of the Gunnery Schools of the Air Service, at Houston, Texas. The new hangars will be used in connection with work in bombing which is soon to be started. Three hundred and thirty-three acres of land near Ellington Field have been secured for the bombing field.

Besides the main field known as Ellington, there are five auxiliary fields near Houston all of which are used in the training of fliers. New extensions include the utilization of land at Park Place and on the Gulf, near San Leon, Texas.

#### Warner Gear Adds New Plant

MUNCIE, IND., Aug. 17—A contract has been let by the Warner Gear Co. for the erection of a large plant, to cost approximately \$250,000.

#### The Results at Sheepshead Bay

Driver	Country	Car	Points	Prize
Ralph De Palma	Italy	Packard Special	30	\$17,000
Ralph Mulford	United States	Frontenac Special	22	5,000
Dario Resta	England	Resta Special	19	3,000
Arthur Duray	Belgium	Frontenac Special	6	1,000
Louis Chevrolet	France	Frontenac Special	0	...
Ira Vail	United States	Hudson Special	0	...



## Expect 25% Cars for 1919

Dealers Have Hearing with  
War Industries Board—  
No 100% Cut

WASHINGTON, D. C., Aug. 16—The National Automobile Dealers Association piloted by President E. W. A. Vesper assisted by Manager Ed. Peake and a score of leading automobile dealers and distributors waited on the War Industries Board here to-day with regard to the 100 per cent curtailment letter which the Board sent to the National Automobile Chamber of Commerce, and was able to have a very satisfactory hearing with the board.

The dealers' debut with the board opened up good possibilities of satisfactory working with it and the dealers came out of a 2-hr. hearing feeling that instead of the industry going to be cut 100 per cent there is every indication that the War Industries Board will curtail only what is necessary and that in all probability the makers will continue through 1919 on a 25 per cent basis as compared with 1917. It is possible that this percentage may be increased to 30 or higher.

Co-operation was the complete aim of the dealers in their working with the Board and they in turn were quite favorably impressed with the desire to co-operate with them on the part of the Board. The Board expressed a desire not to entirely stamp out the industry, which seemed to carry home the thought that the 100 per cent letter the Board sent to the N. A. C. C. was simply a reprisal for the N. A. C. C. members coming forward with a 50 per cent offer for 1919 before they had turned into the Board the steel inventories that the Board asked for in July.

The dealers were frank in all their transactions with the Board and made no effort to conceal any of their real intentions. They did not have to tell the Board about the utility of the automobile in the farming sections, as the Board has

heard that so often that it is almost a delicate question with some of the members. From the dealers conference it is apparent the Board is quite fully advised on all facts relating to the industry.

While the board did not give any definite answer on what percentage the automobile industry would continue on for 1919 the attitude of the board was quite different from the general trend of its letter to the N. A. C. C., which would indicate that personalities are taking the place of sound business ethics in the dealings of the board and the N. A. C. C. The trouble seems to lie on both sides. Leaders in the War Industries board occasionally refer to the automobile industry as an unpleasant subject, one they apparently do not care to discuss. What the reasons back of this are can scarcely be deciphered. The dealings of the N. A. C. C. are to some extent responsible.

It was poor policy for the N. A. C. C. to ask for a 50 per cent bargain for 1919 when the War Industries Board was facing a steel shortage. The figures showed that 20,000,000 tons of steel were needed for the next 6 months and that the manufacturing capacity of the nation was only 16,500,000 tons. The War Industries Board could not possibly agree to a 50 per cent deal when faced with such figures, which figures, by the way, the majority of the steel makers have declared to be the closest to actual requirements that have been given.

It was because of this situation that the War Industries Board asked for the inventories rather than a specific bargain. Some have intimated that one of the objects of the board may have been to get an accurate line on the amount of steel held by the automobile concerns rather than to want the inventories for the purpose of balancing them and continuing the industry as long as possible at a possible maximum.

So long as the War Industries Board is confronted with a production of steel lower than government needs there is no possibility of a specific bargain, and under such conditions the better course would be that of getting every possible bit of steel to balance up inventories, thereby securing the greatest possible good out of the steel on hand.

## Airship Divisions for Dayton

Technical Division Moves This  
Week—Engineering  
Also to Go

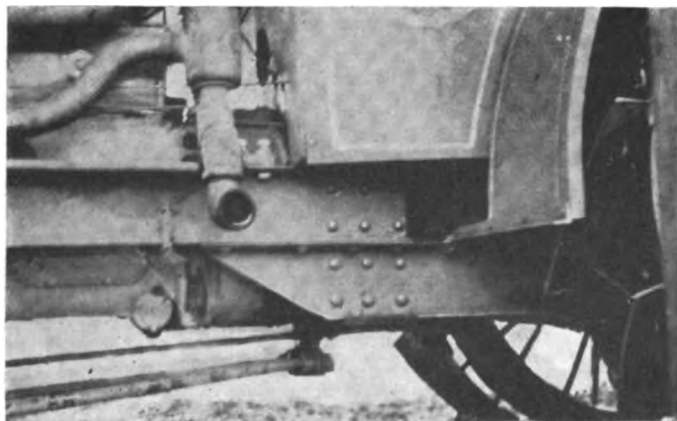
WASHINGTON, Aug. 20—The many reports that important divisions of both the Department of Aircraft Production and the Department of Military Aeronautics will be moved from Washington to Dayton are now assuming concrete form. The technical division of the Department of Military Aeronautics, headed by Colonel T. E. Bayne, will move its complete organization from this city to Dayton this week, where it will be located permanently. The engineering divisions of the Department of Aircraft Production, which is headed by Charles W. Nash, who also controls the production section, it is reported will be removed to Dayton shortly.

These moves, which have been advocated for sometime by AUTOMOTIVE INDUSTRIES, are expected by the Government officials to create more complete contact between closely allied divisions of the air service which have heretofore been separated by a thousand miles.

Dayton, it is pointed out, is practically the center of aircraft production and operation. It is close to Detroit, Indianapolis and Cleveland, has plane factories and fields itself, and thus, it is stated, will afford excellent opportunities for the technical and engineering divisions heretofore in Washington, to gain direct and practical knowledge, and to arrive at better understanding with the officials in the fields.

### Traction Engine Co. Builds Factory

BOYNE CITY, MICH., Aug. 16—The first factory unit of the Traction Engine Co., manufacturer of kerosene-gasoline engines for tractors and trucks, is under construction and will be completed within 30 days. The building is 65 by 130, and contains approximately 8500 sq. ft.



## An Appeal for Standard Tractor Frames

*THE makers of this tractor—and they are not small manufacturers—were forced to adopt the expedient of cutting and splicing the main frame at its point of greatest load because they could not buy a pressed frame which would meet their requirements, and incidentally those of some fifty or more other tractor makers.*

**When will the work of tractor  
standardization begin?**

## Agricultural States Leaders in Cars and Trucks

(Continued from page 311)

Illinois, Missouri, Michigan, Nebraska, North Dakota, Oregon, South Dakota, Washington and Arkansas. To these can be added Kentucky and Tennessee.

The actual registration gains in these different states follow:

Illinois .....	22,450
Pennsylvania .....	19,724
Missouri .....	18,974
Wisconsin .....	17,154
Michigan .....	17,019
Nebraska .....	11,499
North Dakota .....	6,121
Oregon .....	8,434
South Dakota .....	10,842
Washington .....	6,900
Arkansas .....	10,138
Kentucky .....	10,138
Tennessee .....	5,500

The registration gains in these agricultural states are more conspicuous in contrast with the greatly reduced gains in what might be designated manufacturing states and those containing large centers of population. New Jersey and Massachusetts, two leading manufacturing states, have been shown to have decreased. Maryland and Delaware, both essential manufacturing states, show very small gains, small compared with the corresponding period a year ago. Delaware has added 958 registrations and Maryland 2824. Connecticut, a leading manufacturing state and one that gained very heavily a year ago, has added only 1258 in the past 6 months. Rhode Island, essentially a manufacturing center, has added but 1257.

The manufacturing states that have gained heavily in registrations are those that cannot be termed more than quasi-manufacturing ones, all sharing very largely in agricultural pursuits and often mining as well. In this class are Michigan, very heavily reduced as compared with a year ago in new registrations, and Wisconsin and Illinois.

The percentage of gains in registrations in the past 6 months is largest with what can be designated the Solid South, which showed very heavy gains in January. These are continuing. The gains approximate 30 per cent for the area. Naturally the District of Columbia with its unprecedented increase in population since the war began is a leader with a gain of 15,771 as compared with a corresponding gain of 1470 in the first 6 months of 1917. Its percentage gain is 74. With the population of Washington increased approximately 100,000 it is not surprising that such a gain in registrations should have taken place.

Continuing with the Solid South, Alabama shows a gain of 11,986 as compared with 6749 a year ago in the same period. Florida has gained 4530 compared with 1770 last year. Georgia has gained 17,025 as compared with 12,225 in 1917. Other gains in the same period are: North Carolina 6121 as compared with 4656; West Virginia 5094 compared with 4646; Kentucky 10,143 compared with

7200; and in South Carolina and Mississippi the figures for this year are practically the same as those for last year. The influence of cotton and lumber in the South is strongly shown in these figures.

No other one section of the country has shown such a drop this year as New England which has a total of 7106 fewer registrations as of July 1 than a year ago. Two of these six states show losses and the gains of the other four are scarcely one-quarter of the total drop in Massachusetts and Maine. Vermont has increased by but 64; New Hampshire by 166; Rhode Island by 1257, and Connecticut by 1258. Two show a total loss of 9851 and the other four a total gain of but 2745. New England is essentially manufacturing as opposed to agricultural and here is one of the most convincing arguments as to where the cars sold in 1918 have gone to. The demand has been from the fertile acres of the Mississippi Valley rather than from the centers of population or the centers of manufacture. These automobiles have been going into 100 per cent utilitarian service and not into any so-called avenues of luxury.

What might be designated the mining states of the West all show a dropping off in registrations. There are six of these states and as a group they do not show so heavy a falling off as the manufacturing area of New England. The

entire six have only added about 18,000 new registrations, not so many as the State of Missouri. The figures showing registration gains in the first half of this year are:

Arizona .....	1,914
Colorado .....	6,350
Idaho .....	4,080
Nevada .....	740
Utah .....	3,024
New Mexico .....	1,659

It is impossible to give complete and accurate registrations on motor trucks as many states do not segregate them from automobiles. Taking definite figures from those states that have them and obtaining estimates from others, a conservative estimate put the total number of trucks in use at 500,000. Until recently all of the trucks were used in the environs of the larger centers of population and in the smaller cities but the farmer has become a factor in truck buying and the truck is going onto the farm along with the tractor, the electric lighting outfit and the individual type of ice making machine.

## Two Facts Emphasized

Further analysis of the registration figures for the several states emphasizes two indisputable facts:

One—The shortage of farm labor is compelling the continuance of the purchase of motor cars to such an extent that the farmer consuming time with the slow horse is being looked upon as a soldier of industry who is working below his possible and desirable capacity in these war days.

Two—The law of supply and demand is working out admirably in manufacturing and population centers where car sales have uniformly fallen off. This is convincing proof of the extent to which this part of our population has been supporting all forms of war subscriptions and indicates the natural falling off that must be expected due to the removal of the young men who have gone to France. It is an answer to the luxury argument of the automobile. It is a reminder to those who visualize the national aspect of the car from the streets and highways of our Atlantic seaboard, that the true picture of the automobile in its varied aspects of utility is found in the grain areas between the Alleghanies and the Rockies and on the Pacific slope beyond.

## Chalkis Co. 100 Per Cent Efficient

DETROIT, Aug. 20—According to information given out by the War Department the Chalkis Manufacturing Co. is one of the five gun plants credited with a 100 per cent complete machinery installation and in full operation. There are sixteen new gun plants for forging and machining of cannon on the official government list. In the erection of these plants the United States has expended \$34,768,297, of which \$607,993 is credited to the Chalkis concern. In all the sixteen plants in operation, cannon or cannon forgings for mobile artillery from 1½ in. to 10 in. are being produced.

## GAINS AND LOSSES BY STATES

State	1917 First 6 Mos.	1918 First 6 Mos.
Alabama .....	6,749	11,986
Arizona .....	5,278	1,914
Arkansas .....	9,496	10,138
California .....	36,250	69,052
Colorado .....	10,100	6,350
Connecticut .....	7,297	1,285
Delaware .....	2,037	958
Dist. Columbia .....	1,407	15,771
Florida .....	1,770	4,530
Georgia .....	12,255	17,025
Idaho .....	5,004	4,084
Illinois .....	33,700	22,450
Indiana .....	29,628	17,154
Iowa .....	70,393	46,787
Kansas .....	25,592	25,658
Kentucky .....	7,200	10,143
Louisiana .....	8,606	6,350
Maine .....	3,618	—1,961
Maryland .....	17,090	2,884
Massachusetts .....	6,061	—7,890
Michigan .....	40,361	16,019
Minnesota .....	30,500	—3,281
Mississippi .....	5,572	5,850
Missouri .....	19,218	18,974
Montana .....	7,415	4,601
Nebraska .....	26,941	11,499
Nevada .....	2,041	740
New Hampshire .....	4,532	166
New Jersey .....	44,253	—4,595
New Mexico .....	2,967	1,659
New York .....	66,530	11,903
North Carolina .....	4,656	6,121
North Dakota .....	12,705	5,831
Ohio .....	49,834	83,159
Oklahoma .....	19,782	—9,499
Oregon .....	10,682	8,434
Pennsylvania .....	35,925	19,724
Rhode Island .....	4,594	1,257
South Carolina .....	10,000	10,028
South Dakota .....	10,729	10,842
Tennessee .....	11,600	5,500
Texas .....	2,313	—5,161
Utah .....	3,683	3,024
Vermont .....	2,361	64
Virginia .....	9,624	9,339
Washington .....	5,736	6,900
West Virginia .....	4,646	5,094
Wisconsin .....	24,477	18,169
Wyoming .....	2,575	1,649

## A Priority Board Warning

Inadvisable and Useless to Employ Agents to Obtain Certificates

WASHINGTON, Aug. 16—Manufacturers and the public generally are advised of the uselessness and inadvisability of employing agents to obtain priority certificates or preferential treatment from the War Industries Board in an open letter by Edwin B. Parker, Priorities Commissioner of the Board. The letter follows:

### "TO THE PUBLIC:

"The attention of the Priorities Division of the War Industries Board has been called to the fact that certain individuals are offering their services and soliciting employment to present priority applications and procure the issuance of priority certificates, and also to use their alleged influence in having industries accorded preferential treatment.

"The rules and regulations of the Priorities Division are clear, simple, can be readily followed and will be furnished to anyone applying therefor. The employment of agents not only burdens the applicant for priority with a wholly unnecessary expense, but an attempt on the part of such agents to exert personal influence—which it is needless to say they do not possess—may have a tendency to prejudice the applicant's cause.

"EDWIN B. PARKER,  
"Priorities Commissioner."

### Former Texas Co. Engineer Dies from Exhaustion

WASHINGTON, Aug. 15—Capt. O. J. May of Chicago, an officer of the Equipment Division of the Signal Corps, and

formerly lubrication engineer for the Chicago district with the Texas Co., died in consequence of the severe strain to which he was subjected in conducting a 65-hour test of a new oil for lubricating air engines.

Captain May conducted test after test until completely exhausted, and as a result his vitality was insufficient to withstand a severe cold caught a few days after the tests were completed. It is stated that his individual efforts have resulted in a very great saving to the Government, as the tests upon which he was engaged will provide the air forces with a satisfactory lubricant at a cost of but one-fourth of that formerly used.

### The Week's Flying Accidents

WASHINGTON, Aug. 16—Five deaths resulted from flying accidents at fields in this country during the week ending August 10. This was at a rate of one death for every 4408.5 hours flown, or 362,572 miles of air flying. The accidents occurred at:

Gerstner Field, Lake Charles, La.....	1
Post Field, Fort Sill, Okla.....	1
Scott Field, Belleville, Ill.....	1
Taliaferro Field, Fort Worth, Tex.....	2
Total .....	5

### Moline-Knight Prices Increased

EAST MOLINE, Aug. 15—Prices on the different Moline-Knight models have been increased as follows:

Model	Old Price	New Price
G—7-pass. ....	\$2,375	\$2,500
4-pass. de Luxe....	2,375	2,500
C—5-pass. ....	1,750	2,000
L—4-pass. roadster....	1,750	2,000
L—Touring sedan ....	2,280	2,500

### Will of Francis E. Stanley

NEWTON, Mass., Aug. 17—Francis E. Stanley, inventor of the Stanley steamer, who was killed in an automobile accident on July 31, left an estate estimated at approximately \$500,000. In his will filed a few days ago he left \$100,000 to his son, Raymond W. Stanley, and the rest of the estate to his wife.

## Ford Plans Use Water Power

Will Spend Millions of Dollars in Developing Resources United States

DETROIT, Aug. 17—Henry Ford credited with a scheme whereby the power of the country will be utilized in connection with a number of Ford tractor plants. The first factory to use water power will be located at Hamilton, Ohio, its cost being estimated at \$1,000,000. Other plants, similarly situated, will be established throughout the country. The general plan involving use of water power on a large scale will be developed at Hamilton and will afterwards be extended to other centers. Power derived from the Little Miami River at Hamilton will be sufficient to turn out 300 tractors per day during winter months when the available water power is at its maximum. During summer, when the stream is reduced, the plant is to be used for melting steel with the aid of electricity.

### President of M. A. M. Confers on Service Committee Duties

NEW YORK, Aug. 16—In addition to general routine matters discussed at a meeting of the executive committee of the Motor and Accessory Manufacturers Association held to-day, plans in connection with possible activities of the War Service Committee were considered with the result that president C. W. Stiger has arranged to go to Washington for the purpose of conferring with the Chamber of Commerce of the U. S. A. as to the ways in which this committee can assist the Government.

Early in September Mr. Stiger will attend a joint meeting of both the executive



270 jobbers and manufacturers attended the Bicycle and Motorcycle Convention held during the first convention



the war service committees, probably at Detroit, to give effect to the results of his interview at Washington. It has not been definitely decided whether or not the Motor and Accessory Manufacturers shall have a permanent representative at Washington.

#### War Department Gives Manufacturers Information on Contracts

WASHINGTON, Aug. 16—In order that the manufacturers can learn full information regarding the needs of the War Department, the General Staff will place manufacturers on the mailing list and send each of them requests for bids for the products which he is able to provide. Manufacturers, in sending in their names to the Supply Bureau, Director of Purchases and Supplies, General Staff, U. S. Army, Washington, D. C., should also include satisfactory references from banks or reputable business concerns, or from the chairman of the Local Regional Manufacturers Organization associated with the War Industries Board.

#### Starting Device Adapted to Aircraft Engines

MILWAUKEE, Aug. 17—A starting device for heavy duty engines, designed several years ago by Nels A. Christensen, a noted inventor and engineer of Milwaukee, principally for application to motor fire apparatus and similar purposes, has been refined by him to suit the requirements of aircraft. Several hundred hydroplanes in use at the navy aviation camp at Great Lakes, Ill., have been equipped with the starter. Mr. Christensen personally superintended the installations and made numerous practice flights to demonstrate the efficacy of the apparatus. He is president and general manager of the Christensen Engineering Co., 816 First National Bank Building, Milwaukee.

## Improved Methods of Shipping Airplanes

### Close Study of Problems Has Resulted in Saving Overseas Freight Space

WASHINGTON, Aug. 19—Shipment overseas of American built airplanes has been considerably improved by the Aircraft Production Board as the result of studies in plane boxing and shipping problems. Shipment of American De Havilland bombing planes, for example, as now made, saves 644 cubic feet of space over the former methods for each airplane sent. This amounts to a cost saving of \$3,864 per plane, figuring shipping space at \$6 per cubic foot. In addition, 1000 board feet of lumber is saved in the boxing. Mine packing boxes are used to ship 4 battle planes. The gross weight of the 4 planes is 11,000 lb., and when packed, 27,000 lb. Four of the 9 boxes contain front sections of the fuselage. One contains 4 rear sections; 2 hold 2 sets of wings each; 1, 4 sets of rear controls, and 1 set of ailerons. The total space required for 4 planes so crated is 3547 cu. ft. In addition to the parts actually required to complete the 4 planes, spare parts are shipped. Two main wing boxes are sent with each unit shipment of 4 planes, and contain besides the wings with their fittings, axles, wing skids, landing gears, wiring plates, wheels, tires, struts and fittings. One aileron box is included with each shipment of 4 planes.

Shipment of spare parts for 100 De Havilland planes required 105 cases weighing 164 tons. With every plane there are also shipped 2 Marlin synchronizing machine guns operated by the pilot, 2 Lewis flexible machine guns operated by the gunner, camera, attachments for radio set, heating and lighting equip-

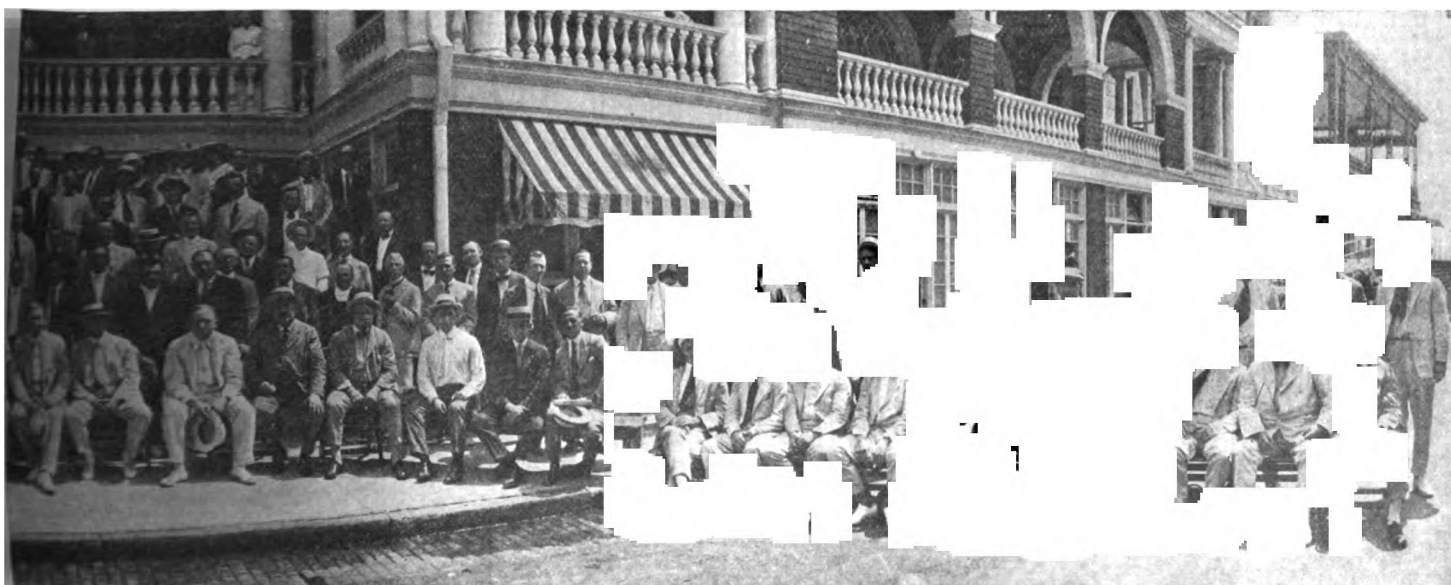
ment, bombing equipment, air pressure gages, oil pressure gages, aneroid barometer, clock, compass, map case, fire extinguisher, safety belts, Very signalling pistol, etc.

All boxes are lined with water-proof paper and the tops covered with tarred felt fastened down on the sides and ends. All the joints are sealed with cement and the exteriors are given two coats of paint. Minute directions are given for packing the various parts of the airplanes. Braces and supports within the box are so constructed as to support the engine and fuselage. Metal parts which might corrode are protected by a neutral slushing compound which is resistant to the effects of sea air and salt water. The instruments on the instrument board are heavily covered with a coating of paraffine, the more delicate instruments being removed and packed carefully in special boxes which in turn are sealed in airtight tin boxes.

#### Wages Increase in May—Number of Employees Practically Unchanged

WASHINGTON, Aug. 16—Wages in the automobile manufacturing industry increased 7.1 per cent for the manufacture of May, 1918, as compared with the manufacture of April, 1918, according to the reports of 48 factories. The number of employees for the same period remains approximately the same, with 114,979 employed in 48 factories in April, 1918, and 114,944 in May, 1918, a decrease of less than one-tenth of 1 per cent. The wages paid by the 48 companies to 114,944 employees in May, 1918, were \$3,015,637.

Forty-seven automobile companies reported 120,000 workers in May, 1917, as against 114,745 workers in May, 1918, a decrease of 4.5 per cent, while wages increased from \$2,773,654 for the manufacture of May, 1917, to \$3,011,044 for May, 1918, a wage increase of 8.6 per cent or a total wage increase counting the decrease in workers of 11.1 per cent.

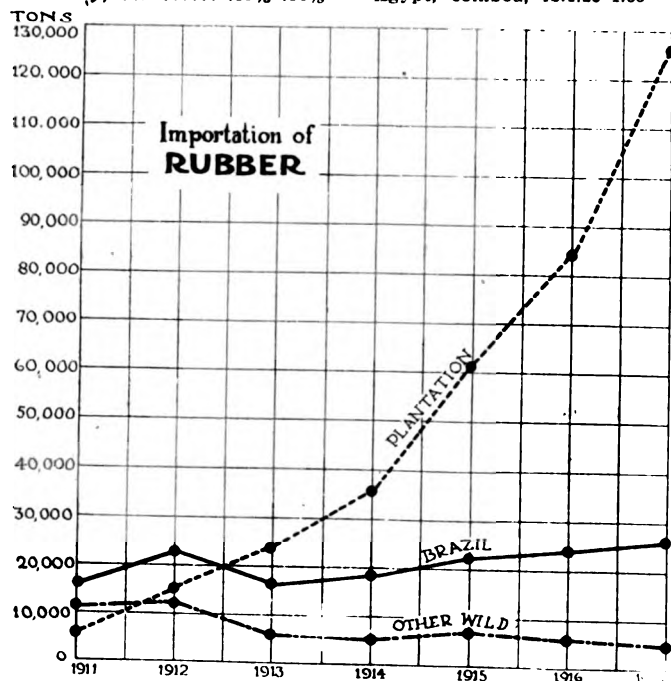


August at Atlantic City. Over 50 manufacturers of automobile parts were present at this, the largest, con-kind ever held

# AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>		<b>Burlap:</b>	
Muriatic, lb. ....	.02-.03	8 oz., yd. ....	.19
Phosphoric, ct. ....	.35-.39	10 oz., yd. ....	.24½
Sulphuric (60), lb. ....	.09	<b>Copper:</b>	
<b>Aluminum:</b>		Elec., lb. ....	.26
Ingot, lb. ....	.33	Lake, lb. ....	.26
Sheets (18 gage or		<b>Fabric, Tire (17½ oz.):</b>	
more), lb. ....	.40	Sea Is., combed, lb. ....	1.65-1.70
<b>Antimony, lb. ....</b>	.13½-.14½	Egypt, combed, lb. ....	1.25-1.35



Imports of cultivated, Brazilian and other wild rubber during the past seven years. Note the abnormal increase in cultivated rubber as the plantations developed

Egypt, carded, lb. ....	1.20-1.30
Peelers, combed, lb. ....	1.05-1.20
Peelers, carded, lb. ....	.95-1.05
Fibre (½ in. sheet base), lb. ....	.50
<b>Graphite:</b>	
Ceylon, lb. ....	.07½-.25
Madagascar, lb. ....	.10-.15
Mexican, lb. ....	.03¾
Lead, lb. ....	.08-.09
<b>Leather:</b>	
Hides, lb. ....	.18-.35½
Nickel, lb. ....	.40-.43
<b>Oil:</b>	
Gasoline:	
Auto., gal. ....	.24½
68 to 70 gal. ....	.30½
<b>Lard:</b>	
Prime City, gal. ....	2.30
Ex. No. 1, gal. ....	1.60
Linseed, gal. ....	1.88-1.90
Menhaden (Brown), gal. ....	1.20-1.22
Petroleum (crude), bbl. ....	2.25
Kansas, bbl. ....	2.25
Pennsylvania, bbl. ....	4.00

## Rubber:

<b>Ceylon:</b>	
First latex pale crepe, lb. ....	.63
Brown, crepe, thin, clear, lb. ....	.60
Smoked, ribbed sheets, lb. ....	.62
<b>Para:</b>	
Up River, fine, lb. ....	.68
Up River, coarse, lb. ....	.40
Island, fine, lb. ....	.59
Island, coarse, lb. ....	.27
<b>Shellac (orange), gal. ....</b>	.70-.76
<b>Spelter</b> ....	.09¼-.09½
<b>Steel:</b>	
Angle beams and channels, lb. ....	.03
Automobile sheet (see sp. table).	
Cold rolled, lb. ....	.06½
Hot rolled, lb. ....	.03½
<b>Tin</b> ....	.88
<b>Tungsten, lb. ....</b>	2.40
<b>Waste (cotton), lb. ....</b>	12¾-.17

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock	\$5.95	\$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping	6.55	6.45
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
Black Sheet Extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent levelling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co. ....	62	64	— ¼
*J. I. Case T. M. Co., pfd. ....	84	84	..
Chalmers Motor Co., com. ....	4½	5½	+ 1
Chalmers Motor Co., pfd. ....	20	30	— 10
*Chandler Motor Co. ....	86	89	— 2½
Chevrolet Motor Co. ....	132	137	— 2
*Fisher Body Corp., com. ....	36½	37	— 1
*Fisher Body Corp., pfd. ....	90¼	91	+ 1¼
Fisk Rubber Co., com. ....	59	63	— 1
Fisk Rubber Co., 1st pfd. ....	99	103	— 1
Fisk Rubber Co., 2nd pfd. ....	78	83	..
Firestone Tire & Rubber Co., com. ....	106	110	+ 2
Firestone Tire & Rubber Co., pfd. ....	..	..	..
*General Motors Co., com. ....	153	154½	..
*General Motors Co., pfd. ....	81¼	81¾	— ¼
*B. F. Goodrich Co., com. ....	45¼	45¾	..
*B. F. Goodrich Co., pfd. ....	98½	100	..
Goodyear Tire & Rubber Co., com. ....	152	157	— 7
Goodyear Tire & Rubber Co., pfd. ....	97½	98½	+ ¾
Grant Motor Car Corp. ....	3	3½	+ ¾
Hupp Motor Car Corp., com. ....	3	3¼	..
Hupp Motor Car Corp., pfd. ....	79	82	..
International Motor Co., com. ....	25	32	— 3
International Motor Co., 1st pfd. ....	60	65	+ 5
International Motor Co., 2nd pfd. ....	35	42	..
*Kelly-Springfield Tire Co., com. ....	49	50½	..
*Kelly-Springfield Tire Co., 1st pfd. ....	80	87	..
*Lee Rubber & Tire Corp. ....	22	23	+ ¼
*Maxwell Motor Co., Inc., com. ....	25¼	26	— ¼
*Maxwell Motor Co., Inc., 1st pfd. ....	54½	55½	— ½
*Maxwell Motor Co., Inc., 2nd pfd. ....	19½	20	— ¾
Miller Rubber Co., com. ....	105	110	— 5
Miller Rubber Co., pfd. ....	95	98	— 1½
Packard Motor Car Co., com. ....	110	120	..
Packard Motor Car Co., pfd. ....	94	97	+ 2
Paige-Detroit Motor Car Co. ....	17	19	..
Peerless Truck & Motor Corp. ....	14	16	+ 1
Portage Rubber Co., com. ....	110	112	..
Reo Motor Car Co. ....	14	15	— ½

	Bid	Asked	Net Ch'ge
*Saxon Motor Car Corp. ....	6¾	7	+ ¼
Standard Motor Construction Co. ....	13	13½	+ 1
*Stewart-Warner Speed. Corp. ....	56½	57½	— 1
*Studebaker Corp., com. ....	44¾	45½	..
*Studebaker Corp., pfd. ....	85	90	..
Swinehart Tire & Rubber Co. ....	46	55	— 4
United Motors Corp. ....	31½	32	— ½
*U. S. Rubber Co., com. ....	61	61¼	..
*U. S. Rubber Co., pfd. ....	104¼	104¾	— ¼
*White Motor Co. ....	46¾	48	+ 3¼
*Willys-Overland Co., com. ....	19¾	19½	— ½
*Willys-Overland Co., pfd. ....	82½	83½	— ½
Standard Parts	55	65	..

\*At close of business Aug. 18. Listed N. Y. Stock Exchange.

## OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co. ....	..	7¾	..
Bower Roller Bearing Co. ....	..	18¾	..
Chevrolet Motor Co. ....	133	136	— 3
Continental Motor Co., com. ....	5¼	5½	— ¼
Continental Motor Co., pfd. ....	94½	..	..
Edmund & Jones, com. ....	14	17	..
Edmund & Jones, pfd. ....	75	90	..
Ford Motor Co. of Canada. ....	147	..	..
Hall Lamp Co. ....	..	14½	..
Michigan Stamping Co. ....	..	..	..
Packard Motor Car Co., com. ....	..	121	..
Packard Motor Car Co., pfd. ....	..	94¼	..
Paige-Detroit Motor Car Co. ....	..	18½	..
Prudden Wheel Co. ....	..	11¼	..
Reo Motor Car Co. ....	14¾	14¾	+ ¾

## INACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Atlas Drop Forge Co. ....	..	25	..
Kelsey Wheel Co. ....	25	..	..

# Industrial Review of the Week

## A Summary of Major Developments in Other Fields

### Bituminous Production

#### Recedes Steadily

In the face of ever-increasing demands for bituminous coal, production recedes steadily week by week from the 13,286,000 net tons reported in the record-breaking week ended July 13. Estimates made at the beginning of the coal year for the tonnage of fuel necessary for essential uses have proved to be too low, the latest revised figures showing that every possible effort will have to be made by the coal-mining industry if the war program is not to suffer a setback. The requirements for the Navy, for instance, were originally fixed at 3,500,000 net tons for the year. It now is estimated that Uncle Sam will need at least 8,000,000 net tons for his vessels before the end of 1919.

An idea of how fast the Navy is consuming fuel may be had from the fact that the demand in July from this source had risen to a 6,000,000-ton-a-year basis. The shipyards, too, are speeding up production to such an extent that the 10,000,000 net tons considered a liberal allowance for the Shipping Board on April 1 have been increased by 3,000,000 tons. Another phenomenal increase is in the demand for bunker fuel. At the beginning of the coal year 13,500,000 tons were assigned for this purpose, with the thought that this amount would prove adequate. The estimate has now risen to 21,000,000 tons. When to the foregoing figures is added the coal needed by plants that have been enlarged, and the additional fuel required to keep a large percentage of industries operating on a 24-hr. basis, it can be seen that the problem confronting the soft-coal mines is one of no mean proportions.

For the week ended Aug. 10 (the latest statistics available), the output of bituminous coal is estimated at 12,274,000 net tons. This means an average production of 2,046,000 net tons a day for this period, which is 54,000 net tons below the daily output established as a minimum. To emphasize the seriousness of the situation still further—the soft-coal mines are now 14,500,000 net tons behind schedule, and it is a foregone conclusion that they will never catch up.

The causes for the fall in output seem to be divided between car shortage and labor unrest, with the greater part of the blame attaching to the former. Record production can only be achieved when the railroads manage to keep an adequate number of empty coal cars moving to the mines and the transportation of loaded cars is speeded up. This statement is substantiated by the fact that the peaks in the coal production chart result when the railroads operate at maximum efficiency. Operations in the Pittsburgh district are short of 200 cars a day, and on Aug. 16 many of the mines in that region

were at a standstill for want of cars. In the Kanawha and Coal River districts of West Virginia car shortage was responsible for the loss of 1347 productive hours during the week ended Aug. 10. In Alabama, too, the lack of cars caused a decided decrease in output.

Despite reduced labor forces, the output of anthracite coal continues to keep well ahead of the quantity mined last year. Hard coal shipments during the week ended Aug. 10 totaled 2,051,933 net tons, a decrease of 6.4 per cent compared with the week preceding. The total output of anthracite coal in July amounted to 7,084,775 tons, an amount exceeded only twice before; but what is even of more importance, virtually the entire tonnage of anthracite mined for the first quarter of the coal year—April to July—is in the hands of the consumer.

Nothing should be tolerated that will interfere with anthracite production if the public is to be supplied with coal. There is evidence that Hun propaganda is rife in the hard-coal regions—in the shape of both covert and open acts calculated to create discord in the labor ranks. The mining force should by every possible means be maintained at its present figure.

Shipments of soft coal to the lakes grow more and more disappointing. It is feared that the Northwest will not get over 25,000,000 tons, instead of the 28,000,000 aimed at. The first eleven days of August saw lake shipments of bituminous—exclusive of vessel fuel—only 1,535,996 tons. The Fuel Administration schedule calls for 4,900,000 tons. July closed 1,000,000 tons behind, and it appears that August will add about 1,250,000 tons to this deficit. For the week ended Aug. 17 the estimate of shipments to the Northwest is 1,020,000 tons. The Pittsburgh district has not been able to respond to the 1600-car-a-day order, due to the unsatisfactory car supply referred to earlier in this review and a marked shortage in motive power—*Coal Age*.

#### Garford Prices Advance

LIMA, OHIO, Aug. 20—The Garford Motor Truck Co. increased the prices of its trucks and tractors on Aug. 15 as follows:

TRUCKS				
Model	Ton Chassis	Old Price	New Price	
75 C	1	\$2,100	\$2,500	
66 B	1½	2,500	3,000	
66 BL	1½	2,600	3,100	
70 B	2	3,000	3,300	
70 BL	2	3,100	3,400	
77 B	3½	3,900	4,300	
77 BL	3½	4,000	4,400	
68	5	4,700	5,000	
68 L	5	4,800	5,100	
69	6	4,900	5,300	
69 L	6	5,000	5,400	
TRACTORS				
Model	Ton Tractor	Old Price	New Price	
70 B	4½	3,100	3,400	
77	7	4,000	4,400	
68	10	4,800	5,100	

### Prepare to Meet Demand for Industrial Steel

The meeting of the special sub-committee of steel manufacturers with Government representatives at Washington on Thursday, Aug. 22, and the calling of a general meeting of steel manufacturers in New York for the following Wednesday point to the taking of new and important steps to meet the demand for ship, munitions and railroad steel.

Coal and coke supply still limit pig iron and steel output. The continuance of an adequate labor supply under the new call for fighting men is a serious problem, and even more grave is the situation caused by the set purpose of labor leaders to bring about union control of the steel industry.

Washington is not so much concerned about the construction of new iron and steel capacity, which would be from 12 to 18 months in the building, as about getting the full fighting effect of existing plants. It is certain, therefore, that in the remainder of the year the changes in metal-working industries due to concentration on war work will be more marked than they have been in the past six months.

The situation as to coal and coke and transportation does not measure up to the enlarged requirements of the war. With an average of 360 blast furnaces operating last month, the pig iron output was 110,000 tons a day. With an average of 335 furnaces operating in April, May and June of last year (25 less than in July, this year) the pig iron output for those three months also averaged 110,000 tons a day. Thus 25 more furnaces are required now to keep output up to the rate of last year.

The pig iron shortage complained of for months grows more acute; but the proposal from Washington that the few remaining cold furnaces be started up will come to little. Operators of some of the small furnaces now blowing, particularly in the South, threaten to put them out if the pig iron price is not advanced by October.

Pig iron allocations in the week have been relatively small. Pending demand includes a round lot wanted for the first 500,000 semi-steel shells to be made for the Government.

The unusual pressure for production is shown in the placing with wire makers of a good percentage of the 82-mm. rounds wanted for shells to be shipped this month to France. Putting the lighter billet mills of these plants on munition steel will mean for the time being a very limited output of wire as the rate for months has been only about 60 per cent of normal.—*Iron Age*.



## Taxation of Cars Protested

A.A.A. Presents Facts and Figures on Subject to Ways and Means Committee

WASHINGTON, Aug. 19—Less than 3 per cent of all of the motor vehicles produced in 1917 sold at \$2,500 or more. On the Cleveland-Akron Highway, of 13,979 vehicles traveling over the road in a week, only 685 were horse-drawn, and more than 2000 were motor trucks carrying 5014 tons of freight, which was only slightly less than 6630 tons hauled in the same week by the 3 railroads. Thirty-three thousand people were transported by the 10,000 passenger cars. These figures and others asserting the importance and essentialness of the automobile industry, and in protest to direct Governmental taxation on motorists, were placed before the Ways and Means Committee this week by Dr. David Jameson, President of the American Automobile Association. Dr. Jameson asserted that it would be as fair to tax coal as gasoline, and referred to the fact that any tax on new cars would be passed along to the consumer. He also contended that any tax on the original cost of used cars would be unjust. This proposed tax on new cars has been changed since Mr. Jameson filed his communication, and is now based on horsepower. Dr. Jameson's letter follows:

"As the spokesman in an organized form of the motor car owners of the country, we did not seek a hearing before your committee, as we are of the opinion that the present comprehensive use of the automobile is entirely clear to all of you. There are a few points, however, we would like to bring to your attention.

### Farmers Biggest Buyers

"Of the 1,798,600 motor vehicles produced in 1917, less than 3 per cent sold at \$2500 or upwards. Three out of every four cars cost not over \$1200. These 1,365,000 represented 75 per cent of the total. Every other car was a certain popular make selling close to \$500. Farmers were the best buyers as a class, absorbing 53.1 per cent of the total vehicles manufactured.

"Our investigations recently by chairmen of good roads, legislative, and touring boards support anew the contention that the passenger automobile is now nine-tenths for utility and scarcely one-tenth devoted to what has been designated as 'pleasure riding.' True it is that vacation periods may be spent in the form of interstate road journeys and there may be local evening and Sunday trips, but the fact remains that a preponderating percentage of the car's mileage is employed by members of the family to crowd more work into one day than was ever before possible.

"If your committee decides that there should be substantial taxation of an essential like highways transportation—and all forms are considered—we shall accept without protest your findings, believing that war revenue necessities demand such action.

"Railroad conditions have compelled an increasing use of the highways, to the extent that long distance traveling is more general than in previous years. The figures come to us through the distribution of thousands of maps by the road bureaus at our national headquarters in Washington and New York, besides which we supply our several hundred clubs in all parts of the country.

"One illuminating example of what can be done where a highway is constructed capable of meeting maximum traffic demands exists in a forty-mile stretch of Ohio road connecting Cleveland and Akron. A census for a week taken in March by students of

the Case School of Applied Sciences gave a total of 13,979 vehicles, of which only 685 were horse drawn. Fifteen per cent of the total were motor trucks, which carried 5014 tons of freight, compared to 6630 tons shipped by three railroads. Thirty-three thousand people were transported in passenger automobiles.

"Proposed levies upon users of gasoline motors and engines would amount to about one-quarter of a billion dollars. Purchasers of new cars, of course, would pay the tax imposed on the dealer, who would pass it along to the consumer. The gasoline tax would be determined by the car's mileage, which undoubtedly would be reduced to a minimum. A federal license tax in addition to that now imposed in all states is manifestly unfair, and especially so if based on the original price of the automobile. All these would be largely a tax on industry and would seem unreasonably excessive on one branch of industrial activity, already taxed heavily by the states.

"The proposed tax will hamper the agencies of production, the fuel and the power they employ. We might as well tax coal as gasoline, which is doing more than any other agency to relieve the conditions resultant upon the scarcity of coal. It is estimated that the power generated by gasoline exceeds that generated by coal and steam nearly ten to one; the horsepower produced by steam being estimated at about 11,000,000 and that of gasoline at over 100,000,000.

"In these days, when our social system is on trial, one of the chief concerns of the Congress should be the safeguarding and the promotion of the sources of national wealth, this to the end that we may endure the great and prolonged strain to which the war will subject us. Industry is the greatest source of national wealth. Is it good economics to tax this greatest source of power known to American industry? When we tax fuel, we tax industrial life at the very source of its vitality.

"In conclusion, might we again call notice to the present excessive taxing of motor cars in practically all states, which in some instances includes registration of car. Its listing in the personal property tax, and the necessity of paying for an operating license for each member of the family who drives the vehicle. Surely it is even now a plentifully taxed necessity.

"Furthermore, the motor car owner is a citizen, and, as such, meets other civic obligations and pays whatever general taxes are imposed. He, however, senses unfairness in being conspicuously singled out every time there comes need for revenue increases."

### March Aids Wisconsin Rural Express Lines

MILWAUKEE, Aug. 19—Alton J. March, head of the A. J. March Motor Truck Co., 215 Wisconsin Street, Milwaukee, and president of the Milwaukee Automobile Dealers' Association, has accepted appointment as Wisconsin representative of the national motor truck committee of the National Automobile Chamber of Commerce and already is making preliminary arrangements for the establishment of rural motor express lines in this State. Mr. March has enlisted the support and co-operation of the State and Milwaukee Councils of Defense; Milwaukee Association of Commerce, Milwaukee Chamber of Commerce, Wisconsin Highway Commission and numerous other organizations to work out a plan of operation to be put into effect immediately.

### Aviation Gunnery Fields Leased

WASHINGTON, Aug. 19—Several fields are being leased by the War Department for the extension of instruction in gunnery for aviators in order that they may be trained on this side of the Atlantic. One tract of 10,000 acres has been leased near Fort Worth, Texas, not far from Taliaferro, Barron and Caruthers Field. Another tract of 750 acres has been leased near Lufbery Field, L. I.

## Enough Cotton Fabric for Planes

U. S. Production Averages 1,200,000 Yards per Month—Sufficient for All Needs

WASHINGTON, Aug. 19—The production of American cotton airplane fabric is now averaging about 1,200,000 yards monthly, sufficient for all requirements, and capable of being largely increased if necessary. No more linen fabric is being imported from abroad for this purpose, and after the imported stock now on hand is exhausted, cotton fabric will be used exclusively in covering American airplane wings.

At the outbreak of the war in 1914, linen was the only material which had proved entirely satisfactory for covering airplane wings, the essential physical properties required being lightness in weight, proper absorption of dope and strength and resistance to tear.

The chief countries before the war producing flax for fine grades of linen were Belgium, Russia and Ireland. The Belgium supply was cut off from the Allies in 1914. Russian flax was difficult to obtain and was later cut off entirely. In the meantime the consumption of linen for war purposes had increased enormously. By the spring of 1917, when the United States entered the war, the linen situation was very serious and it was obvious that some substitute would have to be found.

In developing a cotton airplane fabric which would have the necessary qualities of the linen, the U. S. Government received the greatest assistance from the various cotton mills.

Samples were made from cotton of many constructions and numbers of yarn, varying from No. 40 two-ply to No. 100 four-ply, the cloth having from 50 to 90 threads per inch. Yarns were in some cases mercerized under tension and various twists were tried. Several cotton mills co-operated in this work.

When the new fabrics were secured, samples were put on airplanes, "doped" and varnished, according to regulation practice, and tested in actual use at Langley Field and Pensacola. Flying tests were also made with several other varieties of fabric. The tests were for three months of service, averaging ten hours per day. Members of the U. S. Air Service, members of the foreign flying corps and other experts assisted in the experiments. They reported that the cotton fabrics developed in the United States appeared to serve most favorably. Other very favorable reports have recently been received from tests made in Great Britain on American cloth sent over there.

After many experiments had been made, the first contracts for 10,000 yards each of cotton airplane fabric were placed in the middle of September, 1917. The results obtained were satisfactory and it was decided to place further contracts.

Two fabrics were adopted, the specifications calling for a strength of not less

than 80 lb. per inch in both warp and filling. The cotton used had to be of a very long staple and in November, 1917, the Air Service purchased 15,000 bales of long staple Sea Island cotton.

The first quantity orders for cotton airplane fabric were placed in October and November, 1917, and were for 1,280,000 yards of Grade A and 200,000 yards of Grade B. Deliveries of cotton airplane fabric started in January with the production of 173,000 yards. Production has gradually increased until at the present time 1,200,000 yards are being produced monthly.

Subsequent contracts have been let for cotton airplane fabric amounting to 11,513,084 yards. All of these later contracts, however, have been for Grade A cotton fabric, as it now seems clear that this cloth is superior to the other.

While the cotton airplane fabric was at first used only for training planes, and the Grade A standard linen fabric, which was imported from Great Britain, was used for combat planes, it was decided in April, 1918, that the Grade A cotton fabric could be used for all types of planes.

#### Draft Is Not a Factor in Industrial Disputes

MILWAUKEE, Aug. 17—Because of a report that an employer at Madison, Wis., involved in labor difficulties, attempted to use the deferred classification of employees under the selective draft service act as a leverage upon their industrial status, Gov. E. L. Philipp and the draft administration of Wisconsin have issued an official statement condemning this "reprehensible practice" and assuring the public that the draft will in no way be permitted to become a factor in industrial disputes. It is announced that a striking employee will be given a reasonable time to find employment similar to his present work so that he may continue in his deferred classification. The period will be about ten days, at the end of which time reclassification will be considered.

#### Crude Rubber Imports Limit for August and September

WASHINGTON, Aug. 16—Importation of crude rubber has been limited to 16,666 tons for the months of August and September. This is proportionate to the rate tentatively fixed by the War Trade Board for the quarter ending July 31, 1918, which was 100,000 tons per year. The rubber imports for August and September will be allocated by the Bureau of Imports along the general lines of the previous allocation, with certain changes to take care of increased Government requirements.

#### Republic Rubber Co. Declares Dividend

YOUNGSTOWN, OHIO, Aug. 19—The Republic Rubber Co., Youngstown, Ohio, has declared its regular quarterly dividend of 1½ per cent on first preferred stock, payable Sept. 1 to stockholders of record Aug. 25.

## Gasoline Production Well Maintained

June Totals Slightly Below Those of May, but Daily Production Greater

	June, 1918	May, 1918
Crude oil (bbl.).....	28,140,479	28,510,698
Gasoline (gal.).....	315,023,445	319,391,160

	June 30, 1918	May 31, 1918
Crude oil (bbl.).....	11,956,151	11,824,633
Oils purchased to be re-run (bbl.) .....	932,561	872,300
Gasoline (gal.).....	418,440,353	460,637,479
Kerosene (gal.).....	426,285,676	343,311,945
Gas and fuel (gal.).....	550,704,759	515,020,224
Lube (gal.) .....	158,316,257	161,009,729
Wax (lb.) .....	169,424,428	168,171,328
Coke (ton) .....	17,478	15,583
Asphalt (ton) .....	97,631	104,214
Miscellaneous (gal.).....	273,877,024	317,115,697

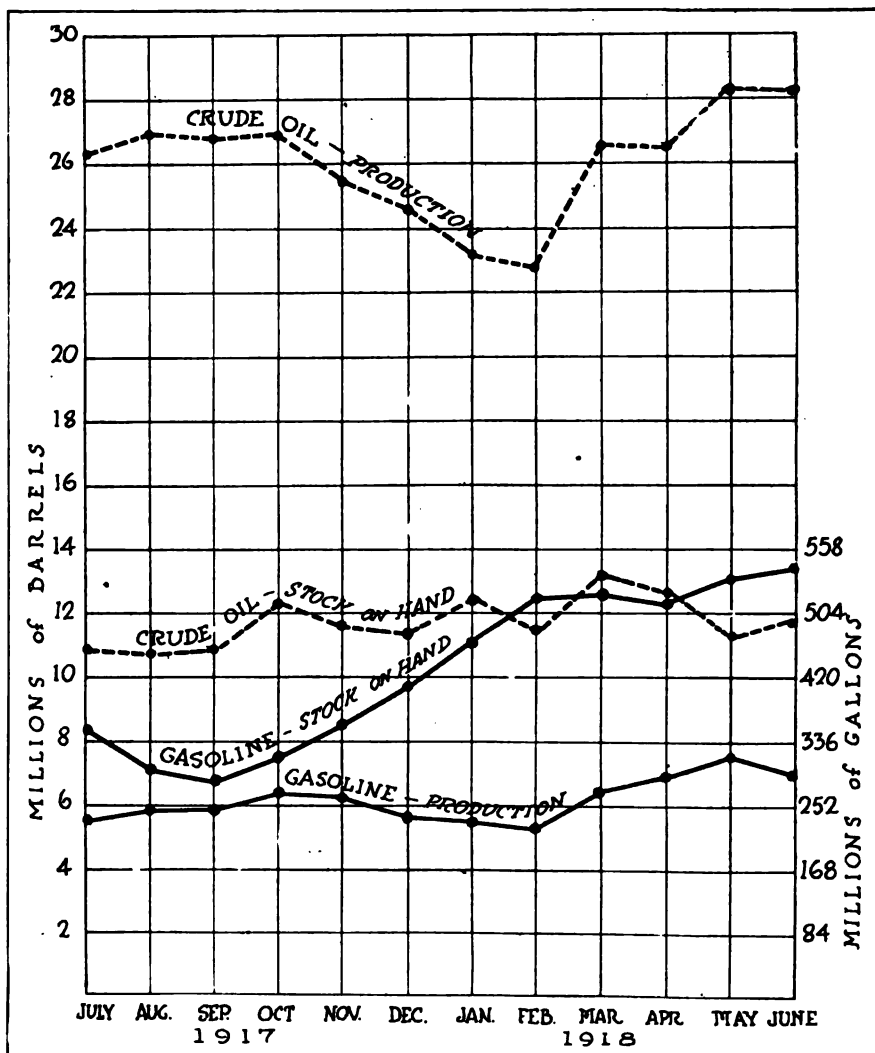
WASHINGTON, Aug. 16 — During June, 1918, the average daily production of gasoline was 10,500,781 gal., an amount slightly in excess of the daily production average for May, although

the total production for the latter month, as shown in the table, was slightly greater than that of June. This apparent anomaly is accounted for by the fact that there are 31 days in May as compared with 30 in June.

According to the figures just issued by the Bureau of Mines the stock of gasoline on hand on June 30 was 418,440,353 gals., as against a stock of 460,637,479 gals. at the end of May. The total of April 30 was still larger, being 509,197,134 gals. Taking the season and the additional demand into consideration, these stock figures are perfectly normal.

Production of crude oil has dropped slightly, the June figures being 28,140,479, as against 28,510,698 gals. during May. The item "Oils Purchased and Re-run" given above is not a figure which can be properly added to actual crude production figures, as it is understood to represent crude or distillate which has at some previous date been included in the regular crude production figures. Nevertheless, these additional 3,483,270 gals. are available.

The remaining items shown in the tabulation herewith show both production and stock of crude oil and gasoline and the stocks on hand of the derivatives of the former as on the last day of each of the two months.



Production and stocks on hand of crude oil and gasoline for the past year

**George E. Flanders Enlists**

George E. Flanders, son of Walter E. Flanders, president of the Maxwell Motor Co., Inc., Detroit, has enlisted as a private in the United States marines at the age of 18, and is now stationed at Paris Island.

Dr. Clyde Leeper, medical director of the social service work of the Goodyear Tire & Rubber Co., and in charge of the anti-tuberculosis work of the Red Cross, has been appointed one of the physicians who will have charge of Red Cross anti-tuberculosis work in Italy. He is scheduled to sail the latter part of this month.

William H. Armstrong, for eight years holding executive positions in the Mitchell Motors Co., Racine, Wis., and its predecessor, the Mitchell-Lewis Motor Co., has resigned as secretary and treasurer of the company to take the active management of the Armstrong Foundry Co., Racine, the recent re-organization of the Holbrook-Armstrong Iron Co. of that city. Mr. Armstrong has been elected president.

A. W. Voegel of Detroit has been appointed assistant to Maurice Rothschild, general manager of the Regal Motor Car Co., Detroit, who is formulating plans to reorganize the company for the start of manufacturing at close of the war.

J. H. Morrill formerly in charge of the engineering department of the Northway Motors Co., Detroit, has been appointed assistant chief engineer of the Buda Motor Co., Harvey, Ill.

Dr. Orrel A. Parker, manager of the wheel department of the Hydraulic Pressed Steel Co., Cleveland, has been placed in charge of records under W. F. Parrish, chief of the oil and lubrication branch, supply section, in the office of the director of military aeronautics.

**To Regulate Crude Oil Prices**

WASHINGTON, Aug. 20—Prices of gasoline and other oil products will be stabilized, and steady production of petroleum will be assured by a plan now being worked out by the National Petroleum War Service Committee in co-operation with the United States Fuel Administration. Maximum premiums will be arranged for payments for various qualities of oil.

Heretofore competition has caused various refiners to bid against each other and pay excessive premiums over the base rate for oil. This has resulted in exorbitant consumer's prices, and has also created disturbance in the oil industry, frequently hampering oil production.

By means of the maximum premiums it is expected that permanent prices for crude petroleum will prevail and that its proper production and distribution will be assured. Protection will thus be given to both small and large refineries in securing their supplies while at the same time consumers will be insured against excessive prices for gasoline and other oil products.

## Men of the Industry

*Changes in Personnel and  
Position*

**Motor Transportation Under  
Brig.-Gen. Drake**

*(Continued from page 307)*

lery, and in each organization and station, there will be an officer of the Motor Transport Corps or an officer as acting Motor Transport Corps officer, designated Motor Transport Corps officer of that command, who is responsible for the efficient operation of the Motor Transport Corps within the limits of his command. His activities are controlled by G-1 in division or corps, and by G-4 in armies, in the same manner as are those of other representatives of technical and supply services in such commands. The functions of this officer are as follows:

First. He is in command of all motor transportation of the First Class, as defined above, and controls its operation as specified in paragraph 4-(h) above. He is also in command of all Motor Transport Corps maintenance and supply agencies on duty with the command.

Second. He exercises the functions of a staff officer as regards the supply of all Motor Transport Corps property for the command and as regards the technical supervision over motor vehicles of the Second Class provided for in paragraph 5 above.

To carry out this technical supervision, it will be his duty to make frequent inspections of all matters having any bearing on the motor transportation of the command. In making these inspections, he will be afforded every facility by all concerned. He will make frequent reports to the Divisions of the General Staff by whom his activities are controlled, covering such matters as the suitability of the personnel charged with operating motor vehicles, the mechanical condition of the vehicles, the conditions under which they are operated, needs for repair or overhaul, carelessness or waste on the part of any individual organization and similar matters, together with his recommendation as to any action that should be taken.

11—The chief of each department will submit on or before August 31, 1918, a list of funds appropriated for the design, purchase, equipment, repair and maintenance of motor vehicles as defined under paragraph 3 preceding. This last will show unexpended balances. The chief of each department will also submit the amount estimated and desired to be retained for purchase of special designs defined in paragraph 7 preceding. All unexpended balances of above appropriations will be transferred to the Disbursing Officer, Motor Transport Corps.

12—All existing contracts for motor vehicles, motor vehicle equipment and

**Airplane Program Mercilessly  
Criticized**

*(Continued from page 334)*

an experimental field and of the Wilbur Wright flying field at Dayton. The committee states that it feels obliged to note in this connection that shortly before negotiations for the McCook and the Wilbur Wright fields were completed Col. E. A. Deeds, a member of the aircraft board, was the owner of the first and a part owner of the second. He sold and transferred them to interests with which he had been identified. The committee states the number and amount of contracts for planes and engines are assigned to concerns at Dayton and Detroit, and the number and collection of aviation fields at Dayton could not fail to attract the attention of the complete senate committee. Due to the vast automobile industry, Detroit doubtless possesses more facilities for gas engine production than any other American community.

Industrially considered, the concentration of a great number of these two pursuits in these two cities may perhaps be justified but the committee is forced to the conclusion that the personnel of the aviation board from its formation to its reconstruction explains the fact. It recommends a commission of individuals and facilities for observation at the front who will work in relays between America and the front.

The Liberty engine is approved by the committee but is said to be imperfect yet, though rapidly approaching perfection. The committee complains that fighting planes have not been built around the Liberty engine and that our aircraft program will not be complete until one is. Only 2114 airplanes have been delivered to our army in France by our Allies.

The committee points out that the Allies have been hampered in deliveries of these planes because of our inability to supply them with raw materials. Our training planes are said to be excellent, both by the committee and by foreign experts who were called in.

The profits on the Liberty engines by our manufacturers are said to run as high as 34 per cent and on the Liberty engine aluminum pistons as high as 285 per cent on the capital invested. Numerous examples are told of in the report of the placing of contracts and their subsequent withdrawal to show the indecision existing with the original Aircraft Production Board.

supplies, maintaining, operating and repairing motor vehicles, will be taken over by the Chief of the Motor Transport Corps, who will also make all future purchases and disbursements.

(322.02, A. G. O.)

II—Section II, General Orders, No. 38, War Department, 1918, is rescinded.

(322.02, A. G. O.)

By order of the Secretary of War:  
PEYTON C. MARCH,  
General, Chief of Staff.

Official:

H. P. McCain,  
The Adjutant General.



**W. S. S. Societies Formed at Ford Plant**

DETROIT, Aug. 13—More than 700 war saving societies have been formed in the plant of the Ford Motor Co. Between 30,000 and 40,000 employees have agreed to take war savings or thrift stamps every week for a total that will reach the \$2,000,000 mark within a year. The societies were organized at the Highland Park plant and at the blast furnaces in the River Rouge district. It is expected that many more societies will be formed in the Dearborn tractor plant of Henry Ford & Son.

**Olds Given Trailer Contract**

LANSING, MICH., Aug. 16—The Olds Motor Works has received government contracts for 2,100 portable kitchen trailers for aviation service. New equipment is being installed for manufacturing the trailers, and it is expected that actual work of turning out the trailers will be started by Sept. 1 and completed by Jan. 1.

**McCord Expanding Plant**

DETROIT, Aug. 17—The McCord Mfg. Co. is erecting a four-story addition to its plant, three stories to be used for factory purposes and the fourth to be used for offices. The new structure will be approximately 372 by 110, with area of 134,000 sq. ft., which, added to the present plant, will give a total floor area of 319,000 sq. ft.

**Miller Rubber to Expand**

AKRON, Aug. 16—The Miller Tire & Rubber Co. will take on a contract in the near future which will make it necessary to employ 400 or 500 additional men and girls. Officials of the company decline to disclose the nature of the contract, but it is assumed that it is a war order.

**Current News of  
Factories**

*Notes of New Plants—Old  
Ones Enlarged*

**Steel Products Co. Builds Powerhouse**

The Steel Products Co., Cleveland, will build a one-story powerhouse at 2196 Clarkwood Road, Southeast. The structure will be 45 by 70 and will cost approximately \$17,000.

L. W. Coppock has been appointed general engineer and chief in charge of production of the Lane Motor Truck Co., Kalamazoo, Mich., succeeding Harvey M. Stewart, who recently resigned as engineer of the Lane Motor company. Mr. Coppock was actively interested in the organization of the United Truck Co., Grand Rapids, and the Higrade Truck Co., Harper Springs, Mich.

**Avery Co. Absorbs Davis Concern**

MILWAUKEE, Aug. 17—The Davis Mfg. Co., Milwaukee, manufacturer of tractor engines, which recently was purchased by the Avery Co., Peoria, Ill., has lost its identity and from now on the big plant in West Allis will bear the name of the Peoria company exclusively. Frank M. Davis, however, continues as general manager of the unit. The Davis company has been manufacturing engines for Avery tractors and power farm machinery for several years and is now devoted exclusively to that purpose. One of the reasons why the Davis name is dropped is to facilitate operations under war-time conditions.

**Talking Machine Co. Builds Airplane**

PHILADELPHIA, Aug. 16—The first scouting hydro-airplane made from parts manufactured by the Victor Talking Machine Co. of Camden, has had a successful tryout. The plane was piloted by Lieutenant G. H. Pumpelly, who put it through its paces. The test showed the machine is capable of turning in a remarkably small area. Plain and fancy diving were features of the exhibition. The start was made from the Philadelphia Navy Yard at League Island, where the machine was assembled.

**Reliance Co. Obtains Government Contract**

APPLETON, WIS., Aug. 17—The Reliance Motor Truck Co., Appleton, Wis., which has just completed and equipped a new manufacturing plant at a cost of \$75,000 or more, has taken a large Government contract for machine-work on large calibre shells. Additional tools and other machinery for this work will be installed immediately. While the contract is being executed the Reliance company will continue to prepare for a large production of commercial cars and internal spur-gear drive rear axles, for which it already has booked contracts to keep the plant busy for months to come. Plans for an additional shop building are being prepared and work will begin before Sept. 1.

**Cleveland Automatic Tool Enlarges**

CLEVELAND, Aug. 16—The Cleveland Automatic Tool Co. has let contracts for a large addition to its plant at Central Avenue, Southeast and East Sixty-fifth Street. The company recently acquired the land adjoining its plant. The new structure will be two stories and will cost approximately \$100,000.

**BUSINESS CONDITIONS AS REPORTED TO THE FEDERAL RESERVE BOARD**

The following summary of general business conditions on July 23, 1918, is based on reports from the 12 Federal bank districts

District	General Business	Crop Condition	Industries of the District	Construction, Buildings, and Engineering	Foreign Trade	Money Rates	Railroad, Post-office, and Other Receipts	Labor Conditions
No. 1, Boston..... No. 2, New York.....	Active..... Activity limited only by shortage of raw materials.	Good..... Fairly good.....	Busy..... Intensely active on war work.	Small..... Heavy decreases, except on Government work.	Improved..... During fiscal year ending June 30 imports decreased 7 per cent, exports 14 per cent.	Increased..... Firm; ruling rate 6 per cent.	Mixed..... Post office, June returns increase over 1917; telegraph, quarterly returns increase over 1917.	Unsatisfactory..... "Work or fight" order and Federal control of employment of unskilled workers; somewhat relieves shortage.
No. 3, Philadelphia..	Very good.....	Very good.....	Very busy.....	Building at lowest mark for a decade.	Shipment of war supplies continues heavy.	Continue firm.....	Increasing.....	Shortage in all lines.
No. 4, Cleveland.....	Satisfactory.....	Good.....	Active.....	Inactive.....	.....	Very firm.....	Increase.....	Scarce; somewhat unsettled.
No. 5, Richmond.....	Active and profitable.	Unusually favorable.	Running to capacity; limited only by labor and supplies.	Private building negligible; Government housing active.	Restricted by lack of freight room.	Firm; 6 per cent. ....	Railroad, irregular; post office, volume large; reflects increased rates.	Some slight improvement reported.
No. 6, Atlanta.....	Excellent.....	Good.....	Very active.....	Light, except Government work.	Very light.....	Slight increase.....	Slight increase.....	Very unsatisfactory.
No. 7, Chicago.....	Do.....	Very good.....	Generally at capacity.	Stagnant.....	.....	Firm.....	Post office receipts increase.	Insufficient supply.
No. 8, St. Louis.....	Good.....	Favorable.....	Active.....	Quiet.....	.....	Do.....	Decrease in post-office receipts.	More settled.
No. 9, Minneapolis..... No. 10, Kansas City.....	Do..... Do.....	Good..... Do.....	Do..... Do.....	Fair..... Generally restricted to essentials.	.....	Do..... Practically unchanged.	No change.....	Good.
No. 11, Dallas.....	Satisfactory, considering summer season.	Fair.....	Do.....	Below normal.....	Good.....	Unchanged; steady to firm.	Railroad, increase; post office, 52.7 per cent increase.	Unsatisfactory on account of shortage.
No. 12, San Francisco.	Active.....	Good.....	Very active.....	Decreased 29 per cent from last month, but 16 per cent greater than June, 1917.	Large volume.....	Firm.....	Increasing.....	Settled.

## Aircraft Production Purchases

WASHINGTON, Aug. 16—Following is a list of purchases recently contracted for by the Bureau of Aircraft Production:

July 31, 1918

Taft Pierce Manufacturing Co., Woonsocket, R. I., equipment for motor assembly plant.

Jas. Cunningham & Sons Co., Rochester, N. Y., 50 Burton type balloon windlasses.

The Russ Co., Cleveland, Ohio, 9500 carrying chests.

Eastman Kodak Co., Rochester, N. Y., license to the Government under patent No. 733,729 and reissue No. 12,637 for dopes, to make or have made and use the processes and products covered by the above mentioned patents for war purposes and during the period of the war.

Aug. 1, 1918

North Carolina Pine Emergency Bureau, Munsey Building, Washington, D. C., 5600 pieces lumber.

Canadian Aeroplanes (Ltd.), P. O. Box 638, Toronto, Ontario, Canada, spares for Canadian JN4-D planes, alleron fittings.

Curtiss Aeroplane & Motor Corp., Buffalo, N. Y., spares for "V-2," Type 3, engine (470 items).

Aug. 2, 1918

George H. Maus, Amsterdam, N. Y., 60,000 bamboo poles.

The Curtiss Aeroplane & Motor Corp., Buffalo, N. Y., spare parts for 436 JN6-H-T training planes, equipped with forward gun and dual control; engine bed bearers, cowls, elevators, landing gears, rudders, wings, etc.

Thomas Morse Aircraft Corp., Ithaca, N. Y., 150 gunnery airplanes, 84-C, complete.

Packard Piano Co., Fort Wayne, Ind., 1000 combat propellers for US-12 engines.

Hallet & Davis Piano Co., Boston, Mass., 1000 combat propellers for US-12 engines.

Zenith Carburetor Co., Detroit, Mich., 50 sets No. 48 D. C. carburetor and spare parts for Hispano-Suiza, 150-hp., Type A engine.

The Silveco Co., South Bethlehem, Pa., 24,000 spark plugs for use on Hispano-Suiza Type A, 150-hp. engine.

Aug. 3, 1918

Ford Motor Co., Detroit, Mich., spare parts according to "M" and "L" lists for 5000 Liberty engines.

The Simplex Wire & Cable Co., Boston, Mass., 3000 miles field wire.

Eastman Kodak Co., Rochester, N. Y., 50,000 gal. cellulose acetate dope.

Standard Seamless Tube Co., Ambridge, Pa., 70,500 ft. seamless steel tubing.

Bordentown Steel & Tube Co., Bordentown, N. J., 54,500 ft. seamless steel tubing.

B. F. Goodrich Co., Akron, Ohio, 10 supply balloons.

Aug. 15, 1918

W. M. Matthews & Bro., 620 Southern Building, Washington, D. C., 5000 breast reels, without spool.

Wayne Oil Tank & Pump Co., 1337 Meridian Place, Washington, D. C., 93 portable oil tanks.

J. C. Pushee & Sons, Boston, Mass., 20,662 brushes.

Continental Car Co. of America, Louisville, Ky., services in connection with crating 350 machine shop truck bodies.

## Contracts

Standard Aircraft Corp., Elizabeth, N. J., 60,700 ft. seamless steel tubing.

Curtiss Aeroplane & Motor Corp., Buffalo, N. Y., 40 sets wings, upper and lower, right and left, complete.

Unit Construction Co., Fifty-eighth Street and Grays Avenue, Philadelphia, Pa., 2700 air fans for driving 100-watt generator used on radio telephone combination transmitting and receiving set.

Aug. 20, 1918

Standard Aircraft Corporation, Elizabeth, N. J., for services in the erection of 1 British Handley-Page airplane.

Wright-Martin Aircraft Corp., New Brunswick, N. J., services and material in repairing motor returned from United States aerial mail station, Busleton, Pa.

Curtiss Aeroplane & Motor Corp., Buffalo, N. Y., 436 JN6H advance training planes with dual control, and fixed gun only; 34 JN4H advance training planes with dual control, and fixed gun only for the Navy.

Spitdorf Electrical Co., Newark, N. J., 40 sets Dixie D800 magnetos and spare parts to be used in connection with all Hispano-Suiza engines using 1 right-hand and 1 left-hand magneto.

D. Nussbaum & Co., Union Course, L. I., N. Y., 7500 sweaters.

Wright-Martin Aircraft Corp., New Brunswick, N. J., repairs for Hispano-Suiza type A engines—crankshaft and hub assembly, crankcase assembly complete, water pump assembly, Dixie D800 magneto assembly, right-hand cylinder cover, tachometer drive assembly.

Long-Knight Lumber Co., Indianapolis, Ind., 100,000 feet walnut.

British Munition Board, London, England, 125 lenses for airplane cameras.

Wright-Martin Aircraft Corp., New Brunswick, N. J., spare parts for Hispano-Suiza engines—cylinder casting left-hand and right-hand aluminum assemblies, cylinder casting steel sleeve assembly.

Firestone Tire & Rubber Co., Akron, Ohio, 436 outer casings (latest type now in production for Curtiss JN6H advanced training planes).

Unit Construction Co., Philadelphia, Pa., material for 500 sets of laminations for Handley-Page propellers.

Hardman, Peck & Co., New York, N. Y., 1000 sets of laminations for Handley-Page propellers.

C. F. Pease Co., Chicago, Ill., 1125 100-yard rolls X-electric blue print paper.

Lycoming Foundry & Machine Co., Williamsport, Pa., 15 sets tools, complete, for maintenance for Gnome airplane engines, type B2.

## Lamp Co. Declares Dividend

The C. M. Hall Lamp Co. has declared a 6 per cent dividend on \$600,000 of outstanding stock, payable Aug. 22, half in cash and half in Liberty bonds.

## General Engineer Depot Contracts

WASHINGTON, Aug. 16—Following is a list of contracts placed by the General Engineer Depot:

Aug. 9, 1918

Penberthy Injector Co., Detroit, Mich., automatic injectors.

U. S. Rubber Co., New York City, conductor cables.

Aug. 10, 1918

Westinghouse Co., Schenectady, N. Y., grease cups.

General Electric Co., Washington, D. C., spares for motor.

Aug. 13, 1918

Goodyear Tire & Rubber Co., Philadelphia, Pa., belt clamps and rubber belting.

International Motor Co., Washington, D. C., spares for trucks.

## Motor Transport Contracts

WASHINGTON, Aug. 16—Contracts for 5000 AA trucks were placed by the Motor Transport Service as follows:

J. C. Wilson Truck Co., Lexington Motor Co., Velle Motors Corp., Auburn Auto Co., Dort Motor Car Co., Hupp Motor Car Co., Elgin Motor Car Corp., General Motors Truck Co., Standard Motor Truck Co., Saxon Co.

The AA standard army truck is an adaptation of the G. M. C.  $\frac{3}{4}$ -ton truck No. 16, which replaced the original AA model.

## Developing Standard Compass Tests

WASHINGTON, Aug. 19—The Bureau of Standards is making an investigation of magnetic compasses. The Bureau will develop a standard method of testing compasses and will prepare specifications for their purchase by the Government. A special form of magneto-meter has been devised to determine the magnetic movement and rotation test for pivot friction. It is expected that several thousand compasses will be tested in the course of the present year.

## Ford Motor Co. Files Suit

MILWAUKEE, Aug. 17—The Ford Motor Co. has filed suit in the circuit court at Milwaukee against the Lippow Cycle Co., 704 North Avenue, to force it to remove a sign announcing the sale of Ford accessories and supplies. The Ford company claims the Lippow company is using the Ford trade mark illegally.

## Calendar

## ENGINEERING

Sept. 2—Cripple Creek, Colo. American Institute of Mining Engineers.

Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

## ASSOCIATIONS

Oct. 7-12—Milwaukee. American Foundrymen's Assn. and 5 allied organizations. Milwaukee Auditorium.

## SHOWS

Aug. 19-24—Erie, Pa. Tractor demonstration (Exposition Grounds).

Aug. 20—North Rose, Wayne Co. Tractor demonstration. State Food Commission. Calvin J. Huson, Director.

Aug. 24—Herkimer, N. Y. Tractor demonstration (Field Day). Chas. A. Taylor in charge.

Aug. 28—Gates Center, Monroe Co. Tractor demonstration (State Fair) Food Commission. Calvin J. Huson, Director.

Aug. 28—Concord, N. H. Tractor demonstration (County Farm Bureaus). M. C. Wilson, Director, Agriculture Extension, Dunham, N. H.

Aug. 29—Laconia, N. H. Tractor demonstration (County Farm Bureaus). M. C. Wilson, Director, Agriculture Extension, Dunham, N. H.

Aug. 28-30—West Raleigh, N. C. Tractor demonstration (Farmers' Convention, College Farm). Dr. R. Y. Winters in charge.

Aug. 30—Campton, N. H. Tractor demonstration (Albion Farms). H. G. Gulliver, Mgr.

Aug. 30—Cheshire, Conn. Tractor demonstration (New Haven County Farm). Mr. Harvey, Mgr.

Sept. 2-6—Hartford, Conn. Tractor demonstration (State Fair). Will F. Landon, Sec.

Sept. 2-7—Indianapolis, Indiana. State Fair. Indianapolis Automobile Trade Assn.

Sept. 5—Medina, Orleans Co. Tractor demonstration (State Fair) Food Commission. Calvin J. Huson, Director.

Sept. 9-14—Milwaukee. Milwaukee Automobile Dealers, Inc. Fourth Annual Wisconsin State Fair. Hart J. Ruddle, Mgr.

Sept. 9-14—Syracuse, N. Y. Tractor demonstration (State Fair). J. Dan Ackerman, Secy.

Sept. 17-20—Riverhead, L. I. Tractor demonstration (County Fair). Harry Lee, Sec.

Sept. 30-Oct. 4—Trenton, N. J. Tractor demonstration (Trenton Fair). Harry B. Salter, Supt.

## RACING

Sept. 2—Uniontown. Uniontown Speedway Assn.

Sept. 7—Chicago. Chicago Speedway.

Sept. 21—Sheepshead Bay.

Oct. 5—Cincinnati. Cincinnati Speedway.



SEP 2 1918

# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

Vol. XXXIX  
No. 9PUBLISHED WEEKLY  
NEW YORK, AUGUST 29, 1918Ten cents a copy  
Three dollars a year

## Champion

### Dependable Spark Plugs



## Big Increase in Porcelain Efficiency

*Half Again as Much Resistance to Current When Heated*

In the high-speed, high-compression motors of to-day spark plugs must work in heat undreamed of a short time ago.

Yet under intense heat the porcelain insulator that once worked perfectly actually becomes a conductor of the electric current—fails to supply the explosive spark.

But science has now more than kept pace.

Experiment 3450 in the tenth year of unremitting original research work in our porcelain laboratories has produced a porcelain with half again as much resistance to current when heated.

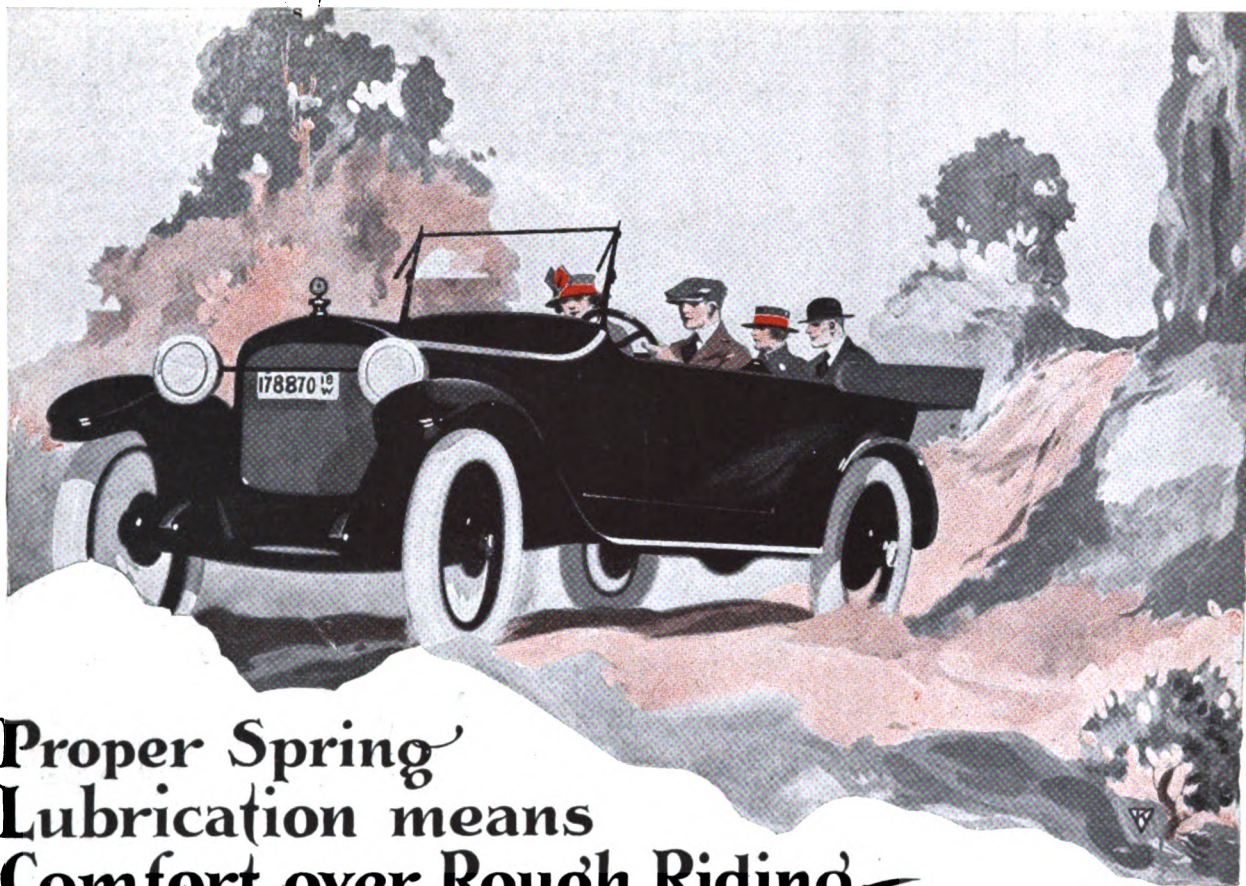
Champion Dependability takes so long a step forward that it seems well

nigh inconceivable that any future motor will ever again develop heat enough to threaten short-circuiting through the porcelain insulator.

Dealers have always found it to their advantage to sell Champion Spark Plugs. Now more than ever their greater dependability means increased business. Sell them.

**Champion Spark Plug Company, Toledo, Ohio**





## Proper Spring Lubrication means Comfort over Rough Riding—

Is your car a rough rider? Do you know that you can improve its riding qualities from 50% to 100% with proper spring lubrication? The easiest and cheapest way to lubricate springs is with Johnson's Stop-Squeak Oil. You don't need a tool of any kind—it isn't even necessary to jack up your car. Just squirt Johnson's Stop-Squeak Oil on with an oil can or paint it on with a brush.

# JOHNSON'S STOP-SQUEAK OIL

Johnson's Stop-Squeak Oil is a remarkable penetrator. It will immediately seep between the spring leaves driving the dirt and rust before it and leaving a thin layer of lubricant between.

### *Takes Out Every Squeak*

Johnson's Stop-Squeak Oil is unexcelled for removing squeaks of all kinds—in springs, shackle bolts, body, fenders, top, etc. Just locate the squeak and touch with Johnson's Stop-Squeak Oil.

Quarts.....\$ .85	Pints.....\$ .50
Half-Pints.....\$ .35	

Write for our booklet on "Keeping Your Car Young."  
We will gladly send it free and postpaid. It will tell  
you how to reduce automobile depreciation.

**S. C. JOHNSON & SON, Dept. A, Racine, Wis.**



# **AUTOMOTIVE INDUSTRIES**

## **THE AUTOMOBILE**

VOL. XXXIX

NEW YORK, THURSDAY, AUGUST 29, 1918—CHICAGO

No. 9

## **Airplane Delays Due to Lack of Co-operation and Experience**

**Appointment of Ryan as Second Assistant Secretary  
of War Step in Right Direction**

**ARMY ORDERS FROM FRANCE CAUSED CHANGES**

**Engine and Plane Program Frequently Altered—Multitude  
of Manufacturing Reasons for Delay**

**By David Beecroft**

**N**EW YORK CITY, Aug. 28—Specific blame for the unfortunate failure of our aircraft program cannot be laid to any one individual. The blame can justly be spread not only over the entire civilian personnel connected with the problem, but also over the army and navy departments connected with it. The blame rests not only on these parties in America but partly must rest on those connected with this work in Europe.

This is the only conclusion that can be arrived at after studying the concise, yet fairly voluminous report of the sub-committee of the Committee on Military Affairs which spent months visiting the different aircraft factories and interviewing persons of all caliber connected with the airplane program. This committee also visited the testing fields and carried on other lines of investigation with the possible exception of investigating charges of personal dishonesty, or official corruption, which investigation is being carried on by Charles E. Hughes.

The report of the sub-committee is perhaps as complete as could be expected, as the committee

realizes the volume of the work before it. While the report is a pretty general denunciation of the complete airplane program, the humanness of the committee crops out when it declares that "your committee realizes that it is easier to criticise than to construct, and that due allowance should be made for mistakes of judgment, which are unavoidable in the organization of a new branch of the service, involving the establishment of an extensive industry. Our inquiry has been as impersonal as these conditions have permitted, and it is in the same spirit that this report is made."

The only possible deduction after studying the report and taking cursory glances at the 1226 pages of evidence obtained in questioning over 110 individuals connected with the aircraft work is that so long as it is human to err, scores, in fact hundreds, of the charges in the report must be ascribed to this human limitation. There is no thought in this of attempting to whitewash any individual in anywise connected with the design or production of airplanes. This statement is made because of the fact

that the delays in aircraft production were very largely because the airplane program, which we had to face after our declaration of war, had to be evolved under strenuous conditions.

It was a new and very highly technical industry in which our country had had a negligible experience. While as a people we had built some planes for peace purposes, we had never built a single combat machine; even our planes which were used in the Mexican campaign were for ordinary purposes and not for combat, so that our experiences in that episode counted for nothing so far as our airplane program is concerned.

It is impossible to agree with the tenor of the report which places practically all of the blame on the automobile industry and the evidence given does not bear out this exclusive condemnation. It is true that the automobile industry was not familiar with many of the problems connected with aviation, particularly that of plane design and construction. On the other hand, there was no group of manufacturers in America familiar with this work excepting small firms that had never had any experience in combat plane design or production.

The automobile industry has taken hold of the development of the Liberty engine and from the general approval of this type of engine, which is now less than 14 months old, and from the great orders which had been placed for it by the Allies, those criticisms by the committee of the industry become not only unmerited and unjust, but lead to the sole conclusion that the work of the committee seems to have been confined too much to the smaller concerns who have felt slighted in this Liberty engine program and who were slighted because of the lack of production capacity and of any organization to take hold of the work.

No stronger commendation of the work the automobile industry has done could be asked than the fact that the number of Liberty engines ordered has been increased from 22,500 to 50,000 and it is probable that orders will soon go as high as 68,000 engines for the next 12 months.

Further commendation of the same policy of the automobile industry in the question of engine design is the corroboration of the Liberty engine program by announcing that the eight-cylinder Liberty, which was originally developed in June and July, 1917, and set aside by army orders later, is now being taken up and will unquestionably fill an important place in our aviation engine program. It is impossible to understand why the Senate Committee should possibly lay the entire blame of the aviation program on an industry that has accomplished so much.

The British War Cabinet report in its chapter on aviation, published in *AUTOMOTIVE INDUSTRIES* some months ago, declared that it requires 12 months from the conception of the design of an aircraft engine until it is in production, and approximately 6 months for the development of a plane through the same stages. The American automobile industry far exceeded this estimate of a country which has been in war 4 years and has learned many lessons in

aviation engine design and construction because in less than 1 year the program of the Liberty engine for eight and twelve-cylinder designs was conceived, the eight-cylinder design was developed and then set aside, and the twelve-cylinder developed and put into production, so that over 4000 engines have been delivered.

With these as actual facts, the censure of the committee cannot be accepted as just and can only be interpreted as being biased due to the evidence of some who have not been as much in sympathy with the program as they should have been. To the critical reader the complete value of the report is lost in view of the failures of criticism to coincide with facts.

Had the report commented reasonably upon the difficulties connected with the development of production as the evidence indicates, we would have agreed that the deductions in the report were in accordance with the evidence at the hearings. On the other hand, the denunciations of the automobile industry are not even modified, but given the complete atmosphere of sole responsibility, in short the industry is blamed for everything, even the hundreds of things over which it had not the slightest control.

It was the human inability to grasp the magnitude of the aircraft program in June, 1917, that practically set the stage for the avalanche of criticism that has been heaped upon everyone connected with aircraft work since January, 1918, when it began to be made known that the program was anywhere from 3 months to 6 months behind schedule.

The real trouble started when those connected with aircraft made the announcement to the newspapers of the country at a dinner in New York City in May, 1917, that the confidential program would be to build perhaps 10,000 planes in the next year. Some of the daily press, not satisfied with 10,000 planes, swelled the number to 50,000, and in May, June and July of 1917 the country was more or less educated to the belief that it was within the range of possibility for America with its world reputation for production to put on the battlefields of Europe during 1918 as many as 100,000 airplanes of all denominations.

Unfortunately, the seed of American possibility of supremacy was scattered broadcast. The thousands of highways through the air to Berlin were accepted as a possibility by millions of our people.

Those in charge were but human beings of the same physical stature as of April 5, before we entered the war. It is true our entry into the war worked a great mental change, but it was impossible to carry out the visions of many who created the picture. *In a word, the aircraft personnel oversold itself.*

That the report, which is published in full in this issue, is certain to accomplish much good is shown by the appointment of John D. Ryan as Second Assistant Secretary of War, with complete responsibility for the army air service, which appointment is but one step upward in the certain program of having a cabinet officer in complete charge of the air service of the army and navy.



Mr. Ryan's appointment as Second Assistant Secretary of War means that the dual control which the government created on May 20 of this year, when Mr. Ryan was given direction of the Bureau of Aircraft Production and Major-General William M. Kenly was given charge of the Bureau of Military Aeronautics, comes to an end. This in itself is an acknowledgment of the humanity of our government, which failed to realize the stupendous problems of aircraft, and to-day realizes as a result of the present report that many of the delays have been due to incorrect organization, which can scarcely be laid upon the shoulders of the personnel carrying on the work under the specified organization. The end of this reorganization by Congress has not yet been reached, because to-day the army and navy aircraft program has not been centered in one man as it is certain to be.

Let us look at this human characteristic to err in perhaps a broader light: It is the easiest thing for our 80,000,000 people who have reached the age of manhood and womanhood to criticize the aircraft personnel for not doing exactly what England, France and Italy did in the manufacture of engines, airplanes, airplane equipment, and in all other matters relating to aircraft.

### Why a British Air Service?

These criticisms may be just, but if we are to continue our criticisms we might ask, Why did not Congress duplicate, identically the legislative organization of England, France or Italy? Why did we not create last year an air service? We can go further and ask: Why did not Great Britain create an air service in 1914 immediately after the declaration of war instead of having to wait until 1917?

There is but one answer, namely, that everybody connected with the air program in Great Britain is human, subject to error, and the same applies to everybody in America whether connected with the army, the navy, the government, or the civilian personnel of aircraft work.

From the hearing before the sub-committee of the Committee on Military Affairs, United States Senate, various reasons for delays in connection with the broad airplane program crop out in different parts of the hearings and the one conclusion is that these delays are so widely spread and cover so many different fields that the blame can only be laid to the enormity of the work, the highly technical



**John D. Ryan**

*Who has been appointed Second Assistant Secretary of War with complete charge of the Army air service*

were in total ignorance up to the time we declared war.

We had never built a machine for combat purposes and one that was intended to carry a machine gun, and it is not surprising that many delays were caused by this. Bombing devices had to be developed. The photographic task alone was a huge one. There was the development of all kinds of instruments for measuring speed, altitude, etc.

Previous to entering the war, our airplane engine production for the Allies was confined to building for training planes and we were in production on the 100 hp. Gnome and the 150 hp. Hispano-Suiza engine. One company had spent, according to its own admission, \$10,000,000 in practically 2 years in adapting the manufacture of Hispano-Suiza engines to meet American factory conditions and American workmen.

### Lack of Skilled Mechanics

The lack of sufficiently skilled mechanics familiar with the manufacture of instruments and capable of interpreting and producing delicate instruments required for combat planes is but one example of the cause of delay in this line.

There was a great lack of engineering ability for the design and production of combat planes none of which had ever been built in America. Previous to the declaration of war the government had not demanded the development of production of a single combat plane. Under such conditions it is not surprising that under the strenuous atmosphere of April, May and June, 1917, this lack of experience should result in failure properly to map out a complete air program.

character of the parts entering into it, and the general lack of experience on the part of all those connected with the work.

In this connection the reader must keep in mind the broad problem of aviation instead of centering perhaps his attention on the Liberty engine, which in publicity in the last year has been looked upon as the apex of our aviation program.

The engine is only a small part of the task. There are four to six quite different types of planes required for combat work and each of these is a huge problem in itself. There is then the adapting of an engine suitable for these. There is the development of a huge line of aircraft equipment embracing over thirty different kinds of apparatus with practically all of which we



Col. Robert L. Montgomery



Howard E. Coffin



Admiral D. W. Taylor

In order to cope with the aircraft requirements the Aircraft Production Board, which was created in May, 1917, almost immediately sent a mission of army and navy officers and civilians to Europe to investigate aircraft methods in England, France and Italy, and to recommend types of engines, planes and accessories necessary for the work and to have samples of these planes, engines, instruments, accessories, and all necessary drawings, together with bills of materials, specifications and other necessities to this country in order to facilitate production.

Perhaps the great delay in the production of combat planes started at this time because samples of the planes recommended by this mission for manufacture here were not received in the United States until after September. When these samples arrived they were without engines with the exception of the Spad and many of the blueprints which accompanied them were inadequate for development according to American methods of quantity production.

### Training Planes Speeded Up

These were five precious months in the aircraft program work and they were made use of by the Aircraft Production Board in speeding up the building of training planes and engines so as to meet our training requirements. The 3000 miles which separated the United States from the fighting front must always be considered as one of the reasons for serious delays.

There should have been organized in 1917 a weekly service between the technical departments of Europe, England, Italy and the United States. There should have been more of our engineers for engines and planes close behind the fighting front in France, so as to bring to America through our own channels correct recommendations regarding different types of machines.

The manufacture of accessories for combat planes is scarcely comprehended by any excepting a few directly connected with the work. These were the cause of serious delays. Other delays were due to the Ordnance and instrument equipment that was to go on these combat planes and this equipment was

not determined until December, 1917, or 8 months after the declaration of war.

Even the settlement of this equipment was not final and as late as January, 1918, the American Expeditionary Force ordered changes in this equipment and it was the middle of February before the Engineering Department of the Aircraft Production Board had these changes in its hands.

Some of these involved the mounting of two machine guns instead of one to fire through the propeller of the DeHaviland-4 plane, which, changed as late as February, 1918, called for a redesign of the fuselage cowl and arrangement of connections between the engine and various instruments.

### Liberty Engine Design Changed

There were other causes of delay which relate more directly to the engine program. When plans were originally laid down for the Liberty engine on June 4, 1917, it was to be an eight-cylinder design, the first sample of which was running at the Bureau of Standards in Washington July 25.

Nearly a month later, or in August, 1917, cable advices from the Bolling Mission in Europe indicated that the development of aircraft was moving so rapidly on the battle front in France that the eight-cylinder engine would be obsolete before it could get into actual use and the Mission recommended a twelve-cylinder Liberty engine instead.

Immediately, the engineering organization of the Aircraft Production Board took up the development of a twelve-cylinder engine and it was entirely due to the fact that when the Liberty engine was conceived in June that it was to be so standardized that a majority of the parts could be used in four-cylinder, six-cylinder, eight-cylinder and twelve-cylinder design, that the development of the twelve-cylinder, which was begun in August, was able to proceed.

There were then delays that came because of the development of the twelve-cylinder engine. Originally it was intended with 5 x 7 in. cylinders to develop 330 hp., but this was soon increased to 400 hp. by virtue of improvement in the cams, intake manifolds and carburetion.



As this increase of horsepower continued, many of the original parts, such as connecting rods, bearings, etc., became too weak for the increased power, which called for a redesign of these parts to give increased strength. The redesigning of the connecting rod, in order to give increased bearing surface, called for a complete change in the dimensions of the rods which required the manufacture of new dies, tools and fixtures, which caused a serious delay in production. This delay was accentuated due to the great shortage of tool makers and die makers throughout the country.

The difficulties some of the manufacturers experienced in getting dies and fixtures constitute another chapter in the aircraft delay and one which cannot be laid at the door of any manufacturer.

### 165 Jigs and Fixtures Changed

An example of these delays was given by W. C. Leland of the Lincoln Motors Co., in which he mentions that the making of heavier bearings in the connecting rod called for a change of 165 jigs and fixtures. The difficulty of getting these was accentuated by the crowded condition of tool shops and the necessity of using inexperienced tool makers in many of these shops.

The Lelands employed the best tool makers it was possible to obtain in the country and yet many of these tools were rejected. They had to be made within 1/1000 in. accuracy and when they arrived they were 7/1000, 8/1000 and often 9/1000 out of accuracy. The Lincoln company had to make over many of these jigs and fixtures and had to build over practically every jig and fixture with its own workmen in the factory. At one time it had 83 different factories in the country, extending from Maine to Ohio and including Iowa and Illinois, manufacturing tools. This work was greatly increased by changes in the crankshaft and connecting rods as well as others in the propeller hub.

Unfortunately the public fails to even think of the enormous work of changing all of these jigs and fixtures and when it criticises it fails to realize the many steps in quantity production and the time and money required in getting a factory tooled and jigged for production manufacture.

### Increase in Power Brought Trouble

There were many other troubles with the Liberty engine, most of which might be traced to the increase in power from the original 330 to the present 440 hp. There were difficulties with radiation, lubrication and carburetion. The original crankshaft was not an oil pressure one and the changing to an oil pressure system carried many changes with it.

As soon as the manufacture of different parts of the engine was passed on to the different manufacturers, many changes in parts were suggested by these manufacturers in order to make production possible.

The Aircraft Production Board, according to the evidence, heeded a great many of these changes, which naturally caused delay, but in the end worked for production.

One of these might be cited: The manufacture of the forged steel cylinders by the Ford company from tubing instead of from a solid forging as was used in the experimental engine. The use of the forging has proved to be one of the great manufacturing achievements in connection with our aircraft program.

There were many other delays resulting from a failure of quick communication between Europe and America and at this writing it would seem that a much more comprehensive mission should have been sent to study the aircraft situation in June of 1917 than was sent.

Here again it was human to err and unquestionably there was not a single person in America at that time to grasp the magnitude of the work sufficiently to select an adequate mission for the work. As a result, the necessary engineering information was not supplied promptly enough from Europe and the program lagged. This may be the reason why the engine program after all, although one of the biggest, outstripped that of ordnance and equipment for the combat planes.

### Expected Too Much of Engine

There may be a just criticism in the fact that too much of the engineering talent connected with the Aircraft Production Board was sewed up in the design and development of the Liberty engine. Today it looks as if an error were committed in expecting the Liberty engine to fill the complete gamut of airplane requirement.

Perhaps it was an error to think that this engine made with four, six, eight or twelve cylinders would perform any phase of combat work at the front.

From the various hearings in the sub-committee report, the reader is apt to reach the conclusion that part of the program was held back pending the development of the Liberty engine and the proving of its suitability for all phases of work. For example, the development of heavy bombing planes does not seem to have made the progress it should and seems to have been delayed until the suitability of the Liberty engine for this work was decided upon.

This seems to be borne out by the report which says that in October, 1917, we had the necessary facilities to build the Caproni bombing plane and that as early as January, 1918, we had expert Caproni engineers in this country ready to proceed with the manufacture of this plane.

### Delay in Transmitting Orders

Although so qualified to go ahead, it was not until Sept. 1 of this year that the first Caproni was constructed. As long ago as the summer of 1917 the Standard Aircraft Co., Elizabeth, N. J., was instructed to have its factory in readiness to build these Caproni machines, but nothing definite was decided upon.

As long ago as October, 1917, at Paris, France, the manufacture of the Caproni was taken up between our Mission and Italy and the apparent decision to go ahead was given; but notwithstanding this it was





Col E. A. Deeds



Charles W. Nash



W. C. Potter

January, 1918, before the Standard Aircraft company was given a verbal order to go ahead with 1400 of these machines, and at the date of the report no official order confirming the verbal order seems to have been given.

Lack of decision in connection with the production of this plane was further indicated by the fact that in April, 1918, the Fisher Body Co., Detroit, was given a contract to complete 250 of these planes, which contract was later canceled.

The report fails to bring out just why there was so much vacillation in connection with this Caproni program, but undoubtedly it was due to the lack of certain information or some policy connected with the work. For example, on Sept. 15, 1917, the Curtiss airplane corporation was given a verbal contract to build 1500 Capronis, which contract was confirmed in October. The Curtiss company appears never to have obtained the necessary information to go ahead and the contract was canceled later.

## Automobile Industry Unjustly Censured in Senate Report

Failure of Government to Give "Go Ahead" Order Has Held Up Production—There Has Been No Profiteering, as Thinly Suggested in Report—Industry Has Done Well

By J. Edward Schipper

**D**ETROIT, Aug. 27—*Special to AUTOMOTIVE INDUSTRIES*—In the eyes of the automobile industry the report of the Senate Committee on aircraft matters places the Government in the light of having bitten the hand that fed it. It is regarded as regrettable from every standpoint and particularly as a very bad preface to the coming Liberty Loan campaign when every ounce of public confidence will be needed.

Were the report true in spirit, it would not have caused the dismay in the industry that it has. "Where," it is asked, "would the government have turned in its efforts to find men of experience in engine production if it had not turned to the auto-

mobile industry?" Yet the industry is blamed for having turned over its facilities, disrupted its tool-rooms, disorganized its production schedules to enthusiastically and patriotically take up the manufacture of a product recognized to be the most difficult in the world to manufacture.

In spite of all difficulties the end of a year of work, Sept. 5, 1918, will see 20,000 airplane engines manufactured in this country. Of this 6000 are Liberty engines and the balance are made up of the Hispano-Suiza, Curtiss OX, Hall-Scott, Gnome and LeRhône types. The manufacturing schedule will total 3000 Liberty engines a month by the end of September. In addition to these there will be 1000 Curtiss and

600 Hispano-Suiza engines per month. Were it not for the automobile industry, what percentage of these would have been made?

At this very time, when the ways should be all cleared for the production of airplanes up to the very limit of productive ability, the full capacity of our plants is not being utilized. The natural tendency to stop action until the completion of an investigation is directly responsible for this.

The Fisher Body Co., with a capacity of twenty planes per day, has never been able to get "go ahead" orders enough to keep its plant going full swing.

The Ford Motor Co. could have been much further ahead in its production schedule than it now is if orders had been released.

The automobile industry was ready and willing but vacillating policies prevented the throwing of full productive effort into airplane production.

The now-historic \$640,000,000 appropriation and the references to it in the report come in for bitter comment by some of the industry who were active in framing the original policy in regard to airplane matters. It is claimed that this appropriation was worked out by the army itself on an estimated production of 22,500 planes. There never was any prediction or expectation that this number was to be ready by July 1. The appropriation was worked out by General Pulloy and his technical board at the time of the framing of the appropriation bill. Of this number it was planned to order 5000 in Europe, 7000 were to be training planes and the remainder fighting planes. No one seems to be able to find any foundation in fact for the much-cited statement that this country would manufacture 22,500 planes by July 1.

What was predicted and what could have been done was to have reached a production of 1000 planes per month by July 1. Dayton-Wright alone could have reached 100 per day with 70 per cent spares or nearly 170.

Fisher could have been started, to say nothing of Curtiss and other plants scattered throughout the country. With investigations coming on, those vested with the power to order were naturally afraid to move with the result that men in the AUTOMOTIVE INDUSTRY WENT AHEAD AND ORDERED MATERIAL IN ADVANCE OF RELEASE ON ORDERS SO THAT PRODUCTION WOULD NOT SUFFER ON ACCOUNT OF THE DELAY. Yet, the automobile industry is accused in the report of being responsible for delay.

The bitterest pill of all to swallow is the thinly veiled accusation of profiteering. This is particularly true of the Liberty engine program. When the time came to fix a price on the Liberty engine there was nothing to go on except what had been paid for foreign airplane engines. These had been sold from



Col. Sidney Walden

\$20 to \$30 per horsepower. The Liberty engine with 450 hp. would have been estimated at \$9,000 at the lowest in accordance with foreign costs. Rolling White of Cleveland and Henry May, vice-president of the Pierce-Arrow, were called into consultation on the matter and at the suggestion of the Secretary of War estimated the cost. The figure placed by them was \$6,000 for the twelve-cylinder engine.

AFTER ENTERING INTO PRODUCTION THE MANUFACTURERS THEMSELVES WITHOUT DISSENT CUT THE ALLOWED COST FIGURE TO \$5,000. On this a flat profit of 12½ per cent was allowed.

Most absurd of all, in the eyes of the industry, is the claim in the report that we should have

gone ahead on quantity production of foreign types. Anyone who has had experience with past experiments in this field can see what this would have led to. The experience of the Wright-Martin company in manufacturing the Hispano-Suiza engine may be referred to, for instance. On an order for 400 of these engines, it took 18 months to get into production and after entering production, 4 months to turn out the 400 engines.

The experience of the Willys-Overland with the Sunbeam is another typical example. This company received in June, 1917, an order to build 1000 Sunbeams. Due to changes and imperfections in the drawings, but six motors had been completed in May, 1918. The airplanes of England, which has a production schedule of some 2800 per month, are produced in approximately 300 plants of various sizes scattered all over the kingdom. It is doubted whether any one of these plants could produce a complete set of detail construction drawings for any one plane. They are hand-made and far removed from the manufacturing proposition that American methods call for.

#### Handley-Page Delays

When the Handley-Page made its long flights and attracted attention to its flying qualities, it was decided to build that type of plane in this country. The Handley-Page company offered at a fancy price to supply its drawings and data for manufacture. Arrangements were then made with the British government over the heads of all commercial parties for the free exchange of manufacturing licenses for the period of the war and the drawings of the Handley-Page were sent over. A great number of dies were made by concerns like the Mullins Steel Boat, when a new set of drawings incorporating improvements were sent over and the whole set of dies had to be scrapped. This occurred three times before a proper set of dies for the metal fittings of this plane could be made. This all helped to spend some of the

appropriation and showed that we could not rely on foreign practice to help us much.

Even taking the best of foreign practice as represented in the Rolls-Royce engine. With 10,000 employees this company turns out 50 of these engines a week. The recommendation that we build this engine which does not equal in performance the Liberty and which falls short of its production facilities by the ratio of about 1 to 7, will hardly be carried out. The Rolls-Royce parts ordered by England to be made in this country are not being delivered now. With this difficulty in making the parts, it is easy to see what would have been encountered in

making the first engine. A total of 6000 Liberty engines in the first year looks large in comparison.

**ENGLAND'S DESIRE FOR 20,000 LIBERTY ENGINES IMMEDIATELY IS ADDITIONAL INDORSEMENT IF ANY BE NECESSARY.**

That the Senate Committee listened too much to small manufacturers who although they had engaged to some extent in the airplane business, were absolutely ignorant of war requirements and certainly of quantity production, is the belief of many. It is upon evidence of this kind, in the belief of these people, that the committee based its statements re-

(Continued on page 358)

## Uncertainty Still Exists in Aircraft Program on Planes

### We Are Still Adapting Discarded European Types—Foreign Engineer's Reports Not Accepted—Bristol Plane May Be Re-Adopted

By ALLEN SINSHEIMER

**W**ASHINGTON, Aug. 27—The vague assurances regarding the immediate and future plans of our air program as told in the recent Senate report, combined with perplexing rumors of our activities in connection with Allied airplanes, still leave considerable uncertainty in the public mind, although the report has done much to clarify public opinion with regard to the earlier aircraft activities. The Senate's publication of the testimony of the witnesses in this matter has also helped to clear the atmosphere.

Rumors are current that a mistake was made in the selection of the SE 5 airplane which we have adapted from the British. It is said that the SE 5 was discarded by England in September, 1917, for the SE 5A, which has a higher speed and all around better performance. The SE 5A in turn, while still in use, was discarded for the Sopwith Camel which, in turn, has been discarded for the Sopwith Dolphin, which is now being replaced by the Sopwith Snipe. Each of these machines in turn has been regarded as superior to the preceding one by the British experts. Hence the public is asking why we have adopted the SE 5 long discarded by England.

#### Why the Bristol Failed

The failure of the Bristol airplane also arouses speculation. There is really no question about this. The American authorities simply took the Bristol airplane, which was designed by English experts for the 190 h.p. Rolls-Royce engine, which weighed 660 lb., and attempted to use it with the 450 h.p. Liberty engine weighing more than 950 lb. The excess weight and surplus power were not suited to the plane. Furthermore, the construction of the Liberty engine is entirely different from the Rolls-Royce and it occupied a greater width of space in the body

of the plane, which also had not entered into the calculations of its original construction. Consequently there was no surprise on the part of foreign experts when they learned that the planes fell away from the fuselage and that serious accidents had resulted. The attempts to use heavier fabric in this plane to counteract the heavier weight were not sufficient in them.

#### To Re-Adopt Bristol

And now after a year of experiment costly both in money and lives, comes the report that the American Government is again going to adopt the Bristol airplane equipped this time with the Hispano-Suiza engine. But strange to say, instead of adopting the latest Bristol type which is equipped with a 300 h.p. Hispano-Suiza, we are adopting the Bristol type used 2 years ago in England and long since discarded.

In his testimony before the Senate Military Affairs Committee, Major General Kenly spoke of the SE 5 as a two-passenger machine similar to the French Spad. He led Senator Reed to remark that it was strange that we had no single-seater. The SE 5 is really, according to authentic information, not a two-seater plane. It is a single-seated machine and differs in appearance, performance and horsepower considerably from the Spad.

An example of the lack of thorough co-operation between the experts and our authorities is shown in a recent instance where the most skilled foreign experts were called to this country to investigate and report on our training activities. They made an exhausted study and filed the report. This report has never reached the hand of Major General Kenly for whom it was intended, and up to this time the work performed by the men called from abroad has been wasted.



Foreign experts in this country are, of course, obligated by their position to refrain from criticism of our activities, but it is not difficult to learn that they are more or less discouraged and disgusted. Stories are told of how designs are brought in to them daily for their approval and even after they are O.K'd are never used. Some of these designs, it is said, are foolish and a waste of time, embodying many unnecessary practices, such as sport and racing lines similar to designs of racing automobiles. Others embody exceedingly valuable principles, but since they are never converted into airplanes are merely wasted. It is also said that many of the engineers waste their time drawing these "beautiful" designs without ever taking into consideration the necessary calculations and dimensions. •

Another example of our delay is found in the Caproni plane which Italy is turning out at the rate of several hundred a month. We have one Caproni plane finished. We might have had 2000 by this time had the authorities placed the orders a year ago. And now after months of delay and experiments and final completion of one machine authentic reports are to the effect that the orders just placed for Caproni machines have been cancelled and the entire Caproni program abolished. Following the experiments, tests and the excellent reports this action has created bewilderment and astonishment in the minds of both the public and the foreign air authorities. Up to this time no reason has been given for this action.

#### Aircraft Bomb Uncertainty

Still another instance of the apparent lack of co-operation is shown in our air bomb construction. The Allies discarded the single fuse bomb two years ago for the bomb with an instantaneous fuse at one end and a time fuse at the other. They also limited the production of the small 20-lb. bombs and increased on the 260-lb. and 500-lb. bombs. Up to a few weeks ago, according to reports here, the American authorities were concentrat-

ing their efforts on a single fuse 20-lb. bomb. Apparently there has been some protest, as it is now said that investigations are being held regarding the advisability of building the larger and two-fuse bombs.

"Too much desire to change," "too many engineers with individual preferences," "too many authorities" and "too little regard for foreign engineering practices" are said to be the principal causes for our airplane failure by those foreign experts who could be induced to express an opinion. They complain that when a type of airplane, such, for example, as the Caproni, is brought to this country, everyone of several hundred engineers has different opinions for changing the design, with the result that much time is wasted and that frequently harmful practices are incorporated.

#### DeHaviland Changes

Another example is that of the DeHaviland 4 as made in this country and regarding which many officers testified before the Senate Committee telling that it was too dangerous to fly. This machine as made in this country differs so radically from the British machine that it is difficult to realize that it is an adaptation from it. The original DeHaviland 4 is recognized as one of the most efficient airplanes used at the front. In fact, the entire DeHaviland line of airplanes are recognized as being among the best produced. It is said that no DeHaviland has been a failure. Yet our engineers so completely changed the DeHaviland 4 that it is reported to be a failure in this country. It is said that they have reduced its efficiency 66 2/3 per cent by adding unnecessary structural and material equipment.

The testimony of the witnesses as made public by the Senate Military Affairs Committee, including more than 1200 pages of statements, shows that an ambitious program is still contemplated and considered possible for the coming year.

## Opinions of Aircraft Experts from Senate Report

**Kenly Tells of Conflicting Cables from Pershing — Ryan Praises Liberty Engine — DeHaviland 4 Plane Not Yet Satisfactory — Henry Ford Advocates Single Head for Airplane Work — Nash Believes We Cannot Deliver 10,000 Planes by July, 1919 — Edgar Wants More Training Fields — Caproni Contract Delays**

THE variety of impressions in the 1226 pages covering the investigation of the Sub-committee of the Committee on Military Affairs, United States Senate, indicates how even to-day this stupendous maze of aircraft necessity has not sufficiently crystallized itself so that a definite program can even to-day be outlined. The following brief extracts from the examination of a few of the 100 or more witnesses serves to indicate this.

Major General Kenly, in his statements, told that the program calls for 350 complete squadrons during the coming year. This means between 6000 and 8000 airplanes. The pilots are already being trained. More than 3000 are ready. General Kenly told the committee that at this time there are thirteen American air

squadrons in France, comprising 273 airplanes. He said that there should be 175 squadrons with approximately 3500 airplanes with the American Expeditionary Forces.

General Kenly told that General Pershing frequently sent a cablegram ordering one type of plane one day and another countermanding it the day following. He stated also that while there was no friction between the Army and the Navy, there is a strong feeling on the part of the Army that the Navy is getting more than its share. He testified that General Pershing countermanded the order for Spad production last year and confirmed the recent rumors that criticism had come from General Pershing of the DeHaviland airplanes shipped to him.

John D. Ryan, chairman of the Department of Aircraft Production, and General Kenly both approved of the centralization of aeronautical activities under one head. Stories of what they called waste of millions of dollars were told and General Kenly laid the responsibility for the early delays and failures to lack of proper organization and executive ability. The DeHaviland 4, said the general, is not yet satisfactory, but is being perfected and is likely to be successful. The DeHaviland 9, he said, will soon be in quantity production.

Mr. Ryan testified that the Liberty engine, both eight cylinder and twelve, is rapidly reaching perfection and will be widely used. General Kenly also praised the engine, but complained that the original aircraft authorities should have developed an individual airplane for the Liberty engine and used foreign airplanes temporarily, earlier in the war.

Mr. Ryan stated that Colonel Deeds of the Signal Corps and Colonel Montgomery, both of whom had been criticized in the committee's report had practically severed their connections with the Department of Aircraft Production. He said that when he took charge of this department none of the men at the head of it were experienced so far as he knew. He told that loss of time and lives and waste of millions of dollars was the result of their work. We have not built a single fighting plane up to this time, he said, because we have wasted time experimenting with a machine to fit the Liberty 12 cylinder engine. The changes ordered in the DeHaviland plane by General Pershing, he said, will make it more serviceable, useful and of greater military value. He predicted quantity production of the DeHaviland 9 by October. The Liberty engine, he said, is better than any engine on either side of the water. There will be ample spruce for airplanes according to Mr. Ryan.

W. C. Potter, who was in charge of equipment under the Signal Corps and who is now Assistant Director of Airplane Production, told that General Pershing has asked for 25,000 airplanes by July, 1919. He stated that it is possible that 18,000 or 20,000 might be delivered.

### Ford Production 100 Daily

Henry Ford told the committee that the Liberty engine was the best airplane engine that has ever been designed and that his factory would produce 100 of these engines daily in the near future. He advocated a single head to control airplane engineering, production and operation.

Charles W. Nash, president of the Nash Motor Co., and now a member of the Department of Aircraft Production in charge of engineering and production, stated that DeHaviland airplanes only could be delivered by January. He believes that delivery of 10,000 air planes by next July would be nothing short of miraculous.

The training of aviators and the surplus of pilots now awaiting airplanes was described by Colonel C. G. Edgar, who was construction head of the Signal Corps. Colonel Edgar urged the building of more training fields and stated that those now in use are seriously overcrowded. He told, for example, of Camp Kelly No. 2 at San Antonio, Texas, originally built for 2100 men and now housing 4700.

Examination of officers of the Standard Aircraft Corp. developed the fact that this company's organization was reduced by 60 per cent due to the absence of Government work. The senators spent much time with the officers of this company in questions relating to its financing.

Captain Ugo D'Annunzio of the Italian Aviation Service and formerly chief engineer of the Caproni plane,

told how he had been disappointed in finding no manufacturing facilities for the Caproni machine and how he had been led to believe that these facilities existed by various officers and manufacturers. He praised the Liberty engine. He told that he had urged the officials to give the Standard Aircraft Corp. an order for two or three hundred Caproni machines because they had already translated the drawings according to their own factory facilities and stated that this suggestion was ignored. Other Italian officials testified that practically daily the American Government aircraft authorities would change their mind regarding the production of Capronis, decided one day to build 1000 and countermanding the order the next day, deciding to change certain details of construction one day and again deciding differently the following.

Much additional testimony of this same nature showing conflicting orders and indecision was added by various manufacturers. Weaknesses of airplanes and dangerous construction was described by fliers who testified.

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### Uncertainty Still Exists in Aircraft Program on Planes

(Continued from page 356)

garding the industry's having acted in a grasping manner toward the airplane orders.

All of the statements regarding the past do not affect the matter in hand, which is winning the war, so much as the fact that the factories now stand ready to go ahead and yet cannot get releases in sufficient quantities to keep the plants going to full capacity. Where the delay comes in, would have been a part of the report. For instance, the contract for 3000 Hispano-Suiza engines was presented by the army and cleared through the Aircraft Production Board in November, 1917. It is only within the past few weeks that "Go ahead" orders were given manufacturers on these engines. In the mean time what became of the orders? Why and where was the delay?

If anyone were to place a finger on the place where the delays have occurred it would be found to be nearly always where foreign practice entered in. The navy has gone ahead with its schedule remarkably well. It has never paid any great amount of attention to foreign development, but has followed American development straight through. It has never been possible to get foreign drawings that American shops could use. It has always been necessary to tear down the machine and measure it to make drawings that we could employ.

When all has been said, the original program of taking what we could of foreign production, but of going ahead on our own engine, the Liberty, has proven to be best. It was originally intended to make the Liberty engine in four, six, eight and twelve cylinders. We gave up all but the twelve and have now come back to the eight. Perhaps we shall return to the four and the six. This gave a range of engines that would cover every field in spite of the fact that the Senate committee points out that we have "made a mistake in trying to build an engine suitable to all purposes."

We have got to win the war. That is the final test and we need not be afraid that this country is going to fall down on its airplane program. The industry awaits the Hughes report with the feeling that it will clear up through its accuracy the vague accusations in the Senate report. In the meantime production is going ahead, and with the release of pending orders will unleash in full the productive ability of our plants. Ford is now turning out over

twenty-five Liberty engines per day, and so also are Cadillac and Lincoln Motors. The General Motors Co., in spite of the impression created by a conversation quoted in the Senate report, is doing its utmost and will soon be up to a production of fifteen per day. Perfection has not been reached, but every day irons out difficulties which appeared overwhelming a few months ago, and every day brings smoother operation of the machinery.

## Coffin Protests to Congress

**Declares Civilian Men on Aircraft Production Board Were Advisory Only and Had No Executive Powers of Any Kind—Executive Power Was Vested in Army and Navy Representatives on Board Who Determined Program**

**L**ETTERS of protest by Howard E. Coffin, former chairman of the Aircraft Production Board, were read into the Congressional Record following presentation to the Senate of the Military Affairs Committee report.

Mr. Coffin protested that neither he nor his board

had at any time any executive authority and had only been clothed with advisory powers. He stated that all contracts had been made by the various bureaus of the War and Navy Departments and that the Aircraft Board never exercised jurisdiction in these lines.

Following are the letters of protest in full:

Hon. Charles S. Thomas,  
United States Senate,  
Washington, D. C.

My Dear Senator: I am in receipt of copies of Judge Garrison's communication to you under date of July 26 and of your reply thereto under date of July 27.

The misleading publicity referred to by Judge Garrison continues to emanate from Washington at regular intervals, and has its inception in the fact that neither in the press nor in the public mind has there ever been a proper understanding of the status of the Aircraft Board or of its non-executive relation to the War and Navy departments. Even in Washington, except in the minds of those having special knowledge of the facts, there has been a tendency to ascribe to the Aircraft Board executive and administrative powers similar to those of the Shipping Board or its Emergency Fleet Corporation and capabilities of action independent of the War and Navy departments.

Much of this confusion of mind has arisen from the fact that three Army officers appointed by the Secretary of War to membership on the board and the three naval representatives appointed by the Secretary of the Navy have served in the dual capacity, namely, in an advisory and entirely non-executive role when sitting with the board, but as executive officers having full power when functioning in their capacity as bureau heads of the War and Navy departments.

I trust that, in simple justice to Mr. Howe, Mr. Thayer and myself, as the civilian members of the Aircraft Board, vested with no executive powers of any kind, and dependent for all information concerning and contact with the technical and administrative phases of the Army and Navy aircraft programs upon the duly constituted representatives and

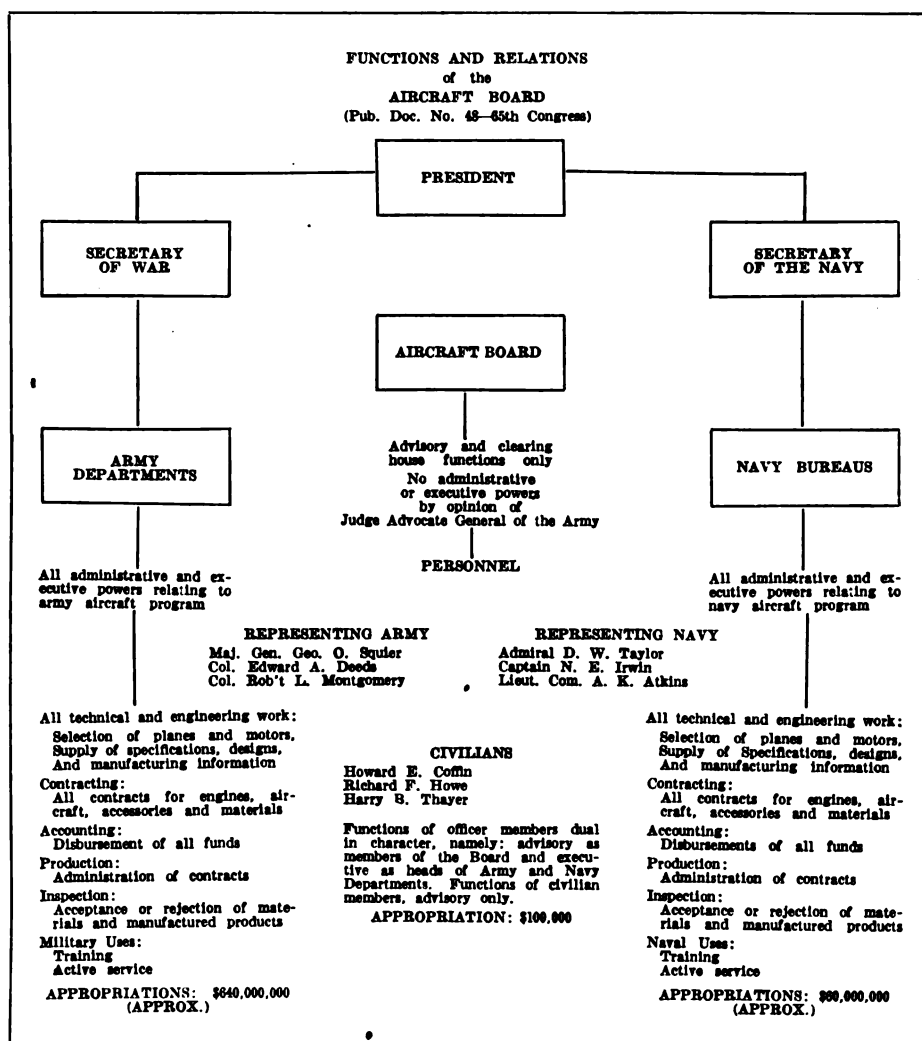


Chart to which Mr. Coffin refers and which shows the organization and personnel of the Aircraft Board



channels of these governmental departments, such a clean-cut distinction and statement of fact may be incorporated in your report as will place before the American people the true status and relations of the three organizations involved in the governmental aircraft program.

For your reference I am enclosing you herewith a chart wherein these relations are clearly set forth in accordance with the rulings of counsel of the Aircraft Board, of the office of the Judge Advocate General of the Army, and the Secretaries of War and of the Navy.

The relations of the three civilian members of the Aircraft Board and of the board itself have been exactly the same to the Navy Department as to the Army, and neither the successes nor the failures of either of these departments in technical or administrative lines can be ascribed to the civilian members of the board.

All decisions as to types of planes and engines put into production have been made by the technical organizations of the War and Navy departments, and all resolutions relating to the placing of contracts have originated within these departments before being brought before the Aircraft Board for clearance.

It has been only within these governmental departments that there has existed a sufficient knowledge as to the requirements of the air services to permit the origination of decisions and actions of this kind. Certainly Howe, Thayer and myself, as the three civilian members, did not dictate in any way in such matters.

All contracts for aircraft have been made by the duly qualified bureaus of the War and Navy departments, and the details of these contracts negotiated by the executive officers of these departments. The administration of all aircraft contracts has from the beginning lain entirely within the hands of the departments and bureaus of the Army and Navy services, and neither the civilian members of the Aircraft Board nor the board as such has ever exercised jurisdiction in these lines. It is significant in this connection that the Navy program, bearing the same relation to the Aircraft Board and its civilian members as that of the Army, and using the same forms of contract, has gone ahead and at high speed, while that of the Army has been and is still in difficulties.

Quoting from the fifth paragraph of your letter addressed to Judge Garrison, you state "that he was before the committee last January or February for something over two days, and if the program which he discussed at the time had been 10 per cent as well advanced as he then assured us it was the present investigations would have been unnecessary."

Permit me to point out to you:

1. That in these two days' hearing the subject of aviation was discussed only for a considerable portion of the first day, and that a part of the first day and the whole of the second was given over to a discussion of the general industries situation in the conduct of the war.

See page 2253 "Investigation of the

War Department Hearings before the Committee on Military Affairs of the United States Senate, Sixty-fifth Congress, Part 6, January 30 to February 2, 1918."

2. That all information given by me to the Senate committee, that portion of the first day's hearing devoted to aircraft, was, of necessity, furnished to me through the War and Navy department channels having responsibility for aircraft production, that this information was exactly the same as that being supplied by the Signal Corps of the Army to the Secretary of War and that War Department officers having the confidential military and production aircraft programs in their charge were assigned for attendance in the Senate committee rooms during my hearing in order that these reports and records might be available for reference.

3. Under the restriction of the bill creating the Aircraft Board limiting its activities to those of a non-executive nature and prohibiting the building up of any office or organization parallel or duplicating the activities of the executive bureaus of the War and Navy departments, it should be clear that the civilian members of the board were dependent entirely upon the official representatives of those executive departments for reports as to military or naval plans and progress of production. I believe it has never been within the power of the three civilian members of the board, even had the necessity been recognized, to institute a thorough-going investigation as to the truth or falsity of these War and Navy department reports made to the Board and supplied to the chairman of the board for use in the Senate committee hearing. It has seemingly required months of investigation, backed by full executive power, to enable either the Senate committee or the Judge Hughes managerial difficulties of the War Department in the carrying out of its aircraft program. It should be evident, therefore, that the civilian members of the Aircraft Board could scarcely have inaugurated an investigation of the business management and progress of the War and Navy departments' administrative bureaus, particularly in view of the fact that at the time of the Senate committee hearing of February 1 there was no realization of the necessity for such investigations.

4. In view of the figures, schedules and reports furnished by the War Department at the time of the Senate hearing, I believe my testimony before this body to have been most conservative. Permit me to call to your attention your own question addressed to Gen. Squier, to be found at the bottom of page 2134 of the Senate hearings; also to the question of Senator Wadsworth, addressed to Col. Deeds, middle of page 2153; also to statement by Chairman Chamberlain, middle of page 2157. These references indicate clearly that my statement before the committee has not been a glowing or unduly optimistic one. In my first day's hearing before you I did point out to your committee the peculiar non-executive and purely advisory relation in

which the board stood to the Army and Navy services under the creating act of October 1. I also transmitted to your committee the information furnished by the Signal Corps that it was expected that 1900 planes would have been shipped for overseas service prior to July 1. Permit me also to call to your attention the contents of the four paragraphs on page 2209 of the Senate hearing, comprising Col. Deeds' description of the manner in which the War and Navy departments' decisions as to types of planes and engines were arrived at, the method of placing contracts and the advisory or clearing-house relation of the Aircraft Board to these contractual activities.

In connection with the Senate hearing I distinctly remember stating to the committee that inasmuch as the relations of the civilian members of the board to the Army and Navy programs were indirect, it would be necessary for the committee to obtain any detailed information it might desire from the War Department officers having executive charge of the work. I believe that several such officers were subsequently called before the committee and military and production information furnished in answer to inquiries of the members of the Senate committee.

In leaving this subject of the Senate hearing in January, permit me to say that I do not believe that you or any other member of Mr. Chamberlain's committee believes that I in any way purposely misled you as to the situation. I transmitted to you gentlemen War Department information which was being embodied in reports both to the Aircraft Board and to the Secretary of War, and frankly resent any inference suggesting deception. In the records of the Aircraft Board for December and January will be found reports made to the board by the War Department representatives as to production progress. At one of the January meeting just prior to the Senate hearing the Secretary of War was himself in attendance when production reports were presented by the Signal Corps.

My statements in these matters can, should you so desire, be verified by referring them to Mr. Richard F. Howe of the International Harvester Co., the civilian member appointed to membership upon the board by President Wilson in November. Mr. Howe is now in Washington and can be reached care the Aircraft Board, of which he still remains a member.—H. E. COFFIN.

Detroit, Mich., Aug. 16, 1918.

Hon. C. S. Thomas,  
United States Senate,  
Washington, D. C.

In connection with your report as chairman of the Senate aircraft committee, may I not ask that in fairness to Messrs. Howe, Thayer and myself, as the three civilian members of the Aircraft Board, having no executive relation to the engineering, contracting, accounting, production or inspection work of the departments, you will give careful consid-

(Continued on page 391)

[Complete Text of Aircraft Report appears on page 393.]

# Benz Now Uses Aluminum Pistons

Weight of Piston Reduced 27 Per Cent and Compression Ratio Slightly Increased—Very Narrow Compression Rings a Feature

THE original Benz aircraft engines of 160 and 230 hp. had light cast iron pistons in which the piston head was slightly domed and reinforced by a perforated steel cone riveted to the head and resting with its apex on the piston pin. In February last an Aviatik biplane with 230-hp. Benz engine was brought down in which were found aluminum pistons. As these are the first aluminum pistons ever found in enemy aircraft and as they are probably the largest diameter aluminum pistons ever successfully used, details of their design and of the composition of the alloy employed should be of interest. This information has been given out by the Technical Department, Aircraft Production, British Ministry of Munitions.

## Piston Weight Reduced One-Third

The pistons weigh 4.53 lb. each without rings, which weigh 0.095 lb. each. The total weight of the complete piston, with rings and gudgeon pin set screw, is 4.91 lb., as compared with the standard cast-iron piston, which weighs 6.72 lb. The piston pins and connecting rods are of standard Benz design, as also is the rest of the engine to which these pistons were fitted. The design of the standard cast-iron Benz piston, which is fitted with a conical steel support, riveted to the inside of the piston crown, and which bears upon the center portion of the gudgeon pin through a slot cut in the connecting rod small end, is well known. Unlike the standard cast-iron piston, the domed head of the sand-cast aluminum piston is supported and strengthened by eight webs radiating from a central boss in the piston crown. The formation and shape of the webs are clearly shown in the sectional drawings.

Three cast-iron rings are fitted above the piston pin, and one scraper ring is provided below the gudgeon pin. All rings are concentric and are machine hammered on the inside. It will be noticed that the rings are all exceptionally deep in section, being 0.21 in. deep and only 0.12 in. wide vertically. The piston ring gap measured in position in a standard 230-hp. cylinder was found to be exceptionally wide, i.e., 0.076 in. As may be seen in Fig. 2, the piston pin bosses are fitted with steel bushes 0.080 in. thick. These are cast into the bosses in the usual way. The piston pins are 1.50 in. diameter, and the piston pin bosses are 2.55 in. diameter. The method of fixing the piston pin by a hexagon-headed set screw and split pin is standard Benz practice.

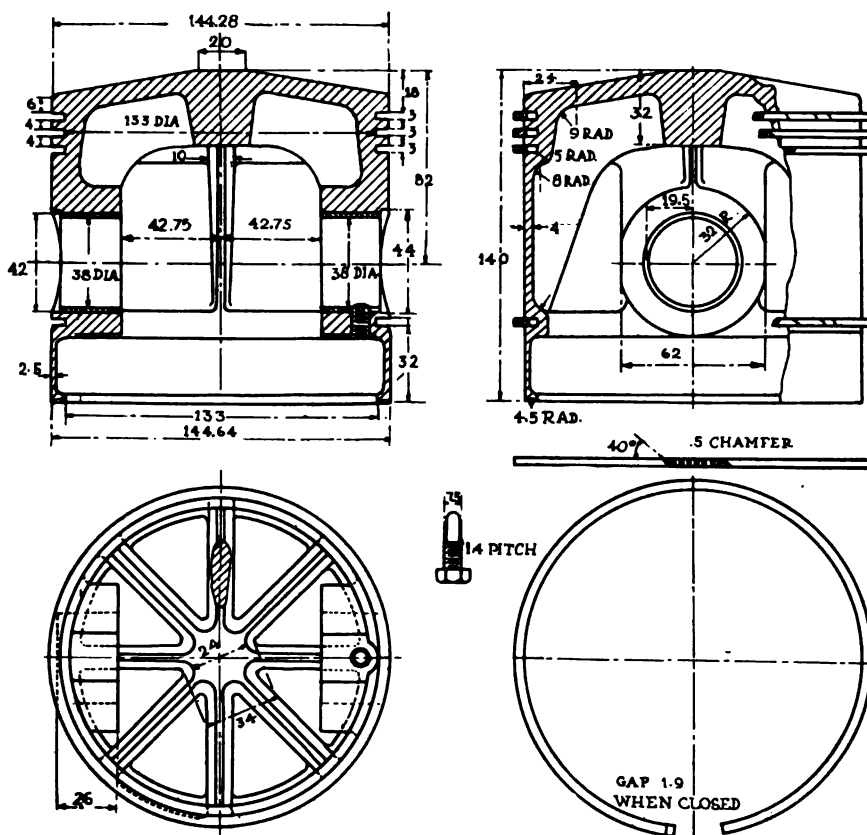
An annular semicircular groove 0.197 in. radius is machined on the bottom lip of the piston, as shown in the section drawing, and the inside of the skirt is machined inside up as far as the reinforcing rib of the scraper ring directly below the piston pin.

Further details of the design of these aluminum pistons are shown in the illustrations, and the chemical composition of the alloy from a metallurgical analysis carried out at R.A.E. is as follows: Copper, per cent, 6.02; zinc, per cent, 12.13; iron, per cent, 1.42; silicon, 0.31; tin, nil; nickel, nil; manganese, trace; magnesium, trace.

As the engine from which these pistons were taken was found to be too badly damaged to carry out a test, it has been impossible to ascertain the increased relative efficiency between this engine and the standard 230-hp. Benz. The compression ratio, however, is apparently slightly higher in the engines fitted with the aluminum pistons, and the distance between the top of the piston and the central axis of the piston pin is increased from 2.750 to 2.785 in., which gives approximately 1 cu. in. less clearance volume, making the compression ratio 5 to 1 instead of 4.94 to 1.

The clearance allowance corresponds to 0.005 in. per inch of bore at the head end and 0.0025 in. per inch of bore at the skirt.

A NEW Danish process by which certain by-products, valuable for electrical insulation, may be made out of fish offal, is soon to be put to practical test in Skagen, Denmark, according to the United States Commerce Reports. The most important of the new products is called "cornimit," and a factory known by that name is now being erected. It is claimed for "cornimit" that it excels galalith as an insulating material.



Sectional views of piston and details of piston pin screw and ring

# Intensive Training in An Aircraft Plant



*Learning to assemble wing floats*

**Curtiss Company's School  
Has Capacity of 200 to 300  
Operatives Per Week**

**Women Develop Skill After  
Short Instruction  
Period**

By Frank L. Glynn\*

develop the skilled help needed, the company set aside a good-sized space on a mezzanine floor, approximately 5000 sq. ft., as a central training department. This space was supplemented by adding other suitable spaces in the various productive departments throughout the plant so that a total of more than 10,000 sq. ft. is now used for purposes of instructing unskilled new employees.

It has been found desirable to train operatives in several places in the plant rather than to have all of the training done in one larger central department, as there are some operations which do not lend themselves to the purpose of training when this is attempted outside the regular production department.

To-day the complete training system has a capacity of between 200 and 300 persons per week. The number

**N**OT long ago the man had to steal his trade. Yesterday the trade stole the man. To-day industry is filling its needs for skilled operatives by training the unskilled. And now the shortage of skilled labor has been followed by a shortage of men which will constantly increase as the army and navy grow.

The Curtiss Aeroplane & Motor Corporation of Buffalo, N. Y., faced the labor shortage problem in a very intensive way during the past winter, and in April last opened a training department which has since developed to such a degree that it can produce upwards of 10,000 operatives a year, trained for production.

Owing to the shortage of men, an experiment was made with women, resulting in the greatest of satisfaction, as shown by the fact that the foremen's requests for help during a recent month showed an increase of nearly 100 per cent for women over the previous month. Many of them now say that properly trained women are much better than the men they were able to get.

As soon as it became evident that something must be done to



*Beginners in the "dope" room. Young girls and middle-aged women are among the applicants*

\*Director of Production Training, Curtiss Aeroplane & Motor Corporation



August 29, 1918

**AUTOMOTIVE INDUSTRIES**  
**THE AUTOMOBILE**

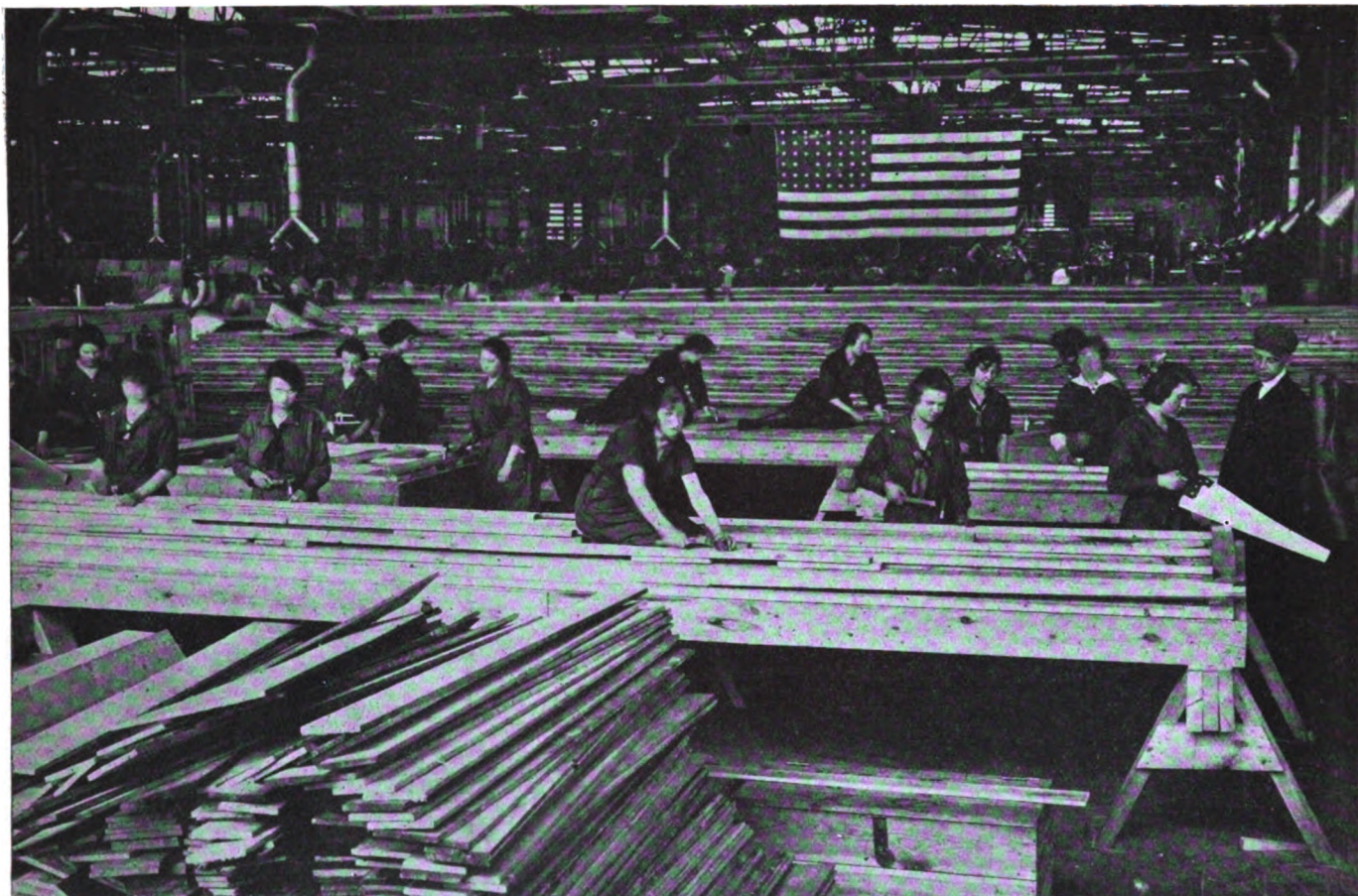


*Learning the intricacies of wing assembly under the watchful eye of the male instructor. Fully 98 per cent of the women who have entered the employ of the Curtiss company had no mechanical experience*



*Female instructors teach beginners the various operations of the sewing department. By intensive methods the learning period has been reduced to an average of about two weeks*





*Women are taught and employed for even some of the heavier operations in the shipping department. A number of girls are here being shown how to crate wings*

trained each week has been constantly increasing from a relatively small beginning. The actual average per week of new employees trained during a period of four months is 87.

As to the cost of training, it can be said, as can of course be said of all such training systems, that the actual cost must be considered to be the difference between the cost of production in the training department and in the regular production department, and in calculating this cost the additional overhead in the form of instructors' salaries, spoilage, etc., must be taken into account.

In the Curtiss plant it has been found that the average gross cost of training has been approximately \$35 per individual, and the net cost, figured as above indicated, averages between \$7 and \$9 per employee.

Instructors have been developed from those already in the company's employ as mechanics or operatives and by taking shop instructors from schools and giving them actual production experience in the department of the factory for which they are to train help.

At first there was considerable objection to introducing women operators, as aircraft work requires a high degree of skill, and the consensus of opinion was that "women don't know anything." Without question, fully 98 per cent of the women who have entered the Curtiss employ never had any previous mechanical experience, yet the number of unsuccessful ones out of the thousand promoted from the training department during the past three months was negligible. The elimination came during the training period, which averaged about two weeks' time. During these two weeks, however, many were saved who otherwise would have been failures, because the training work not only taught them the various operations, but also fitted them into the special work for which

they were adapted, thus reducing the turnover materially.

The actual work may be carried on anywhere, but the organization and operation of the training department must be segregated and its departmental relations must be carefully planned or it will cause as much trouble as the "youngest in the family" usually does.

This, however, is a matter of detail in the original layout for the introduction of the training work and varies greatly with the individual plant or type of factory organization. After the work is successfully begun, it is comparatively a very simple matter for any factory to maintain it through the usual factory force.

If the original plan of organization be right, the training department will turn over with such rapidity that the cost should be reduced at least 50 per cent over what it otherwise might be; just the same as in the production of materials. This means one-half the floor space, one-half the equipment, one-half the instructive force and one-half the wage cost for the learning period. Then, too, the matter of properly intensifying the "learning period" to reduce it to the shortest possible minimum is exceedingly important in this respect and depends entirely on the original layout of the plan for operating.

The Curtiss work was the pioneer effort in the United States for the training of a large number of operatives daily in a short period of time. Green people were taken in and trained in an average of two weeks' time where the old shop practice would have taken at least six weeks with but little assurance of success.

Thus the training department in the Curtiss plant has been a saving to the company and the Government instead of a disbursement, besides which it assures the placing of employees in the proper place for highest pro-



duction and personal satisfaction.

Actual production orders are taken for the training work and no practice work or imitation miniature articles are built, and all work is done on a time-study basis. The people are trained on the real article and the real machine, so that when turned over to the production department they can give real service.

The result has been that the labor needs of the factory can readily be recruited, production carried on to better advantage during the learning period, the turn-over decreased, and the foremen are much more highly pleased at receiving the trained worker, made to order, than having to deal daily with green help.

We do not feel that we have solved the problem for all factories, nor do we feel that this is a panacea for all the labor ills, but for the Curtiss company the training department has rendered a large service in production training from fitting a girl to use a hammer and saw, milling machine, weld or braze, all along the line even to training for inspection.

Each factory is a problem in itself, depending upon its particular type, method and volume of production, and the numbers employed, so that this article is presented



*Propeller finishing is another of the operations which the Curtiss company now has done by women. These beginners will soon be put into the regular production department*

more as a suggestion of possibilities rather than information for any one to use as a patent medicine to cure all the ills that flesh is heir to.

### New Foot Warmer for Aviators

**A**N electric foot warmer for the use of aviators, drivers, etc. has been invented by W. W. Lillard, 200 Telle Avenue, Jersey City, N. J. Mr. Lillard, an engineer, is at present on active service, and the invention is being promoted by Ernest J. King, of the same address.

The equipment comprises an insole of the same general appearance as the common slip insole, except that it has two small plugs at the heel, which project about one-eighth of an inch into the bottom. These plugs are the terminals for the heating unit which is imbedded in the insole. The insole is placed in the shoe the plugs fit snugly into small sockets which are sunk in the heel about one-eighth of an inch.

There are two different ways for conducting current to the contact sockets in the heel. One consists in having two thin metal strips extend along the outside of the shoe to the heel for the distance of about an inch, these strips are adapted to make contact with contact plates in the foot. The other method consists in bringing two very thin wires down the back of the shoe inside the back stay to the contact sockets, connection being made at the top of the shoe by two small snap-fasteners which are barely visible. One wire is fastened to the inside seam of each trouser leg, and the other to the waist, where connection may be made with an electrical source. In making connection in this way absolutely no wire to get in a person's way.

It is claimed that a person equipped with this device can keep his feet as warm as he wants to, and that when his feet are warm his whole body is warm. The heating element is intended to be operated from a 6-volt battery, and the heating element has a resistance of about 6 ohms, the current consumption is only one ampere.

### Exhibition of New British Products

**T**HE British Science Guild has organized a comprehensive exhibition of products and appliances of scientific and industrial interest which, prior to the war, were produced chiefly from enemy countries, but are now produced in the United Kingdom. The exhibition, which is being held at King's College during August and the first week of September, contains, in the first place, products chiefly imported from Germany before the war, but now made in England. It also illustrates the remarkable developments that have taken place generally in British scientific industries in the past few years.



*Screw machines are operated almost exclusively by women in the Curtiss plant. They were all trained in the company's school*



# The Peoria Kerosene Tractor

Assembled of Parts Produced in Specialized Plants—Engine, Clutch and  
Transmission Bolted Together—Drawbar Hitch Can  
Be Laterally Adjusted from Driver's Seat

**A** TRACTOR of 12-25 hp. rating made largely of parts of specialized manufacture is produced by the Peoria Tractor Corp., Peoria, Ill. The current product is referred to as Model J and is equipped with a Climax kerosene engine of 5 in. bore by 6½ in. stroke (510.4 cu. in.). The clutch is a Borg & Beck and the transmission a Nuttall, so the machine is composed mainly of well-known parts.

The frame is built up of 6-in. heavy channels which are tied together by three ½ x 6 in. steel plates, bob riveted. To the forward end of the frame is riveted a front axle pedestal, made of ½ x 6 in. steel plate. This pedestal extends from side to side of frame, but is stiffened by props at the center. An unusual design of front axle is used. It is certainly somewhat crude looking and emphasizes the need for specialized tractor axle manufacture which has been advocated in these pages. The main element of the axle appears to be a length of Tee iron, to the top flange of which are riveted two suitably bent pieces of strip iron to form the steering yokes. These steering yokes extend about half way to the center of the axle and are made so long to permit of the steering arm on one of the knuckles, to which the drag link is connected, to swing through it. At the center a swivel bracket is bolted to the axle, to which connects a swivel post through which the weight of the frame is carried on the axle. A coiled spring supports the frame on the vertical post. The details of construction of this spring mounting unfortunately cannot be clearly made out from the illustration. To take up any lateral thrusts on the axle two radius rods are run from it to a frame cross member back of the engine. The two steering knuckles are identical in design and therefore are interchangeable. The front wheel spindles are made of cold-rolled stock and are secured into the knuckles by means of nuts. The arms for the tie rod are formed integral with the knuckles but the arm for the drag link is bolted on.

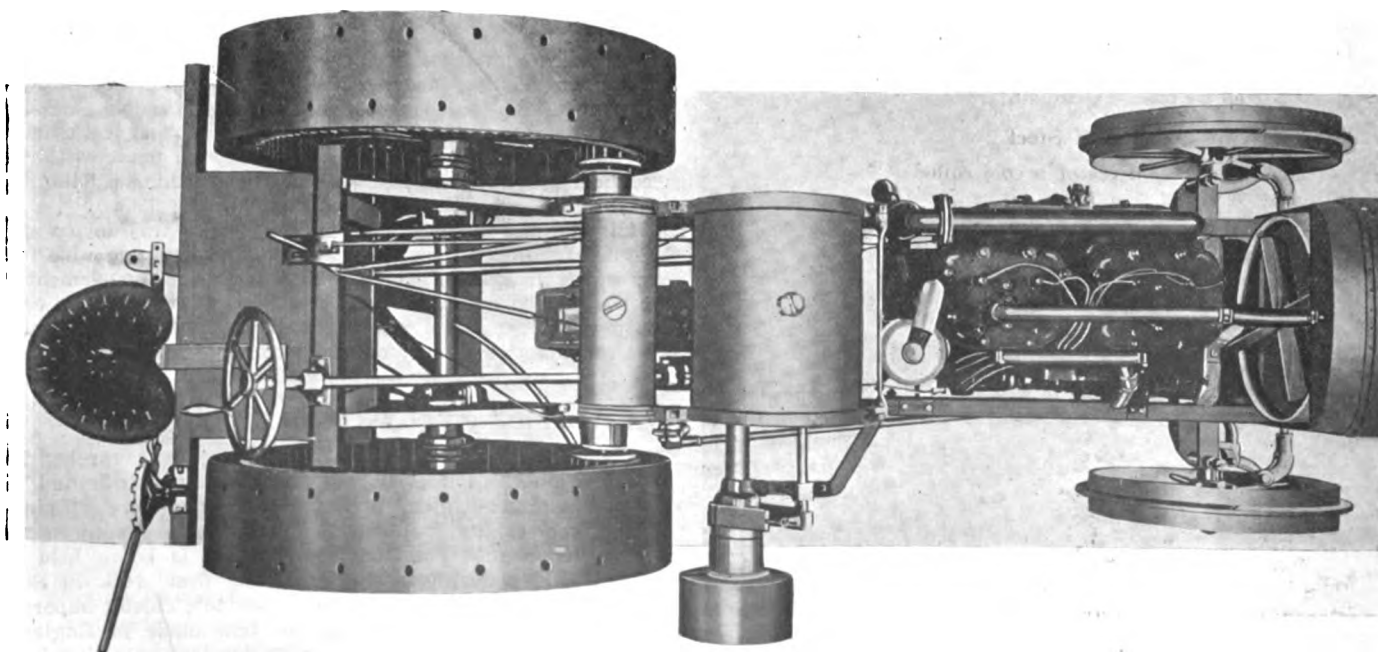
It is not necessary to say much about the engine, as this has been fully described in a previous issue of *AUTOMOTIVE INDUSTRIES*. It may be recalled that it is a four-cylinder machine of 5 in. bore by 6½ in. stroke (510.4 cu. in. displacement) and is designed to operate at 650-800 r.p.m. The power rating is 34 hp. An enclosed governor is fitted and the cylinder heads are detachable. The engine is specially designed for operating on kerosene, there being a deep water space above the combustion chamber and the spark plug bosses in the cylinder head being completely surrounded by water.

A 1½-in. float feed type of carburetor is used, specially adapted for working on kerosene, and ignition is by an Eisemann magneto with impulse starter. Magneto, governor and water pump are located in line at the side of the engine and driven through the same gear train. The engine is supported by four arms cast on the crankcase and bell housing, directly on the main frame. The radiator is a Eureka with copper tanks and the radiator fan an Oakes mounted on ball bearings and driven by a 2-in. flat belt. The air taken in by the carburetor is drawn through a Bennett air cleaner.

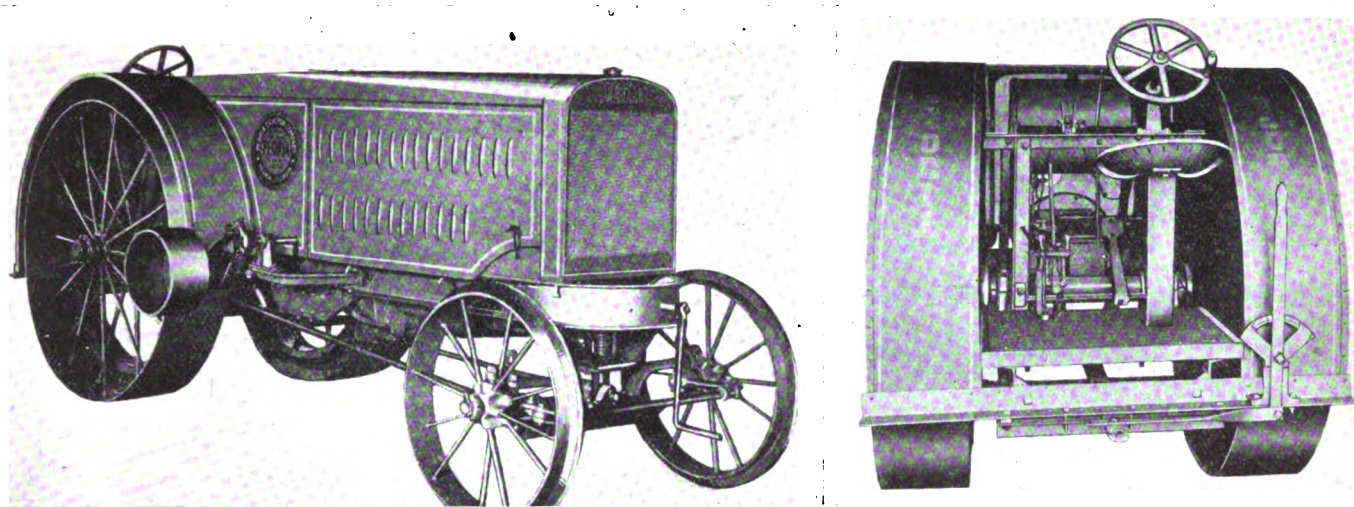
Fuel is carried in two cylindrical tanks resting on top of the frame back of the engine space. The kerosene tank, which is closest to the engine, has a capacity of 22 gal. and the gasoline tank 5 gal.

## Unit Power Plant Construction

As already pointed out, a Borg & Beck plate clutch is used, this being a special tractor design and having its front end supported on a ball bearing. Directly back of the clutch is the Nuttall transmission, which affords two forward speeds and one reverse. This transmission, which is enclosed in a cast-iron case, comprises not only the change gears but also the jackshaft and differential, as well as a belt power take-off shaft. All gears are made of medium carbon steel, and



*Plan view of Peoria tractor with hood removed*



*Three-quarter front view and rear view of tractor*

after the teeth are cut the gears are hardened and ground. The shafts are of forged steel, hardened and ground. They are mounted in Hyatt roller bearings. The case is partly filled with oil and is provided with a very large cover plate admitting of easy access to the gears, bearings, etc. Shifting of gears is effected on the selective principle and a lock is provided which makes it impossible to engage two sets of gears at the same time. The two forward speeds are  $2\frac{1}{2}$  and 4 m.p.h. respectively.

A power take-off shaft extends from the gear case over the top of the side frame and carries a brake pulley and a belt pulley. The belt pulley is 14 in. in diameter, with a 7-in. face, and at 800 r.p.m. of the engine gives a belt speed of 2400 ft. per min., the gearing being such as to give 650 r.p.m. of the pulley shaft at 800 r.p.m. of the engine crankshaft. It will be seen that the belt pulley extends beyond the rear wheel, which has the advantage that the belt can be run either to the front or rear. The long overhang of the belt shaft tube detracts somewhat from this advantage, however. The brake drum is of very small diameter and the way the brake contracting gear is designed it must impose very considerable pressure on the outboard bearing of the pulley shaft when the brake is applied. The brake is controlled by the same pedal as the clutch, the first motion of the pedal releasing the clutch and continued motion applying the brake, which latter is faced with Non-Burn friction lining.

Final drive to the rear wheels is by internal gears. The pinions for the final drive are secured to the ends of the jackshaft forming part of the Nuttall transmission. There are pads formed on the jackshaft tubes by which the transmission is supported on top of the main frames.

#### **Rear Axle of Cold-Rolled Stock**

The rear axle consists of a cold-rolled steel bar  $2\frac{15}{16}$  in. in diameter and 64 in. long. It is fastened to the frame by means of two adjustable axle brackets. By means of these brackets the driving pinions can be brought into accurate mesh with the internal gear bull rings on the rear wheels. A further advantage claimed for this axle construction is that when the axle spindles in the wheel hubs have worn on one side, the axle brackets can be loosened up on the axle and the latter turned half way around. Whether this would materially improve the running conditions is to be doubted, however. It will be seen that the internal gears are very large in diameter, not much less than the diameter of the wheels. This permits of the use of relatively large pinions and cuts down the tooth pressure—a desirable feature where the gears are not enclosed.

Driving wheels are 56 in. in diameter and have a rim 12 in. wide. They are of the all-steel type, the spokes being riveted into both hub and rim. A noteworthy feature is a removable cast-iron bearing sleeve 14 in. long. Most of the wear of the axle bearing undoubtedly comes on this sleeve, which can be renewed when the play becomes excessive.

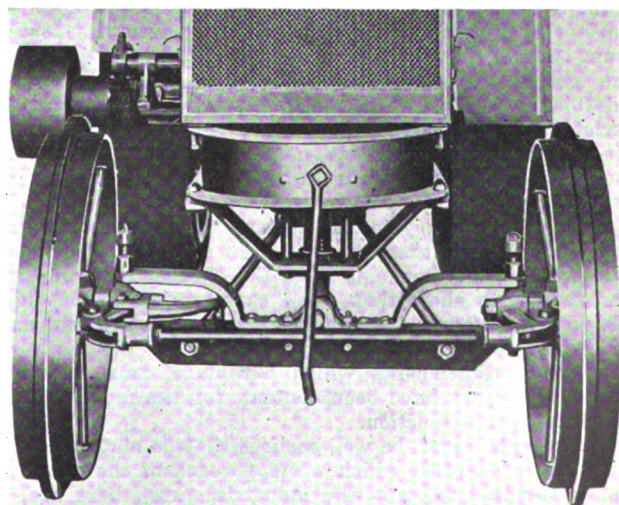
The drawbar is hinged to the frame at its forward end and its rear end has a range of lateral motion of 20 in. This motion is controlled by a lever conveniently located at the side of the driver's seat, enabling the driver to shift the hitch while the tractor is in motion. This feature is of value particularly in side-hill plowing, when there is a tendency for the plows to change the width of the furrow, which tendency can be corrected by means of the hitch lever.

A drawbar plate  $5\frac{1}{2}$  in. wide is located directly under the rear axle and is riveted to the frame. The rear axle is secured to this plate by  $\frac{3}{4}$ -in. U bolts. The drawbar is 18 in. high from the ground.

The front wheels are 30 in. in diameter and are provided with guide rings. It will be observed that the rear wheels are shown without lugs, and evidently no lugs are included in the regular equipment, though the wheel rims are punched for lugs.

Steering is effected by means of an enclosed worm and gear mechanism of the Peoria company's own design. The steering gear is operated by means of a hand wheel with handle and the steering post is supported at its upper end by a bracket bolted to an angle iron structure secured to the frame. On the rear end of the frame is a wooden floor on which are mounted the driver's seat and the gear control bracket. The combined clutch and brake pedal is directly in front of the driver's seat, which latter is of the ordinary plow type.

The Peoria tractor has a wheel base of 96 in. and weighs approximately 4900 lb. As its drawbar rating is 12 hp. it should develop a drawbar pull of 1800 lb. The belt power rating is 25 hp.



*Front view, showing front axle construction and front spring support*

# Some Outstanding Problems in Aeronautics\*

## Material for the Different Elements of a Plane—Problem of Size Limits—Variable Wing Area and Camber—Aircraft Engines

By Dr. W. F. Durand

**P**ERHAPS nowhere is there to be found a better illustration of the interdependence of technical and scientific research and study than in the manifold advances in various technical and scientific lines which conjointly have made the aeroplane in its present form a structural possibility.

Broadly, the modern aeroplane comprises a body of some sort or form fitted with wings to provide the supporting surfaces, with a prime mover or source of power and with a propeller of some type to transform the power provided by the prime mover into propulsive work, and by the reaction of the relative air stream on the under side of the wings, to secure the sustaining or lifting force necessary to carry the weight. This construction calls for a wide range of constructive materials. Thus the body and wings, comprising the aeroplane proper, require the following fairly distinct classes of structural elements:

(1) Those intended primarily to give form, strength and coherence to the structure. They represent in effect the skeleton or foundation on which the entire function of the aeroplane as such must depend.

(2) Various secondary elements intended to so tie or connect the principal members together as to secure homogeneity of structure as a whole, and mutually responsive action on the part of the different elements comprised under No. 1. The elements here considered are those which, from a purely structural viewpoint, may be classed as struts and ties or tension members, with suitable connections and joint fastenings.

(3) Surface covering for the body and wings. This gives outer form and continuity of surface and provides furthermore the actual surfaces on which the air lifting and supporting forces may act.

Broadly speaking, the fundamental problem in all aeroplane construction is adequate strength or function on minimum weight. In no other form of engineering construction is the necessity for weight saving so rigorous. In a very real sense every ounce of material entering into the structure must be able to show a competent passport. The structural problem of the aeroplane is therefore one of strength in relation to weight. For the main elements comprising the skeleton of the structure, wood has, thus far, held the main place, with metal construction steadily attracting more and more interest and assuming a place of growing importance, at least in the study of new designs.

It is not necessary to our present purpose that we should consider in detail present practice in aeroplane construction. The trend of development since the earliest days of the art has tended to show that wood construction under suitable design and safeguard was able to provide the easiest and on the whole the most satisfactory solution of the many problems and requirements which aeroplane construction presents, and so we have been content, for the most part, with this type of construction.

We may, however, be well assured that no matter how good may be any solution which we may reach of the many problems presented to us in the industrial arts, there are, as a matter of fact, series of better ones only awaiting our patient

study. This is indeed a fundamental truth of which we should never lose sight. We may be, for the moment, satisfied with our solution of a problem in technical industry; we may be able to see nothing better, and yet we may be well assured that, as a simple matter of fact, there is something better. This is a perfectly safe assertion, if only as based on the law of probability of our having, at any given time, reached the final optimum possible combination capable of furnishing a solution of the problem.

Thus, as applied to the problem of constructing the framework of the fuselage of an aeroplane or of combining together wing spars and ribs in such manner as to form a wing skeleton, we may be sure, however satisfactory our present practice may seem and however good it may really be, that in reality it is not the best and that long series of better solutions only await our intelligent and patient study.

In this and in all such problems there are always two fairly distinct though interrelated parts:

(a) What materials are best suited to the purpose in view.

(b) What disposition shall be made of the materials adopted.

Thus, in the case of the fuselage, granting wood material to be adopted, there remains the question as to the very best distribution of such material as between the main longitudinal elements, or longerons, and the intermediate elements; also as to the extent to which reliance may be placed on the outer covering, especially if of ply-wood. What aeroplane designer can feel sure that, even with given materials, he has reached the optimum distribution of function as between the main and secondary elements of the fuselage and of a ply-wood outer covering?

Much less, what aeroplane designer can feel any confidence in having now reached an optimum combination, once we admit the possibility of metal construction, or of some combination of metal and wood, with all the possibilities of the new light metal alloys and of the new alloy steels with their astonishing physical characteristics.

So far as conditioned by the application of the ordinary loading test, static in character, and aside from the possible results of dynamic attack, shock, long continued vibration, etc., we may perhaps frankly admit that the present state of metallurgy is able to supply us with material, either in the way of light aluminum alloys or special steel alloys, which if properly used will enable us to meet all such static tests in an aeroplane construction, and on even terms or better as regards weight compared with wood.

If such is the case, it certainly stands before us as a problem for the near future to pass in review most thoroughly the entire range of constructive materials, metallic as well as wood, and to determine, in the light of the experience which we are so rapidly accumulating during these days of storm and stress in military aeronautics, the combinations of materials which may assure the most efficient service on the minimum of weight.

In connection with this search for new and better materials must go hand in hand search for better modes of combination in the structure—in other words, better structural design. It goes without saying that the best general type of design, in the way of the distribution of materials, forms and proportions of members, etc., will vary with the class of

\*Sixth Wilbur Wright lecture read before the Aeronautical Society of Great Britain at London, June 25.



material employed. There must be some optimum design with wood. There will likewise be another and undoubtedly a different optimum design in the case of steel, and again different in the case of aluminum or other alloys. Thus the search for the best final combination is a search for an *optimum optimorum*; for the best possible material and for the best possible design using such material.

What order of saving may be looked for in the near future from any such search it is, of course, idle to predict. Could we, however, approach somewhat closely to the best use of the best combination of materials even now available in the field of engineering construction and without waiting for new and superior materials which the metallurgical art will doubtless be able to furnish, it seems not unreasonable to anticipate the possibility of a marked saving in weight without loss in strength or security.

This then stands out as one of the great problems of aeronautic engineering, that of the best materials and their best use. Much has already been done, but much yet remains, and rich rewards most assuredly await patient and well directed work in this field.

### The Problem of Size

One of the most interesting of the problems presented to the aeronautic engineer is that of the limiting size and carrying capacity of aeroplanes. Is there such a limit? If so, what is it? Why is it? And how may it be removed or extended?

In dealing with this problem we come, of necessity, into contact with the laws of similitude of geometrically similar structures. It is well known that under simple modes of loading, geometrically similar structures of wing and fuselage will have similar factors of safety under equal unit loads. But for such structures, if strictly similar geometrically, the weights themselves will increase as the cubes of the similar dimensions, while the areas of wing or supporting surface will only increase as the square, and hence the ratio of weight to area will continuously increase as the linear dimension.

Under these circumstances, it is readily shown that, in accordance with the relation of the factors involved, there will be for any given speed, some size for which the lifting capacity over and above the structure itself will be a maximum and above which the lifting capacity over and above the structure will become less and less with increase in size, gradually reaching zero for some value of the size of the structure. This would mean that at such point the supporting force developed at the speed in question would be just enough to lift the structure itself from the ground, but with no reserve for additional load.

This is, of course, a definite law derived from well known principles of geometry and calculus, and if it were the whole story, it would indeed tend to raise an insuperable bar before continued expansion in size. If such were the case it would mean in effect that increase in lifting capacity could only be reached by the following measures:

(1) Reducing to a minimum the relation of weight of structure to area. That is, general improvement in the program of design and reduction of weight of structure in relation to supporting surface.

(2) Reducing to a minimum the resistance of the plane at the given speed and likewise the relation of weight to horsepower.

(3) Raising to a maximum the relation of lifting force to area, consistent, however, with the decrease of the total propulsive resistance of the plane.

Were we indeed subject, without recourse, to the operation of this law of mechanics and geometry we should be in a sorry state regarding the future development of the aeroplane as regards size and carrying capacity. We should be limited strictly within the bounds of the developments made possible by improvements and advances along the lines as indicated above. But fortunately for the future of aerial navigation, we are not so limited and there seems no reason why, at the present time at least, we should need to anticipate any especial limit as necessarily imposed on aeroplane construction, as regards either size or carrying capacity.

We are able to escape from the consequences of this law by reason of two facts.

(1) It is not necessary that a large element of an aero-

plane, a wing in particular, should be geometrically similar in structural characteristics to a smaller one. For a certain size the structural elements will partake of certain characteristics. As the over-all size increases, these elements may take on new characteristics. Those which had been solid may now become hollow or of lattice or built-up form. The law of geometrical similitude will not hold, and the weight will not necessarily increase in ratio with the cube of the over-all linear dimensions.

(2) It is by no means necessary that a large aeroplane shall be, in its general form, a geometrical copy of a small one. While both will have similar elements, such elements need not be the same in number or arrangement. In fact, one of the most obvious of means for increasing lifting power is to increase the number of the wings or lifting elements. There is no reason, at least structurally, why wings and connecting elements should not be increased in number beyond anything now in use or even considered—increased to a point which would give a size and lifting power great enough to meet any demands which we can now formulate or which the future seems likely to present.

Structurally, therefore, the problem of increased size presents three problems, as follows:

(1) The structural problem of so developing the character of the elements of aeroplane construction such as wing spars, longerons, struts, ribs, etc., that with increase in over-all dimension the weight shall not increase sensibly faster than as the square of such dimension.

(2) The structural problem of combining the larger elements of aeroplane construction such as wings, fuselages, or engine nacelles with their connecting structures, in such manner as to secure, for a given wing area, the minimum weight of secondary structure.

(3) The aerodynamic problem of combining multiple wing elements in such manner as to reduce to a minimum the interference of one with another. This is a problem which opens fascinating possibilities to the student of experimental aerodynamics—a problem on which already some beginnings have been made, but one far from a final or as yet wholly satisfactory solution, and one on which the future development of greatly increased size and carrying capacity seems destined to largely depend.

In short, then, so far as increase in size is concerned, there seems no reason to apprehend any particular limit, or any serious difficulty on the part of the scientist and the engineer in meeting the demands of the future in these respects. The difficulties seem no greater than those which have been overcome in the case of ocean shipping as shown by the continuous development from the early beginnings of the application of engine power to ocean navigation during the first half of the last century down to the mammoth floating structures of the present time; and if we may take any indication from the accelerated rate of progress which has characterized the entire history of aerial navigation, we may feel confident that we shall not have to wait a half or three-quarters of a century for a parallel development in the latter field.

### Variable Wing Area or Variable Wing Camber

To mention only one of the many remaining problems which are connected with the design and construction of the aeroplane itself, a word may be said with regard to the problem of variable wing area. Broadly speaking, the ideal aeroplane should be able to change its wing area in accordance with the conditions and circumstances of flight. For ease in getting off the ground at a moderate speed, for ease in landing likewise at a moderate or low speed, there is need of a relatively large area of wing or supporting surface. For the attainment of high speed, reduced wing areas are needed, and are furthermore sufficient for the support of the weight at such high speeds. The supporting force gained by a given form of aeroplane wing depends on the area, the speed and the angle of attack, and there will be some combination best for each set of conditions. To meet these conditions, varying from time to time throughout the course of a flight, a correlative variation in wing area is needed.

To some extent the same ends may be met by changing the camber or curvature and form of the fore and aft section of the wing.

Thus, when the camber or fore and aft curvature is in-

creased, the form will be more suitable for landing at a reduced speed, while with curve flattened and camber reduced, the form will more readily favor the attainment of relatively high speed.

The problem of an adjustable wing, either as to extent of area or camber or both, is a favorite one with students of aeronautics, and we may hope for some measure of useful and practical solution. Thus far, of the many devices and forms proposed, none has so far fully justified itself as an altogether satisfactory and practical solution of the problem.

#### Motive Power

Passing now to the motive power and its application to the propulsion of the aeroplane, a most interesting and important series of problems challenges our attention. Only the more important can be noted here.

One of the most important of these is that of fuel. What is to be the future fuel for the aeroplane, or for aerial navigation in its wider aspects? How long will our stores of crude petroleum oil from which we now obtain our petrol or essence or gasoline, as it is variously termed, continue to furnish this all-important element in the present program of power development? Doubtless there are large stores of petroleum oils yet undiscovered, but we may safely assume that we are using up a supply in the nature of a bank deposit. We are using our principal, and not living on the interest. So far as we know, nature is not now engaged in making for us petroleum oils, certainly not in any proportion to our rate of expenditure. To such a general program of consumption there is, of course, but one end, ultimate exhaustion.

This is, of course, only one phase of the overshadowing menace which the modern social and industrial world must face some time when our present supply of carbon and hydrocarbon fuels begins to become exhausted, unless indeed we develop or discover in the meantime some other source of energy which will adequately take their place. This is perhaps a question which need not seriously concern the present generation, but when we take a long look ahead—a look, for example, as long as that covered by the development of Europe from the days of the Cæsars or even from the time of, say, Galileo—we may realize with startling emphasis the need of foresight with regard to a source of energy adequate to the world's demands. Various ages have been designated as of stone, bronze, etc. The present might well be designated as that of natural energy. Our entire civilization, in a material sense, rests upon the utilization of sources of natural energy which are not inexhaustible and which are, in fact, becoming exhausted, in some cases, with menacing rapidity. In the meantime we must, and presumably we shall, make some shift to tap efficiently other sources now known, or we may haply discover sources which to-day lie beyond our present vision.

#### Fuel Problems

A long look ahead for aerial navigation therefore shows that if the present line of development is to continue, there will be a serious problem to be met some time, and that perhaps before many decades—the problem of a fuel suited to the needs of aeronautic prime movers, at a time when present petroleum sources will no longer yield the supply which we now accept and use with so little thought for the requirements of to-morrow.

But with regard to the question of fuels, we need not go so far afield as to look into the coming decades for interesting and important problems. Perhaps the one most pressing for present solution is the question of what is the best fuel for the modern aviation engine, having in view the three requirements—power, economy, with reliability and durability. Out of the exigencies of the present war have come many serious and extended researches relating to the problems of military aviation, and of these none is perhaps of greater significance regarding the future of commercial aviation than the studies which have been made regarding aviation fuels.

While matters relating to the problems of military aeronautics must be spoken of with much reserve, it will perhaps be permissible to say before this audience that from these studies three principal results seem to have been rather definitely established. These are:

(a) As between the various grades of aviation motor fuels which have been used during recent years, and comprising a rather wide range of composition and of physical and technical characteristics, there is but little to choose from the standpoint of power or economy alone. This assumes, of course, that the fuel is a genuine motor fuel and the results regarding power or economy relate to an assumed period of effective operation under such fuel. It must not, however, be assumed that there are no differences in power or economy traceable to the fuel employed, for such is far from being the case. It is, however, within the limits of reasonable statement to say that such differences are relatively small and under most circumstances would not, of themselves, constitute a determining or controlling factor.

(b) As between such motor fuels marked differences do seem to be indicated as regards their influence on the life and reliability of the motor, especially on long time tests, or in actual service on long time flights.

(c) For the various fuels, in order to realize the best results either as regards power, economy, or life and reliability, special and individual carburetor adjustments are necessary, and such as can only be determined by trial under actual working conditions.

#### Present Fuel Satisfactory

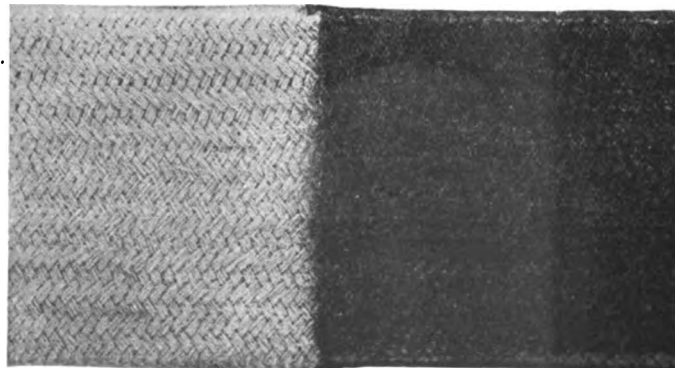
It may perhaps be further said that the problem of an excellent and reliable motor fuel for aviation purposes seems to have been satisfactorily solved. Its specifications and range of characteristics, physical and chemical, are pretty well established, and so long as our source of motor fuel supply is to be found in petroleum derivatives, we seem to have reached a reasonably satisfactory determination of the best combinations of such derivatives for the various requirements of aviation service. These characteristics, which must be considered as a part of the great body of military information and which cannot for the moment be put down in plain print, we may hope will, in due time, become available in the arts of peace and for the development of commercial aviation in its various fields of promise.

(To be continued.)

#### New Spring Lubricator

THE McCormick Laboratories Co., Dayton, Ohio, has investigated the problem of leaf spring lubrication and has developed an interleaf lubricator which, it claims, overcomes all the difficulties experienced with leaf springs when unlubricated or lubricated in the primitive way by means of a table knife or paddle. The interleaf lubrication evolved consists of a fabric tube which is slipped over every second leaf. This tube is impregnated with lubricant. With this lubricator, it is claimed, the spring leaf surfaces are permanently and uniformly lubricated, the compressible character of the tube compensates for inequalities in the leaves and makes for uniform distribution of pressure. The lubricator prevents water and grit from entering and consequently prevents rusty, frozen leaves.

The McCormick Laboratories Co. does only research and development work and is not engaged in manufacturing.



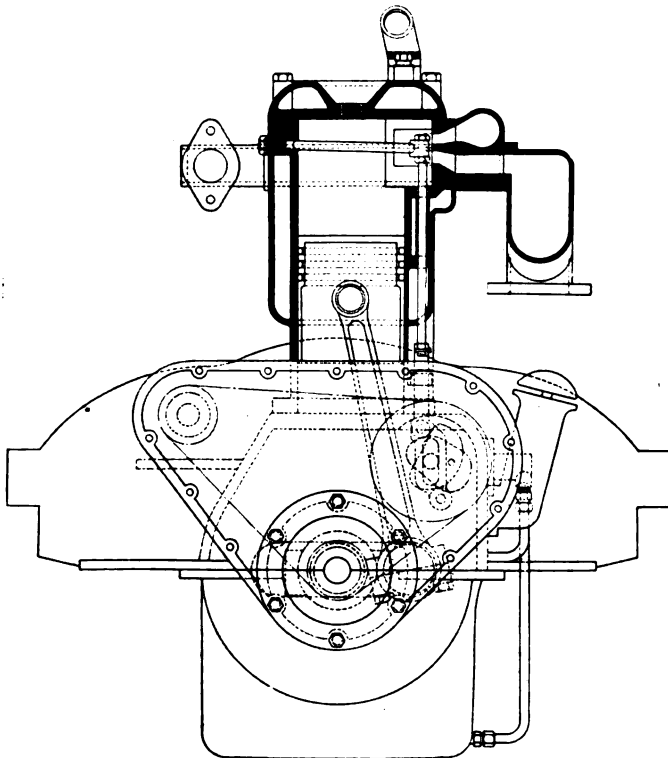
*The fabric tube as used in interleaf lubrication*

# McElroy Kerosene Engine

Has Sliding Valve Positively Operated by Double Cam Mechanism—Fuel Charge Heated in Combined Inlet and Exhaust Manifold and Standard Carbureter Used

**A**N engine embodying a novel form of sliding valve and burning kerosene as well as gasoline is manufactured by the McElroy Engine Co., 909 Clifton Avenue, Newark, N. J. It is being regularly manufactured in small lots for stationary work, and several four-cylinder models for motor vehicle purposes have also been built.

The slide valve is of crescent shape and operates in a pocket turned eccentric with the cylinder at the upper end thereof. This sliding valve is moved up and down positively by a double cam mechanism on a half-speed shaft. One cam raises the valve and the other returns it. Each cam has a roller follower, and the two rollers are, of course, carried by the same push rod, which has an extension saddling the camshaft.

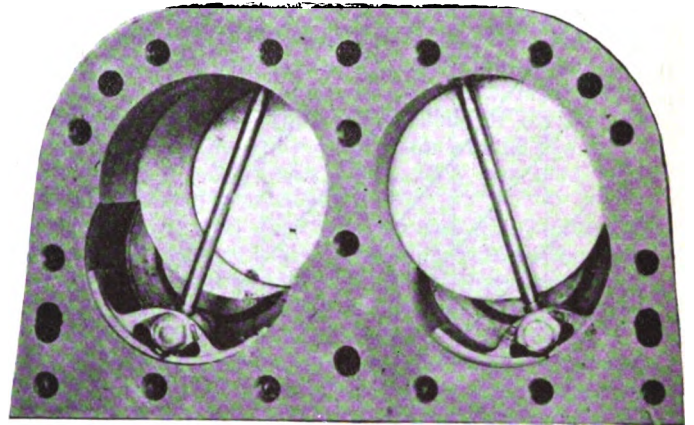


*Sectional view through cylinder showing sliding valve and valve-operating mechanism*

In order to prevent the slide valve from leaving its surface under the influence of suction in the cylinder it is held to same by a rod extending through the combustion chamber and having a spherical seat in the end of a screw screwed into the cylinder wall on the opposite side.

Inlet and exhaust ports are formed in the cylinder wall at the valve pocket, the inlet ports below and the exhaust ports directly above. The two manifolds are in one casting and as a result the incoming charge is heated by the hot wall of the exhaust passage. This is the only heat supply to the charge and is said to be sufficiently effective to permit kerosene to be used as fuel. An ordinary gasoline carbureter is used of any well known make. As a matter of fact, two carbureters are fitted, one for gasoline and the other for kerosene, and the two valves are interconnected, so that as one is opened the other is closed proportionally.

Other features of the engine are conventional. The cylin-



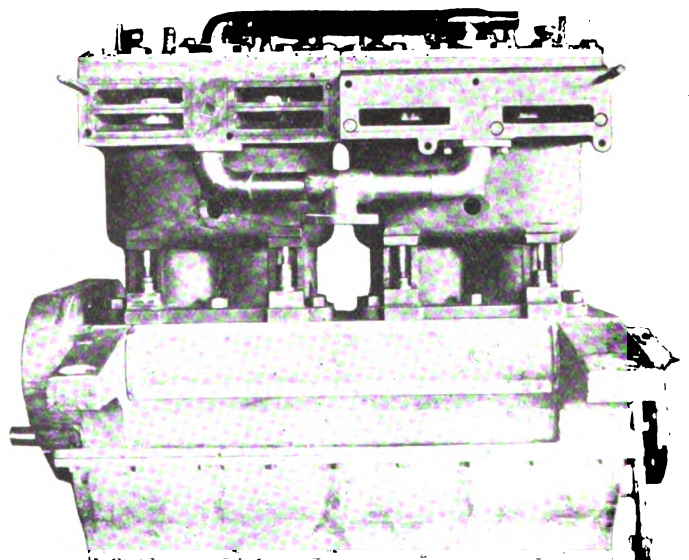
*Top view of cylinders with cylinder heads removed and valves in place*

der heads are detachable, which facilitates removal of the valves and cleaning of the combustion chambers when necessary. Camshaft and magneto shaft drive is by a silent chain. The crank case is divided in a horizontal plane through the crank axis. Lubrication is by the circulating splash system.

## Book Review

**A**UTOMOTIVE Magneto Ignition, by M. E. Toepel, published by Spon & Chamberlain, 120 Liberty Street, New York. 103 4½ x 7½ in. pages, bound in limp leather. Price, \$2.

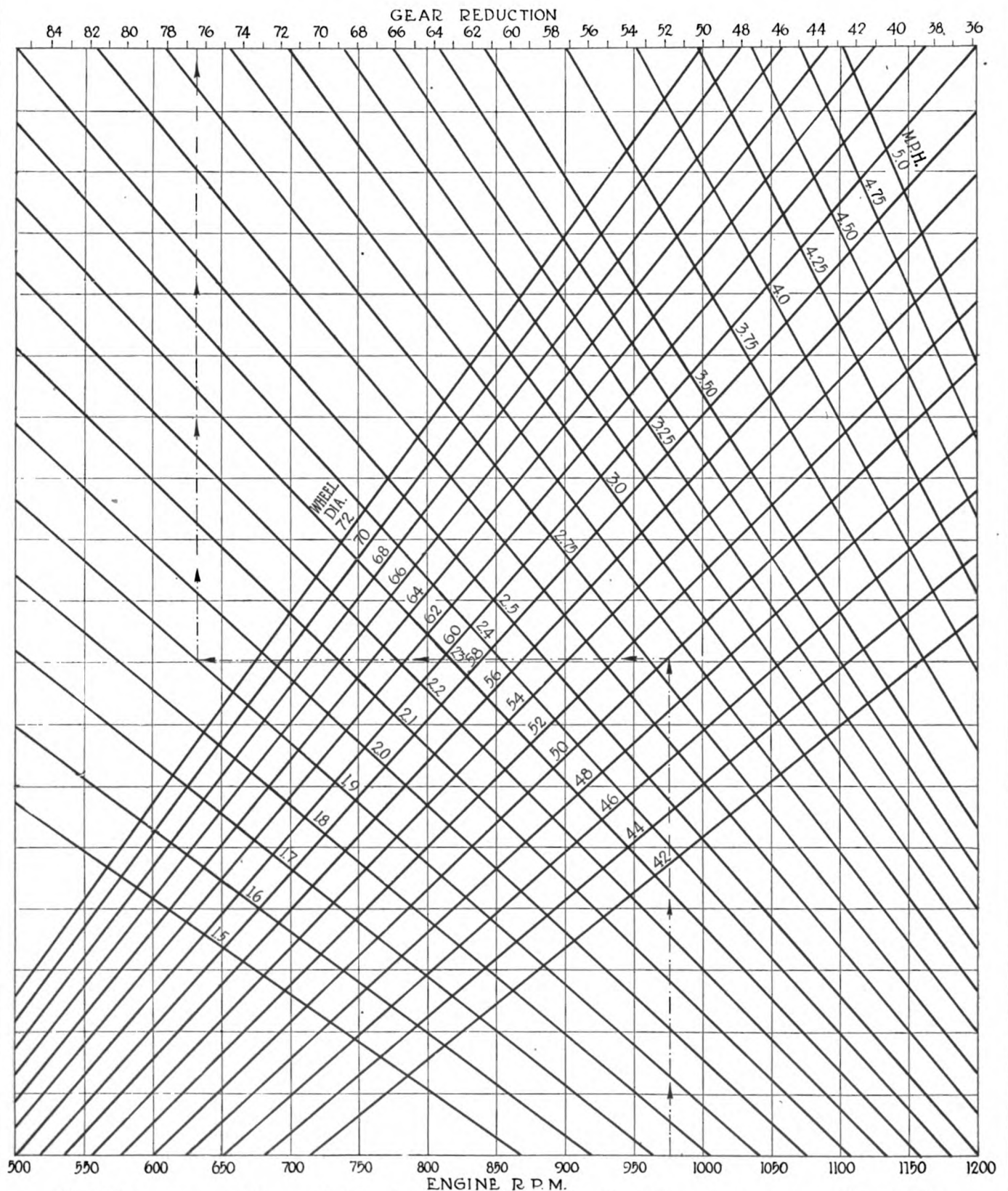
This little book is intended as a guide to practical men having to look after magnetos on various types of automotive vehicles. It is in the form of a catechism, and contains some 200 questions and answers thereto. The author is at present engaged as instructor in the U. S. Government school for the study of magneto ignition, and apparently has had in mind the needs of his pupils. Reference to specific types of apparatus and minute details have been avoided, and the book is not descriptive in any sense.



*The four-cylinder McElroy engine, showing inlet, and exhaust ports in cylinder walls*



## Tractor Gear Ratio Chart



*To find the gear reduction required to give a certain tractor speed with a given engine speed and drive wheel diameter, proceed as illustrated by the example shown in dash-dotted lines. Start with the engine speed on the bottom scale, pass vertically up to the inclined line denoting the wheel diameter, then horizontally to the right or left to the inclined line denoting the tractor speed, and then vertically up to the top scale, where the required gear ratio may be read off*

## Entz Magnetic Transmission on Fifth Avenue Bus

SOME eight months ago the Fifth Avenue Coach Company, New York, installed an Entz magnetic transmission on one of its standard Model A buses, and placed the machine in regular service. Each of the buses operated by the company carries about 300 passengers per day, and as an average of four stops are made per passenger, it is readily realized that the strains on the clutch, brakes and transmission are very severe. With the Entz magnetic transmission no friction clutch is required, nor are there any clashing gears, and if this transmission could be properly developed for this particular service, a material saving might be effected.

The installation of the transmission was made by the Entz Motor Patents Corporation of New York, and was completed on November 28, 1917. The bus with Entz transmission complete weighed 10,180 lbs., of which 3,810 lbs. was on the front axle and 6,370 lbs. on the rear axle. This weight is made up of the chassis weight of 6,466 lbs., of which 3,150 lbs. is on the front axle and 3,316 lbs. on the rear axle, and of the body weight of 3,714 lbs., of which 660 lbs. is on the front axle and 3,054 lbs. on the rear axle. The bus with the Owen magnetic transmission is 890 lbs. heavier than the regular type A bus of the company.

During one month's service, ending January 6, 1918, the Owen magnetic equipped bus showed a fuel consumption of 1 gal. per 4.3 miles, as compared with 1 gal. per 5.4 miles for the standard type bus. This showing, however, was materially improved later on.

From December 6, 1917, to January 26, 1918, the bus

ran 4,605 miles. Between December 6, 1917, and January 19, 1918, it showed an oil consumption of one gallon per 244 miles. During the period from December 30, 1917, to January 26, 1918, the fuel consumption was at the rate of one gallon to 5.7 miles.

During the month of March the bus ran 2,495 miles. Between March 3 and March 31, 1918, the oil consumption was at the rate of 1 gal. per 279 miles, which was 64 per cent better than the showing of the standard A type bus, and the gas consumption was at the rate of 1 gal. per 5.6 miles, which was 12½ per cent worse than the standard type A bus.

During April and May the bus ran 4,887 miles and consumed gasoline at exactly the same rate as the standard type A bus and 33 per cent less oil than the standard type A. Between December 6, 1917, and May 31, 1918, the bus ran altogether 14,968 miles.

The troubles experienced during the period of observation were chiefly of a minor character, except that once the clutch and motor armature burned out, which was due to defective insulation. The driving shaft keys sheared off twice, and necessitated the installation of a new shaft and flange.

The engineers of the Fifth Avenue Bus Company consider the experiment with Owen magnetic very successful, but since the company has already committed itself to the straight gasoline bus, to the extent of 300 vehicles, no more magnetic equipped machines will be placed in regular service at the present time. For later orders the system will receive favorable consideration.

## Vacuum Muffler Based on New Principle

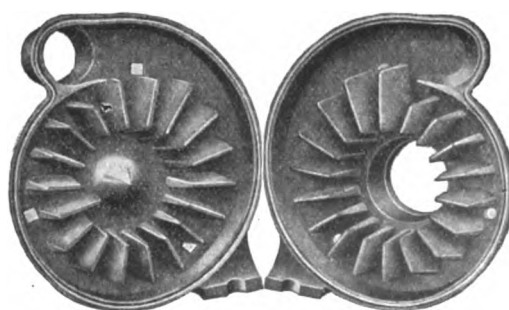
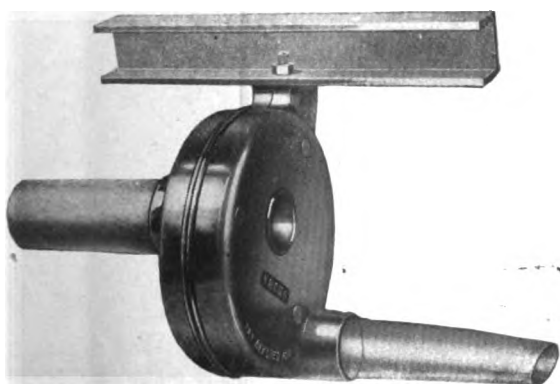
A MUFFLER based on an interesting principle is manufactured by the Vacuum Muffler Corp., New York City. It consists of two castings of flat cylindrical shape open on one side. On the inside of each are a large number of radial partitions, and the two castings are so fitted together that the partitions on one enter between those on the other. The exhaust gases enter the muffler through a central opening in one of the castings, and the stream is broken up by a cone cast on the other. It is thus divided into a large number of small streams, which pass around the circumference of the muffler and then unite in the common outlet. As the paths of the different small streams are of unequal length, the exhaust gases, instead of being discharged all at the same time, are discharged gradually, thus avoiding the loud noise which is produced if an engine exhausts through a comparatively free outlet.

What undoubtedly adds to the efficiency of the muffler is

the fact that the gases are given an excellent chance to cool rapidly.

It is quite understandable that this muffler offers but little back pressure to the exhaust, as the latter does not have to follow a zig-zag path nor encounter obstructions in the shape of plates with fine perforations. It is claimed for this muffler that it remains entirely free from carbon. This is probably due to the fact that the exhaust gases pass through every part of it at considerable speed and thus give the carbon no chance to settle.

According to a test made by Joseph Tracy, an engine fitted with one of these Vacuum mufflers gave 4 per cent more power than when exhausting directly into the atmosphere. The test was made on a four-cylinder 30-hp. motor, and when operating without a muffler the exhaust passed to the atmosphere through a 15-ft. length of 2½-in. pipe. The fuel efficiency was improved in the same proportion.



Left—Vacuum muffler mounted on car frame.  
Above—The two castings composing the muffler

# Preparing Men for War Tasks

General Motors Truck Co., Pontiac, Furnishes School to Train Men for the Sanitary Corps—Men Are Trained So They Can Repair Trucks Under Any Conditions

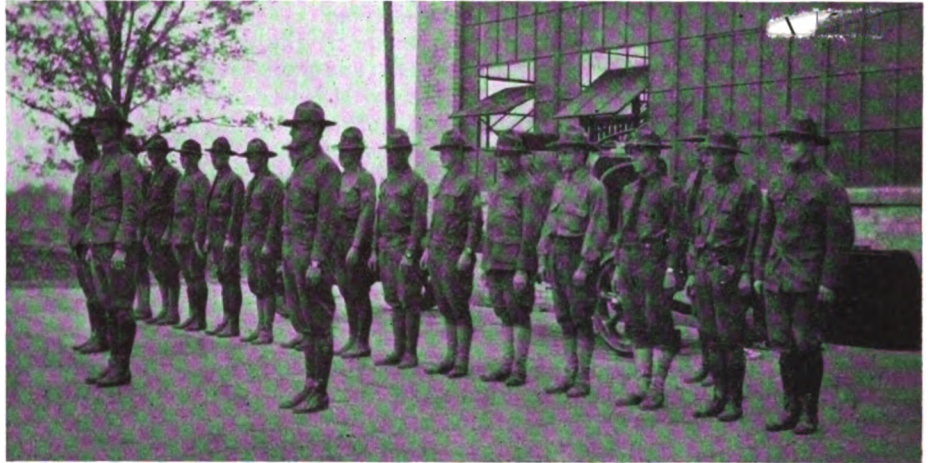
THEY call it "France"—the plant of the General Motors Truck Co., Pontiac, where men come from various cantonments for a thorough training in automobile mechanics for work in the Sanitary Corps of the United States Army. They work with tools that come with the truck, the same as they would in some isolated post in France. Under expert instructors they receive a 6 weeks' course, from which they are graduated to go overseas for duty on the battlefields or to cantonments to prepare other men.

The purpose of the course is to make the men so familiar with the parts of a truck that they will be able to recognize any part immediately and be able to properly adjust it in the least amount of time. They are taught just what parts to remove to repair others; how to interchange parts, and to replace any part that may have become defective through accident or wear and tear.

## First Squad Came in December

The first squad came to the General Motors for training in December from the aviation section of the Signal Corps. Another company of men came from Allentown, Pa., March 1, and other cantonments also have sent men to the plant for training.

A systematic course is pursued. Before any actual work is done the newcomers are taken on a tour through the factory. They start with the foundry, where they are shown what pig iron looks like, whence they are taken into the factory, watching the machine develop step by



*A company of men that came to the General Motors for training for the Sanitary Corps. All the men are under military supervision*

step into the finished product. The class is accompanied by instructors, one to a squad composed of not more than ten men.

For the most part the class is composed of men who are theoretical or practical mechanics having been graduated from engineering courses in colleges or having had training that puts them above the ordinary automobile mechanics.

## Ambulance Mechanism Studied

Having gone over the ground once and somewhat acquainted themselves with the course, the men start over again, this time specializing on the ambulance, analyzing each unit in minute detail. The frame and the method of mounting the various units on it are taken up first. The engine, clutch, transmission, rear axle and radiator



*A company of men receiving instruction in the workings of a truck chassis*



*The men specialize on the ambulance. The training received at the plant enables them to maintain a truck*



are next considered in turn. The engine, the most complicated part, is under discussion the longest period of time. A week is usually spent on this; 4 days are spent on the rear axle; 3 days on the clutch, and shorter periods on the other units. All this work is done by personal demonstration; all the parts are taken down and assembled by the men themselves with no other tools than those included in the regular equipment of the truck.

Having completed the course outlined in the foregoing, the men have a comprehensive idea of how to repair a truck, but they are not yet finished. They must be taught how to make adjustments and how to maintain the truck in service. Once again the men return to work on the engine for the purpose of acquiring a knowledge of making adjustments. Next the men are taught how to adjust steering rods, adjust tappets, grind valves, time magnetos, adjust carbureters, and all other service operations that may be called for "over there."

When the service of carbureters and magnetos is under discussion an expert on each is called in to give a talk on his respective line.

In all operations the shortest methods for replacing parts, repairing and making adjustments are taught. Time counts on the battlefield, especially in the ambulance unit, and the importance of this is not lost sight of in the course.

All the men attending the classes are under military discipline—all of them work from 8 to 10 hours a day and have one hour drill in the morning from 7 to 8 o'clock. Although under military supervision during the day, the men are privileged to go where they choose in the evening.

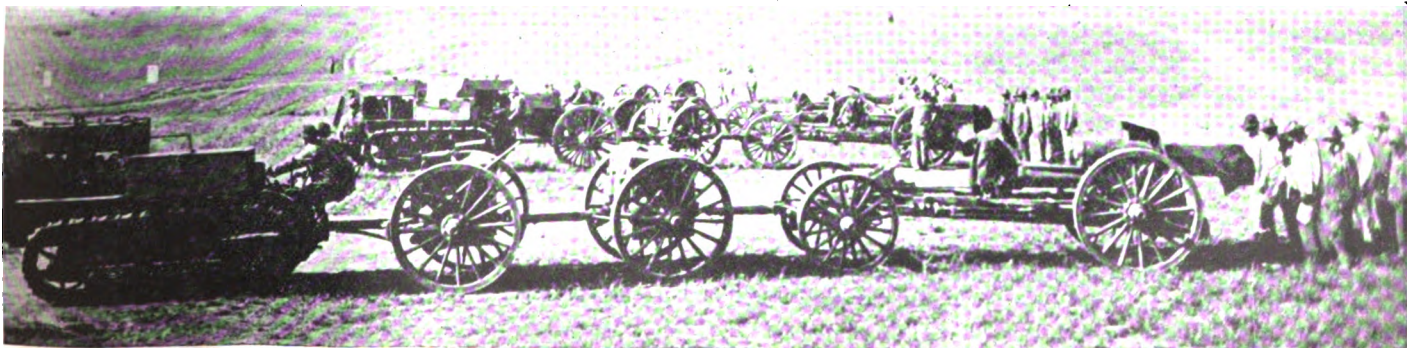
From the first bit of assembly through to the last, the Sanitary Corps follows the work carefully, in the knowledge that not the slightest detail of assembly can be missed. At the close of their training the men take two examinations, one written, the other demonstrative. It is necessary that both be passed with a certain grade. While both are extremely difficult, it is the demonstrative examination that meets with the most disfavor among the students.

For this latter examination it is required of the men to assemble a truck. Next a truck that has been tampered with is given them, and they are asked to find the trouble. Every sort of trouble imaginable is met with, and thus far none has failed in this particular section of the examination.

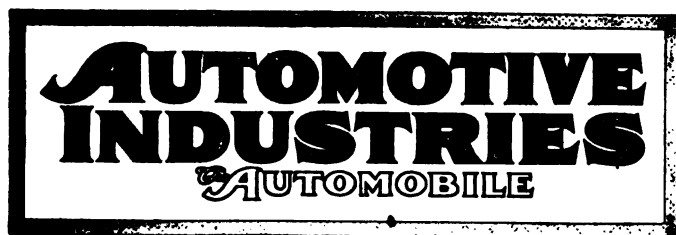
Instructors take keen delight in thinking up methods of tampering with trucks for this particular test. Among the things they do is to put small wooden plugs in the gasoline tube so that but a small amount of fuel will run into the carbureter.



*The upper picture shows an American tractor crossing the Egyptian desert with the British Expeditionary Forces. The picture at the right shows more big guns being brought up in a recent British advance. In the lower picture tractors are hauling guns to firing positions during maneuvers at Fort Sill, Okla.*



## Tractors at Home and Abroad



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## Do Not Force the Issue

"IF the automobile industry would keep quiet, we could get up to 100 per cent of our steel requirements." This remark, made by the purchasing agent of one of the largest automobile factories in Detroit, sums up in a nutshell the opinion of many buyers of the industry.

The War Industries Board is a body of business men concerned with the winning of the war. Since the winning of the war is the biggest and most important business before this country at the present time, the wishes of this board take precedence over everything else in the country.

Since the War Industries Board is composed of good business men, it is but natural that when they are pinned in a corner by requirements for a ruling on material that they need, their first consideration is going to be what they require themselves. When asked to make a definite ruling, they are not going to estimate on a minimum but on a maximum. The result of this is that when the automobile industry

insists on a ruling regarding the amount of steel that it is to secure, the War Industries Board will take first into consideration the maximum amount which the War Industries Board will require to carry on its own business.

Steel authorities and those versed in manufacturing know that the War Industries Board *can never use up to the maximum* estimate of the steel it requires. They know that from month to month, as time goes on, there will always be a surplus over the amount required for war purposes. This surplus is large enough to take care of the important industries of the country to an extent fully in keeping with the reduced requirements of commercial manufacture, due to war-time conditions.

Purchasing agents for automobile factories have this well in mind. Their sympathy is not with those in the industry who insist on obtaining a definite ruling, with the result that the industry is in a hard and fast condition, with a minimum amount of material, instead of being in an elastic condition, with a quantity of material obtainable which would readily take care of the very limited demand now existing.

It does not take a minute of clear thinking to readily see that, regardless of all rulings and regardless of all requirements of commercial enterprises, the War Industries Board is first going to be served with the amount of steel it requires to carry out its program of winning the war. Over and beyond this quantity of steel, the highest authorities are agreed that there is sufficient to take ample care of industries working under a reduced war-time program. Let us stop forcing the war board into a corner where it is compelled against its wishes to make rulings which will not be favorable to continued commercial manufacture.

## The Tractor Seat

THE average tractor is equipped with the regulation cast seat which has become standardized on sulky plows, binders and other agricultural machinery. Recently an attempt has been made to provide more comfortable seats for tractors, and this movement bids fair to gather force and lead to a complete change in the design of seats. It certainly seems reasonable that the tractor seat, which the farmer occupies almost without intermission from morning till night, should be at least as comfortable as his automobile seat, which he seldom occupies more than a couple of hours at a time.

Probably the habit of many farmers of leaving their machinery out in the open during long periods of non-use, exposed to the weather, had considerable to do with the adoption of the cast iron seat, for properly painted cast iron bears this treatment remarkably well. The provision of a comfortably upholstered seat with arm rests and back would appeal to some farmers as an improvement, while it might prejudice others as rendering the tractor less weather-proof. It might have the effect of inducing farmers to take better care of their tractors, to provide proper housing facilities and to put them up as soon as their work in the field is done.



# Aircraft Report Unfair to Industry

Evidence in Hearings Shows Army, Navy and Government Departments Also at Fault

By DAVID BEECROFT

**A** PART from the justice or injustice of the aircraft report by the sub-committee of the Committee on Military Affairs, United States Senate, only one dominating conclusion can be reached, namely, that there is grave necessity for a supreme head of all aircraft activities; and while the appointment of John D. Ryan as an Assistant Secretary of War is a step in the right direction, it is only one step, and the satisfactory working out of the aircraft task cannot be accomplished until there is one head for all navy and army aircraft work.

A very large percentage of the thousands of delays referred to in the sub-committee report are due directly to poor organization of the Aircraft Production Board in the past. The board was really a dual entity, in that the executive power rested with the army and navy representatives on it, whereas the civilian members only had advisory power.

While the civilian members may be indirectly blamed for the progress of the aircraft program to-day, the fact must be understood that these civilians were without the necessary power, and it is unfortunate that they took up the position and placed themselves open to criticism under such conditions. Credit must be given these civilians for making literal sacrifices under such a situation, because it can only be said that their intentions and motives were of the highest order.

The 1220 pages of hearings conducted by the sub-committee bear out the fact that in army circles there was a decided lack of co-operation and desirable understanding, particularly between those in Europe and those at home.

General Kenly made the point quite clear in his evidence that orders from France given for one kind of plane were countermanded a few days later. Sometimes the countermand came some months later. This was true with the Spad order given to Curtiss, which was given at the direction of the military authorities in France, and which was later countermanded by these same authorities on the ground that the Spad was at that time an obsolete machine; yet it is to-day one of the best chasse or fighting types, and we are now proceeding with orders for the construction of a British type similar to the Spad.

The aircraft authorities in this country took their entire advice from the military authorities in France on this subject.

This is not cited as a criticism of the military authorities, but rather as an example of how necessary it is to have a single head for the entire aircraft task; and further, how necessary it is to have the closest unity between France and America in this work.

Another example of the lack of co-operation between the military and civilian members of the Aircraft Production Board was that the civilian members gave the go-ahead order on one type of bombing plane so that production could be started last fall, but it was months before the go-ahead order was executed by the military authorities.

No reason is given for the delay, but it is evidence of how necessary it is to have one-man control instead of having civilian members going over a certain task and making recommendations, and then apparently having more valuable time consumed by army or navy members going over the same field and several months later coming to the same conclusion.

The lack of one-man decision was also shown in the Liberty engine program, which was originally planned as an eight-cylinder design, and the development started as such, but changed to a twelve-cylinder design last fall under recommendations from France. Now that the twelve-cylinder design has been developed, it proves to be too powerful for the De Haviland 4 plane, which was adapted to its use. It seems that less power is actually needed for this two-man machine.

A one-man scheme of organization would have unquestionably prevented a great many delays and misunderstandings which have arisen due to the apparent failure of different factions to co-operate as they should have. There has been a serious delay and a slow program on the development of planes to meet engine requirements. Whether this has been due to holding off until the Liberty engine was thoroughly developed and its suitability for different types of planes ascertained, is not certain. It does appear that our bombing program is sadly delayed, part of which has already been explained.

We cannot but again refer to an editorial in these columns some months ago, in which it was recommended that more engineers be literally conscripted into the airplane engineering program, and that a corps of these be maintained as close as desirable to the combat field in France, and that the speediest courier service between those engineers and those at home be maintained.

The development of a complete airplane program is so enormous that no small group of engineers can possibly handle it. The work of differentiation is so wide that a corps of engineers with highly varying qualities is needed.

It is unfortunate that the automobile industry is so generously blamed for the present situation in the aircraft program. The report insinuates that there are other manufacturers in the country that could have handled the work to better advantage. This seems to be the one case in—*Continued on page 391.*



# □ Latest News of the

## Five Types of Planes Under Test

Include SE5, Bristol, De Haviland and Two Others—Pomilio Built in Indianapolis

WASHINGTON, Aug. 28—The SE5 plane, stated Mr. Ryan to-day in answer to an inquiry by a representative of AUTOMOTIVE INDUSTRIES, is still being used by British airmen. He would not comment on the fact that it has been replaced by four machines, each superior to the other in turn. Mr. Ryan also stated that we are adopting the latest Bristol, although the foreign experts report to the contrary.

"Liberty twelve-cylinder engine production," said Mr. Ryan, "is fully up to expectations. Orders for them have been increased from 22,000, which were ordered prior to last May, to 50,000. A large quantity of the Liberty eight-cylinder engines and also of the 150 hp. and 300 hp. Hispano-Suiza have been ordered. The eight-cylinder Liberty engine, which is a 250 hp., and the 180 hp. Hispano-Suiza are in quantity production. The 300 hp. Hispano-Suiza will soon be in quantity production."

We are now trying out five types of planes new to this country at Dayton, according to Mr. Ryan. These include the SE5, the Bristol exactly as made in England, a two-seated fighter plane especially designed for the Liberty engine by an ex-captain, and two other types which Mr. Ryan refused to discuss. All of these planes, he said, can be put in quantity production if they are found satisfactory.

Members of the Pomilio family, together with 30 designers and workmen, have just arrived in this country from Italy to work for the Department of Aircraft production in designing new planes, said Mr. Ryan. The Pomilio have sold their Italian airplane interests to the Ansaldo Co. The Pomilio organization will be located at Indianapolis. Mr. Ryan pointed out that the Government is using the services of every first class airplane designer in the country and mentioned such men as Glenn Curtiss and Glenn Martin and said all men of their standing are receiving every encouragement from him.

He stated that the changes in the De Haviland 4, as ordered by General Pershing, have previously been recommended by a representative of the original aircraft board who had been sent to England to observe the English manufacturers build the De Haviland 4 over there and will return to this country and file

a report just prior to General Pershing's.

Mr. Ryan also cited an American officer lately returned from France, who stated that the De Haviland Company itself is enthusiastic over the American De Haviland design.

He told this in refutation of the testimony of army officers and others who claimed that the De Haviland 4 is a dangerous machine to fly and is inefficient because it has been changed considerably in mechanism and structure. There has been no let-up in the De Haviland production, said Mr. Ryan.

Airplane engines, he said, are the real limiting factor in the air programs of all warring countries and we are therefore concentrating on engine production, not only to meet our own needs, but also to meet the demand of the allies who are clamoring for far more Liberty engines than we can produce.

### Order 8000 Liberty Eights

DETROIT, Aug. 29—Special to AUTOMOTIVE INDUSTRIES—Dispelling all doubt regarding the purposes of the Aircraft Board in so far as the eight-cylinder Liberty engine is concerned, announcement has been made that contracts for 8000 of these already have been let. Of this total, the Willys-Overland Co. will produce 3000 in the Curtiss plant and the other 5000 is to be made by the Buick Motor Co.; production on both orders will be started soon. The Willys-Overland company is at present devoting fully two-thirds of its capacity to war work. The Elmira plant is 90 per cent on war work and the Elyria plant 75 per cent. The production of 8-in. shells will start next week in the new Toledo plant and the production of gun carriages has been started in another new plant. The passenger car output is now 300 cars daily. The production of the Curtiss company is now 800 planes monthly.

### Redfield a Member of Priorities Committee

WASHINGTON, Aug. 27—William C. Redfield, Secretary of Commerce, was to-day appointed a member of the Priorities Committee of the War Industries Board. His appointment is regarded as distinctly advantageous to industries classed as non-war. Last week Secretary Redfield declared himself in favor of giving more attention to the so-called non-war industries, so that their organizations and factories will be kept intact for after-the-war trade.

It is reported that thousands of complaints have been made to official Washington recently against the shutting down of factories not producing war materials. Secretary Redfield favors priority rulings which will permit limited operation.

## Ryan Heads Army Air Service

Appointed Second Assistant Secretary of War in Charge of All Army Air Activities

WASHINGTON, Aug. 28—John D. Ryan, director of the Bureau of Aircraft Investigation, has been appointed Second Assistant Secretary of War in charge not only of aircraft production but also of all military aeronautic activity. Major General William Kenly, head of the Department of Military Aeronautics, will hereafter report to Mr. Ryan. A new head of the Bureau of Aircraft Production will be named shortly by Mr. Ryan. Until the new director is named, W. C. Potter, assistant director of the bureau, will be the acting director, according to a statement made to-day by Mr. Ryan.

This consolidation of all military air activities under one head by Secretary Baker with the concurrence of the President virtually establishes an air ministry in line with the recommendations of the Senate Military Committee but with less powers than that committee desires.

The Senate Committee demanded a separate section to be controlled by a secretary of aeronautic operations, who was to be placed in supreme command, responsible only to the President. Under the new arrangement the army air service still remains a subsidiary of the War Department and Mr. Ryan is responsible to both Secretary Baker and President Wilson, while the naval air service remains under Captain N. E. Irwin, United States Navy.

Opinions expressed by both military and naval authorities are not in favor of a co-ordination of naval and military air operations. It is pointed out that our naval air program is radically different, involving questions of navigation and co-operation with the navy. Both Secretaries Daniels and Baker coincide with this view.

### Financial Aid for Non-War Industries

WASHINGTON, Aug. 29—Financial aid will be afforded to all non-war industries suffering serious curtailment if a plan proposed to-day by Bernard M. Baruch, chairman of the War Industries Board, becomes effective. Mr. Baruch has pointed out to the Federal Reserve Board that all of the non-war industries requiring material which is needed for the war must be "skeletonized" and asks that financial aid be given to save them from being wrecked. The Federal Reserve Board is considering the suggestion.

# Automotive Industries



## Cut Car Production to 25%

### War Industries Board to Allow Makers to Produce 50% During Remainder of Year

WASHINGTON, Aug. 26—Passenger-car manufacturers will be given steel sufficient to balance their inventories for a production, during the last 6 months of 1918, equal to 50 per cent of the production in the same period of 1917. Those makers who have more steel than this figure allows will turn over their excess supplies to other automobile factories which need it to complete their production.

The makers are further pledged to purchase no materials, equipment or supplies other than those needed to absolutely match up the stocks on hand. Upon meeting these conditions the manufacturer's requests for steel will receive preference treatment from the Priorities Division of the War Industries Board.

### Urge 100 Per Cent War Work

No decision has been made regarding further supplies of steel to the industry following Jan. 1, 1919, but the board in its letter to the National Automobile Chamber of Commerce, setting forth the above, again urges the industry to use all possible haste in averting the plants for use in either direct or indirect war work.

These decisions by the War Industries Board are the results of meetings between the board and Hugh Chalmers and Alfred Reeves, representing the industry. The agreement finally arrived at by the board was expressed in a letter sent to the N. A. C. C. and signed by Alexander Legge, Edwin D. Parker, J. L. Replogle and George N. Peek

### Inventories Aggregate \$150,000,000

The letter points out the fact that the inventories of raw materials and semi-finished materials in the hands of the industry aggregate \$150,000,000, and that these cannot be liquidated without additional supplies of steel which will allow the makers to match up the various parts.

The magnitude of the industry, which had more than \$1,000,000,000 in 1917, was one of the primary considerations which influenced the decisions of the board according to the members. They stated that they believed that an industry of this size was entitled to all the assistance that could be legitimately given in enabling it to clean up its stocks.

Following is the full text of the letter sent to the N. A. C. C.:

National Automobile Chamber of Commerce,  
7 East 42nd Street,  
New York City.

"Supplementing our letter to you of the 9th instant we beg to advise that we have now received most of the reports embodying the data and information which we requested you to furnish us, and have given these reports careful study and consideration. From them it appears that the stocks of raw materials and of semi-finished materials in the hands of manufacturers of passenger automobiles, while large, are greatly unbalanced, with the result that these large stocks, aggregating approximately \$150,000,000, cannot be liquidated until they have been 'matched up' with other materials necessary to manufacture the completed cars.

"The conclusion has been reached that it is in the public interest, as well as in the interest of your industry, that it be assisted as far as practicable, without interfering with the war program, in the liquidation of its stocks now on hand; and to that end the Priorities Division of the War Industries Board will accord a degree of preference designed to accomplish this result, to all manufacturers of passenger automobiles who will subscribe to a pledge to be prescribed by the Priorities Commissioner embodying in substance the following:

"(1) That the manufacturer will limit its purchase of materials, equipment and supplies to such as are absolutely necessary to match up its stocks now on hand.

"(2) That its production of passenger automobiles, and all repair parts therefor, shall not for the six months ending with December 31st, 1918, exceed 25 percent of its production for the calendar year 1917.

"(3) That it will conserve and economize in every possible way its stocks of iron and steel and their products now in its hands, or that may come into its possession, and will release on request of the War Industries Board to such other manufacturer of passenger automobiles as may be designated by the said Board such of its stocks as can be utilized by such other manufacturer and which are not required by it for either the limited production above specified or for war work.

"(4) That it will from time to time render such reports of its activities under oath or otherwise as may be called for by the War Industries Board.

"The War Industries Board will in carrying into effect the terms of the pledge herein provided for use as a basis, as far as applicable, the sworn reports recently rendered it in pursuance of its request.

"In justice to the passenger automobile industry we feel again impelled, as the situation appears to us now, to frankly repeat our statement to you of August 9th, that the urgent war requirements for iron and steel are so great that the probability of your industry procuring iron and steel after January 1st, 1919, for the manufacture of passenger automobiles is so uncertain that we again urge the members of your industry to as rapidly as possible utilize your facilities for the production of direct and indirect war requirements, not only in the interest of the Nation but in the interest of your industry itself. In such effort the members of your industry will have the active and whole-hearted cooperation of this Board."

## Gas Conservation Requested

### Fuel Administration Urges Owners to Eliminate Sunday Motoring East of Mississippi

WASHINGTON, Aug. 28—Owners of passenger cars in States east of the Mississippi are requested to refrain from operating of their machines on Sundays by the Fuel Administration. Motor boating and motorcycling for pleasure are also barred. No mandatory order has been issued as yet. Owners are expected to voluntarily observe the request, which is effective beginning Sunday, Sept. 1. The request includes taxicabs. Exceptions are as follows, and include only motor vehicles used for necessary purposes:

Tractors and motor trucks employed in actual transportation of freight.

Vehicles of physicians, used in performance of professional duties.

Ambulances, fire apparatus, police patrol wagons, undertaker's wagons, and conveyances used for funerals.

Railway equipment using gasoline.

Repair outfits employed by telephone and public service companies.

Only voluntary compliance with the letter and spirit of the request will prevent the issuance of a mandatory order prohibiting the use of gasoline on Sundays, says the Fuel Administration. Nearly 3,000,000 automobiles, it is estimated, will be affected by the order, and it is expected that 9,000,000 gallons of gasoline will be saved each Sunday if the request is strictly observed. Dr. Garfield made it plain to-day that the Government believes automobile owners will observe the spirit of the request and that issuance of a mandatory order will not be needed.

The heavy demand for gasoline overseas for use in airplanes, tractors, tanks, trucks, passenger cars and motorcycles is the principal cause for this conservation measure, while, in addition, there is the large and constantly growing demand for fuel oil for many of the war machines. Heretofore by cracking processes it has been customary to take one barrel of gasoline from two barrels of crude oil. Owing to the exceedingly large demand for fuel oil this proportion is being reduced, and it is likely that shortly only 30 per cent of each barrel will be made to yield gasoline. While the stocks of gasoline and oils are always low at this time of the year, up to this year production has been slightly in excess of the demand. In July of this year, however, consumption was 29 per cent

(Continued on page 400)

## St. Louis Develops Return Loads

### Chamber of Commerce Traffic Department Distributes Useful Data

ST. LOUIS, Aug. 24—Under the leadership of the traffic department of the Chamber of Commerce the return loads bureau is making definite progress. During the last week P. W. Coyle, of the Chamber of Commerce, has sent to local shippers a letter giving the data concerning time-tables and warehouse facilities of five truck lines to towns 20 or more miles distant from St. Louis. A meeting has been called for this week, at which bills of lading and rate data will be discussed by the express line owners and managers of local truck companies.

It has been developed that the chief drawback to shipments by truck lines has been the failure to observe the time card. Also that the chief fault with a return load from the smaller city was the failure to maintain a warehouse where a bill of lading could be issued. These defects can be remedied.

H. R. Brashier, assistant to Traffic Commissioner Coyle, has taken up the warehouse work. It is expected that several of the St. Louis warehouses will be consolidated. Country produce off the Missouri side of the river and coal on the Illinois side have been offered for return loads.

At the last meeting W. F. Rehbein, branch manager here for the Garford Motor Truck Co., was chosen chairman of the Joint Interurban Motor Truck Service Committee.

### Limited Supply of Coal for Michigan Passenger Car Industry

WASHINGTON, Aug. 24—The passenger car industry in Michigan will be limited in bituminous coal storage to a 20-day supply to be delivered after preferential industries, which includes the motor truck industry, are given a 45-day supply. The industry in other states will be limited to a 15-day supply after preferred industries receive a supply from 20 to 30 per cent. Public utilities will receive supplies ranging from 30 to 90 days before the non-preferred industries are supplied. All non-preferred industries are completely cut off from future shipments of by-products and gas coal.

Coal in excess of the above storage limitations, which are considered sufficient for current operations, will not be delivered to non-preferred plants for use before April 1, 1919, unless there is a surplus over the demands of the preferential consumers.

### Studebaker Gun Carriage Christened

DETROIT, Aug. 24—Over 2000 munition workers of the Studebaker factories, 250 of whom were women in shop overalls, celebrated in fitting style the

christening of the first of the many siege gun carriages which they will turn out during the next few months. The carriage was christened "Black Jack."

### American Import Restrictions Affect Ceylon Plumbago Output

THE plumbago industry in Ceylon is experiencing a period of stagnation, due chiefly to decreased shipments of graphite to the United States. Although the War Trade Board's restriction on plumbago imports has been a factor in this stagnation, there was a lessened demand on the part of American importers several months previous to the American restriction becoming effective. It is noted, for instance, says Consul Walter A. Leonard, that the plumbago shipped to the United States from Ceylon during the quarter ended March 31, 1918, totaled only 2194 tons, valued at \$405,064, according to invoices certified at this consulate, as against 6524 tons, valued at \$2,166,957, during the corresponding quarter in 1917.

In 1917 the United States took over 81 per cent of Ceylon's plumbago as compared with 75 per cent in 1916 (percentage based on quantity, not value), showing how dependent the industry is on the American market. The year 1917 was not quite as prosperous for the plumbago industry as the record year of 1916, when the total quantity exported was 668,216 hundredweight of 112 lbs., valued at \$7,298,128, as compared with 540,950 hundredweight valued at slightly less than \$6,500,000 in 1916. While the best grades of plumbago sold for as high as \$500 per ton during 1916 and 1917, half this price is not obtainable at present.

Unlike the tea and rubber industries, plumbago mining is largely in the hands of native Ceylonese, the majority of owners being men of small means with labor forces not usually numbering more than 20. Such owners must rely on an immediate sale of their graphite, and any marked fluctuations in the market will cause them to shut down or open up their mines. Thus it is observed that on June 30, 1917, when the market was good, 1288 mines were being operated, and employing 19,912 men, as compared with 764 mines at the end of the year employing 15,379 men. The small mines are obviously the ones first shut down in case of market depressions.

In 1916 the total output of Ceylon's graphite mines was over 33,000 long tons (of 2240 lbs.), compared with approximately 26,000 tons in 1917. Improved machinery, especially in working mines to greater depths, should enable Ceylon graphite to be mined at approximately the rate of 30,000 tons annually for many years to come.

### Puritan Buys Broc Electric Parts

DETROIT, MICH., Aug. 24—The entire stock of parts for the Broc Electric, formerly made in Saginaw, Mich., has been bought by the Puritan Machine Co., of Tenth and Lafayette Avenues.

## Location for Ford Mexican Plants

### One Factory to Be at Monterey and Another Plant at Guadalajara

MONTEREY, MEXICO, Aug. 26—Locations for two of the proposed tractor manufacturing plants which Henry Ford plans to construct in Mexico have been tentatively selected and only await the formal approval of the Carranza Government for final decision. One of the plants is to be located at Monterey and the other one at Guadalajara. It is stated that the project embraces also the establishment here of a large automobile assembling plant. In the contract entered into between Mr. Ford and the Mexican Government it is stipulated that all of the raw materials and finished products entering into the manufacture of the tractors and automobiles shall be of native production. No difficulty will be experienced in complying with this requirement, it is expected. Steel may be obtained from the plant of the Monterey Iron & Steel Co.; timber is available in abundance; cotton and other fibers may be had for fabrics.

### Exports to Holland and Denmark

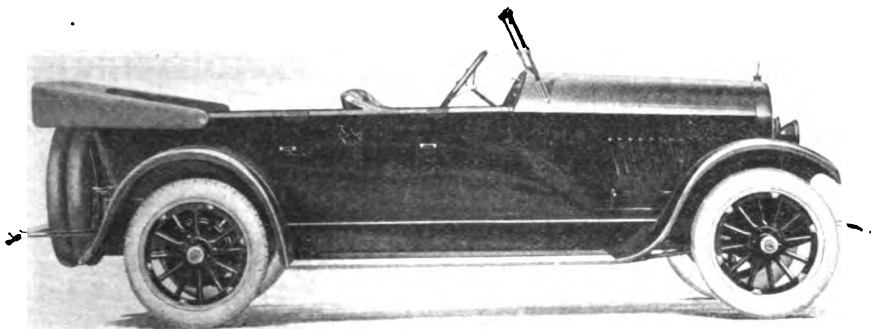
WASHINGTON, Aug. 25—Passenger cars, bicycles, motorcycles and spare parts of these excepting tires and accessories will be considered for exportation to European Holland and Denmark proper by the War Trade Board, according to an announcement to-day. Prospective importers in European Holland must obtain import certificates from the Netherlands Overseas Trust Co., following which the importer must notify the prospective exporter of the serial number of the certificate. The exporter can then apply to the War Trade Board for an export license. This means that the shipments to European Holland, except those consigned to the Government of the Netherlands, must be consigned directly and only to the Netherlands Overseas Trust Co.

When importing merchandise to Denmark the importer must first obtain an import certificate from the Merchants' Guild of Copenhagen or the Danish Chamber of Manufacturers and then advise the exporter in the United States of the serial number. The exporter in turn can then secure his license from the War Trade Board. In the case of Denmark, shipments may be consigned to an individual.

### Pennsylvania Rubber Declares Dividend

JEANNETTE, PA., Aug. 23—At a meeting of the board of directors of the Pennsylvania Rubber Co., held on Aug. 19, the regular quarterly dividend of 1½ per cent on preferred stock and 1½ per cent on common stock was declared, payable Sept. 30 to stockholders of record Sept. 15.





*Characteristic straight line body design is evident in the new Westcott*

## Westcott Arrowline Seven

**A New Model with Straight Body Lines and a Continental 9-N Engine  
—Standard Parts Are Used Throughout**

A new seven passenger model, known as the Arrowline Seven, has been announced by the Westcott Motor Co., Springfield, O. The body is of characteristic straight line design. The top line of the hood and cowl from the radiator to the instrument board is perfectly straight, and there is another straight line extending from the top line of the doors through to the radiator. The doors have sharp, square corners at top and bottom. The door handles are of tee design, with inside release, and the bumpers are of diamond bar shape.

This body is mounted on the standard Westcott six cylinder chassis, with a wheel base of 125 in. Cantilever springs are used at the rear, which combination permits of the use of a long body. The seats are pitched at an angle for comfortable riding, and the upholstery is very soft and deep. There is plenty of foot room for all of the seven passengers.

The front seat of the car is undivided, thus affording space for an additional passenger in an emergency. Between the disappearing seats in the rear is a small compartment for personal effects, which are secured against theft by a Yale lock, controlled by the same key as the ignition switch. Above this compartment swings a robe rail of leather. Tonneau and cabinet are illuminated by a small electric light. The instrument board is of walnut, and an unusual item of equipment is an electric signal lighter with extension cords.

The new Westcott is equipped with the Continental 9 N engine, of 3½ in. bore by 5½ in. stroke. Standard parts are used throughout the chassis, including the Delco starting, lighting and ignition system, the Rayfield carburetor, Gemmer steering gear, Fedders radiator, as well as oil cup lubrication, self acting top and thermostatic control of the temperature.

### U. S. Light & Heat Corp. Elects Officers

NIAGARA FALLS, N. Y., Aug. 23—At the annual meeting of the stockholders of the U. S. Light & Heat Corp., held at the offices of the company, the

following directors were elected for the ensuing year:

Ralph C. Caples, Egbert H. Gold, Edwin K. Gordon, James E. Kepperly, Chauncey L. Lane, C. O. Mininger, James O. Moore, B. J. O'Reilly, James A. Roberts, George G. Shepard and J. Allan Smith.

The following officers were elected for the ensuing year:

Egbert H. Gold, chairman; J. Allan Smith, president; Chauncey L. Lane, vice-president and general manager; B. J. O'Reilly, treasurer; R. H. Van Nest, secretary; T. G. Swannie, assistant secretary and assistant treasurer.

### Maxwell Motor Co. Calls Special Meeting

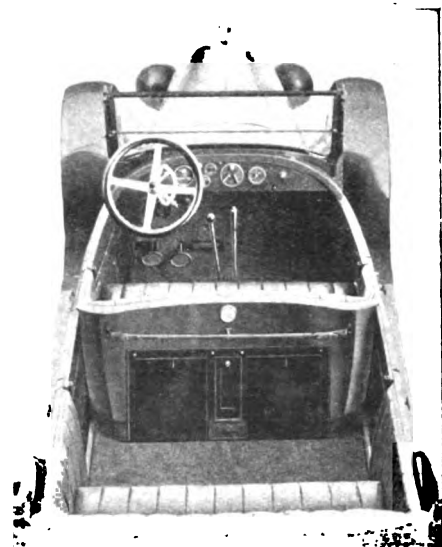
DETROIT, Aug. 26—A special meeting of the stockholders of the Maxwell Motor Co. has been called for September 5 for the purpose of considering and acting upon resolutions expressing the election of the company to have the moneys held by the Central Union Trust Co. applied to the purchase of shares of the first preferred stock for retirement.

### Gutta-Joolatong Rubber May be Imported

WASHINGTON, Aug. 24—Importation of gutta-joolatong rubber which has been prohibited by the War Trade Board is now allowed to the extent of importing a limited amount necessary for essential purposes in this country during the remainder of the calendar year. The amount licensed for import will be allocated by the Bureau of Imports of the War Trade Board among manufacturers in accordance with their requirements for the production of commodities essential to the success of the war.

### More Roads for Colorado

DENVER, Aug. 23—Plans for extensive development of Colorado highways, promotion and regulation of motor truck transportation and a general advancement of the motor car industry in this territory have just been decided upon



*Interior of Westcott Arrowline Seven*

at a Denver meeting of the executive committee of the Colorado Good Roads Association and the legislative committee of the Colorado Association of County Commissioners. The four main steps to be urged by a statewide campaign are:

(1) An enabling act to give the people of the state an opportunity to vote on a bond issue for building and maintaining permanent highways throughout Colorado.

(2) A transferring from the general fund to the state highway fund of all receipts from the state inheritance tax, now amounting to about \$150,000 yearly.

(3) A doubling of the yearly motor car license fees, which are now far below those in effect in many states.

(4) State traffic regulations aimed to give control over the speed of motor trucks, width of tires and other factors vitally affecting the wear of highways.

### Want Tractor Exhibits in N. E.

BOSTON, Aug. 24—Efforts are being made to develop tractor sales in New England. Plans are under way now to try to get some interest aroused to have tractor contests at some of the numerous county fairs throughout New England in the fall. No section has a greater number of fairs for its size than the six states comprising the group up here.

### Conveyor Increases Tractor Production

DEARBORN, MICH., Aug. 23—Henry Ford & Son have completed the installation of a conveyor in the plant in which final assembly is made. With the aid of this production has jumped upward and the daily output is now averaging 160. The production last week was 919 tractors as compared with 835 the week previous.

### Liberty Gets Government Order

DETROIT, Aug. 24—The Liberty Motor Car Co. has received an order from the Government for 2500 two-wheel trailers similar to those the Paige-Detroit Co. is working on. The company's production of passenger cars for last month was 250, and is averaging 10 a day at present.

## Makers of Wheels Organize

### Form Association of Automotive Wheel Manufacturers for Co-operation

TOLEDO, Aug. 28—The Association of Automotive Wheel Manufacturers was formed in this city a few days ago when twelve concerns, representing practically all the makers of metal wheels and some of them representing wood wheel interests, met for the purpose of organization. The complete scope of organization has not yet been decided upon, but has been left to a committee of three, which will draft plans and present a report at the next meeting of the manufacturers' interests which will be held in September, perhaps in this city. The committee of three to carry out the organization is made up of Mark Merriman of the Hayes Wheel Co., H. A. Coffin of the Detroit Pressed Steel Co., and George L. Lavery of the West Steel Castings Co. The conception of the Association of Automotive Wheel Manufacturers dates back to 1917, when Washington had some misconception of the possibility of metal wheel manufacture and when it was assumed that the metal wheel production was limited to foundry capacity, whereas its limitation was confined to machine shop capacity. It was this misconception on the part of the Government which led manufacturers to see the necessity of co-operation in order that the wheel problem might be correctly presented where necessary.

The objects of the association are to investigate the promotion of engineering connected with wheel manufacture and also the mechanical problems connected therewith. The necessary research and investigation into various lines of automotive manufacture is also one of the spurs to action. Undoubtedly many problems relating to standardization will be considered by the association, not that it will pass upon the standardization work but rather that closer co-operation with the Society of Automotive Engineers can be carried out. The association has in mind the more complete co-operation of all makers in the field and the welding together of all interests. Among those present were:

A. H. Anthony, Massillon Steel Casting Co.  
Edward H. Webb, Dayton Steel Wheel Co.  
Geo. L. Lavery, West Steel Casting Co.  
G. S. Porter, Hayes Wheel Co.  
Mark Merriman, Hayes Wheel Co.  
Ralph D. Webster, Wire Wheel Corp. of America.  
R. F. Flinterman, Michigan Steel Casting Co.  
Geo. Walther, Dayton Steel Foundry Co.  
R. P. Flower, Standard Steel Casting Co.  
A. L. Jelley, All-Steel Wheel Co.  
W. E. Burns, Michigan Malleable Iron Co.

Replies from those favorable to the formation of an organization who were unable to attend were read from the following:

B. L. Smith, Smith Wheel Co.  
Edward Budd, Budd Wheel Corp.  
Isaac G. Johnson & Co.  
Bertner Fleeger, Stryer Steel Casting Co.

### Hanks Leaves S. A. E.

NEW YORK CITY, Aug. 28—M. W. Hanks, who has for over a year had charge of the standardization work of the Society of Automotive Engineers, has resigned, and connected himself with the navy as mechanical aeronautical engineer. It is in connection with standardization work in the navy that Mr. Hanks hopes to carry on the work he has been connected with in the past.

### New Aviation Training System Adopted

WASHINGTON, Aug. 27—Experienced flying officers are now being returned from abroad to act as special instructors in the advanced courses of aviation training. Candidates for flying service consequently receive more individual training in this country. A new plan, known as the Gosport system, or "All Thru," as it is, popularly called here, is used, which brings closer contact between the cadet and the instructor. When the cadets arrive at a flying field from the ground school, where they have learned much of the theory of flight, engine control and repair, radio, signaling, and other kindred subjects, several of them are assigned to an instructor, who stays with them until they have qualified in elemental flying. They are then sent to the special schools for final work, and training in their particular line, as pursuit, reconnaissance, artillery control, or bombing pilots. The old practice of giving a cadet so much time in the air under instruction, and then turning him loose for his first solo flight, in a "sink-or-swim" fashion, is being discontinued, and what is believed to be a more safe and sane system is being adopted.

### Aviation Field Accidents Show Decrease

WASHINGTON, Aug. 27—Six deaths resulted at aviation fields in this country for the week ended Aug. 17. This represents but one fatality for every 3638 hours flown, or 291,040 miles of air travel. Following is the summary:

Brooks Field, San Antonio, Tex..	1
Carlstrom Field, Arcadia, Fla....	1
Carruthers Field, Benbrook, Tex..	1
Kelly Field, San Antonio, Tex....	1
Chanute Field, Rantoul, Ill.....	1
Post Field, Fort Sill, Okla.....	1

Total..... 6

### Hart-Parr Dynamometer Performance

CHARLES CITY, IA., Aug. 26—The Hart-Parr Co. has given out the results of the dynamometer test on its 30-hp. tractor at the Salina demonstration. According to the official report, signed by Oscar W. Sjogren and C. K. Shedd, engineers in charge, the engine of the tractor gave an average output of 31.13 hp. at an average speed of 731.8 r.p.m. for a period of 30 min. According to A. W. Fitzpatrick, service manager of the company, the test was made at 12.30 p. m., when the Government thermometer was at 109 deg. in the shade, yet the temperature of the cooling water never rose above 175 deg.

## Government Schools in Employment

### Organizes Instruction Classes to Train Executives Without Charge

WASHINGTON, Aug. 26—The Government has organized a system of War Emergency Courses for the training of employment managers which has involved the creation of an advisory committee to set the general standards of instruction with the co-operation of a number of departments at Washington. These include the Ordnance Department, the Quartermaster Department, the Navy Department, the Department of Labor, the Emergency Fleet Corporation, the General Staff and other Government divisions. The policies of this committee are carried out by a staff organized as the Employment Management Division of the War Industries Board.

This division has secured the services of the foremost instructing authorities of the country on each individual subject dealt with. The subjects included in the course cover the organization and equipment of an employment department, the employing of the worker, training the worker, payment, control of working conditions, keeping the worker up to standard, the government of the shop, etc.

The means of instruction include systematic lectures by experienced teachers who will devote all their time to the work, and special lectures by experts who have had practical experience in specific lines. These are supplemented by studies made in efficient plants and other illustrations of given conditions.

To these courses employers are invited to send men or women of their own choosing, subject to the approval of the division. It is, of course, understood that those benefiting by attendance will return to their sponsors and be utilized by them in employment work.

Instruction is, in all cases, offered without any charge for tuition. The only outlay is for the living expenses of students while in residence and about \$15 for books and supplies. Application for admittance to any of these courses should be sent to Captain Boyd Fisher, 717 Thirteenth Street, N.W., Washington, D. C., who will furnish the necessary blanks, etc.

The following courses have been arranged and others will be announced later:

City	School	Date
Boston, Mass.....	Harvard, Boston University and Massachusetts Institute of Technology co-operating	Sept. 2
Rochester, N. Y..	University of Rochester	Sept. 16
Pittsburgh, Pa....	Carnegie Institute of Technology and University of Pittsburgh co-operating (tentatively)	Sept. 23
New York, N. Y..	Columbia University	Sept. (date not yet fixed).

Courses will follow at about eight-week intervals at each of these schools.

## Imports of Rubber Drop Slightly

July Is 1198 Tons Behind Last July—Total for 6 Months Is 10,189 Tons Ahead

NEW YORK, Aug. 26—Importations of crude rubber dropped slightly during the month of July as compared with the previous month, though the total for the first six months of the year is well in excess of the total for the first six months of 1917. During July, 1918, a total of 16,092 tons was brought in, as compared with 17,290 tons in July, 1917, the drop amounting to 1,198 tons. July, 1918, showed a much greater drop when compared with June, the difference being a loss of 8022 tons.

During the first six months of 1918 the total amount of rubber brought in was 105,371 tons. This compares with 115,560 tons brought in during the first six months of 1918, making this year to date 10,189 tons ahead of last year. Following are the statistics as compiled by the Rubber Association of America:

Months	1917, Tons	1918, Tons
January .....	12,788	16,084
February .....	10,162	13,108
March .....	18,624	17,161
April .....	13,000	12,703
May .....	18,411	16,288
June .....	15,096	24,124
July .....	17,290	16,092
Total .....	105,371	115,560

### Export of Tin Plate Regulated

WASHINGTON, Aug. 26—New regulations (W. T. B. R. 209) have been published by the War Trade Board governing the issuance of licenses for the exportation and manufacture of tin. Applications for licenses to export tin plate will only be received from the manufacturer, or, if the applicant is other than the manufacturer, when evidence satisfactory to the War Trade Board shall be furnished showing that the purchase of the tin plate to be exported has been made by the applicant directly from the manufacturer. A copy of the contract for such purchase shall be filed with the application.

Of more direct interest to concerns in the automotive and allied industries are the conditions governing the issuance of licenses for the exportation of bearing metals, anti-friction metals, white metals and tin alloys containing more than 5 per cent of tin; of solder containing more than 40 per cent of tin, and of tin foil, collapsible tin tubes, bottle caps or covers of tin foil containing more than 5 per cent of tin.

Applications for such licenses will be considered provided that, in the case of shipment to Canada or Newfoundland, evidence satisfactory to the War Trade Board is furnished showing that the

above-mentioned commodities are to be used for a purpose for which they may be used within the United States, and do not contain a percentage of tin higher or of a quality other than is requisite for the purpose to which they are to be put.

If the shipment is to other destinations, evidence must be furnished that it is intended for a purpose which will contribute directly to the successful prosecution of the war, and that the tin content of the bearing metals and solder does not consist of Straits tin or Banca tin.

If the tin content of the various alloys is less than given above, consideration of the application will be facilitated if it is accompanied by an affidavit from the manufacturer stating the amount of tin content.

### Ford to Produce Thousands of Whippets

DETROIT, Aug. 26—The Ford Motor Co. has begun production of thousands of Whippet tanks of the small type for the Government, for which it has been awarded a contract amounting to millions of dollars. The Ford company has been experimenting for some time with the small tanks similar to those which recently achieved success on the western front, and is now in a position to manufacture them on a large scale. Before the contract was received, officials of the company stated that small tanks could be turned out with nearly as great rapidity as Ford cars, and it is expected the daily output of tanks will be extremely large. The exact size of the contract is not stated, but it is reported to be one of the largest received in Detroit.

### Railroads Largest Steel Users

WASHINGTON, Aug. 23—A meeting yesterday between the War Industries Board, Dr. H. A. Garfield, Fuel Administrator; Carle Gray, representing the Railroad Administration; Felix Frankfurter, of the Department of Labor, with the War Service Committee of the Iron and Steel Institute and other steel makers, showed that the largest Government agency consuming steel is the railroads; next, ship builders; third, War Department, and fourth, the Navy Department. Discussion as to the best means of meeting these actual war requirements without possibility of curtailment resulted in decisions that there must be:

1. Greater conversion of mills to the production of steel that is required in the war program.

2. An increase in the coal supply, particularly by-products coal, available for mills engaged on Government work.

3. Shutting off further steel shipments to industries other than those engaged in meeting war needs.

4. More rigorous conservation in the handling of steel in the mills.

The steel men in the meeting promised to co-operate to their utmost in meeting the Government's steel requirements and virtually pledged themselves to so increase their output as to guarantee the needs of the war program.

## Order 17,000 Class "A" Trucks

White, Packard, Peerless and Pierce-Arrow to Build Standardized White Trucks

WASHINGTON, Aug. 26—Following last week's announcement in AUTOMOTIVE INDUSTRIES of the reorganization of the motorized vehicle section of the army under the direction of the original regime which favored the standardized truck program, the following list of truck contracts has been made public. These contracts were made shortly before the reorganization took place and while the Motor Transport Service was under Col. F. M. Glover. The contracts were as follows:

White Co., Cleveland, 8000 "A" (White) 1½-ton trucks.

Peerless Motor Car Co., Cleveland, 3000 "A" (White) 1½-ton trucks.

Packard Motor Car Co., Detroit, 3000 "A" (White) 1½-ton trucks.

Pierce-Arrow Co., Buffalo, 3000 "A" (White) 1½-ton trucks.

These "A" trucks which were contracted for are the White 1½-ton trucks which were substituted for the original standardized "A" truck following tests held by Col. Glover together with the Ordnance Department.

These manufacturers have been allowed a price of \$2480 each for the trucks, and the Peerless, Packard and Pierce-Arrow companies have been allowed an additional \$100 for each truck for tool costs.

Col. C. B. Drake, whose nomination for Brigadier-General has been made, is already in active charge of the new Motor Transport Corps and Colonels Glover and George have been transferred to other army divisions. Col. Drake is at this time working out the organization of the new corps.

### Saxon to Make AA Trucks

DETROIT, Aug. 26—The Saxon Motor Car Corp., Detroit, has received a sample of the 1-ton truck of the Class AA type and will start shortly on the manufacture of a quantity of these trucks, for which an order was recently received from the Government.

### Milwaukee Wants Training School

MILWAUKEE, Aug. 26—Milwaukee, with thirteen large factories devoted to the manufacture of motors for passenger and commercial cars, trucks, tractors and aircraft, is making an effort to induce the War Department to locate a training school for automotive mechanics selected under the draft in this city. The Milwaukee County Council of Defense has been assured by each of the plants that they will assist in conducting and maintaining a school of this kind. It is pointed out that few cities in the United States have equal facilities for training soldiers in the construction, maintenance and repair of gas engines.



## Labor Shortage Shuts War Plants

Non-War Industries Must Furnish Help—1,000,000 Workmen Needed

WASHINGTON, Aug. 24—A shortage of 1,000,000 unskilled workers, and a tremendously increased shortage over this figure in the near future, is announced by the United States Employment Service of the Department of Labor. Reports show that some of the most important war factories have been forced to shut down units because of lack of labor. The Employment Service has notified all state directors that the 1,000,000 shortage of men must be met by securing the labor from non-war industries.

Nathan A. Smyth, assistant director general of the United States Employment Service, pointed out that if this labor demand is not met promptly the new army which will be raised by increasing the present draft age limit may be faced by lack of equipment. Mr. Smyth said:

"The figures now brought together show to what great extent a shortage of unskilled labor is imperilling the work of America's war industries. The seriousness of the situation can scarcely be exaggerated. Instance after instance is coming to our attention where the lack of unskilled labor threatens to cause some highly essential war project to close down.

### Available Labor Supply Depleted

"Though thousands of men have been moved by this service within the last 3 weeks, sometimes over great distances, we are confronted with the fact that available supplies of unemployed labor are practically depleted. Most of those who can now be found are of a restless, shifting type who will usually stay on the job only a little while, and are of slight value when there.

"As the army increases, the situation will grow more grave. The fact must be faced squarely and resolutely. There are plenty of men in the country to meet the present needs for unskilled labor, but they are now working at non-war work. The time has come when America must get fully on a war basis.

"If we are not to leave our armies in the lurch for the lack of munitions and supplies, every able-bodied man in the country will soon have to find work in some essential industry. Patriotic employers in non-war industries should take immediate steps to reduce their forces of men to an absolute minimum.

"An aroused public sentiment, which will brand as a slacker any man who willfully refrains from working at some productive job up to the full extent of his capacity, will be more effective than any laws or regulations.

"What, perhaps, is most needed in our war industries is an infusion of men who

will undertake to work as common laborers because of our country's need. Their presence will be an inspiration and example to those already at work and will go a long distance toward reducing the inefficiency and abnormal turnover of labor which exists at many important projects. Americans, like the English and the French, must learn that 'common labor,' when performed for one's country in time of war, is worthy of any man, whatever his prior position or experience."

In order to fill the present labor shortage, additional quotas of unskilled labor have been assigned to the various states, bringing the total to be supplied to 878,150, distributed as follows:

State Quotas to Fill Labor Shortage of 1,000,000 Unskilled Workers	
Alabama	4,050
Arizona	2,640
Arkansas	3,870
California	42,150
Colorado	10,120
Connecticut	16,340
Delaware	1,670
Florida	4,930
Georgia	6,070
Idaho	2,020
Illinois	78,670
Indiana	20,940
Iowa	11,350
Kansas	10,120
Kentucky	8,100
Louisiana	8,000
Maine	7,660
Maryland	14,340
Massachusetts	58,960
Michigan	24,110
Minnesota	18,390
Mississippi	2,200
Missouri	25,260
Montana	2,980
Nebraska	8,180
Nevada	1,580
New Hampshire	4,930
New Jersey	38,310
New Mexico	1,140
New York	169,140
North Carolina	4,310
North Dakota	1,850
Ohio	49,370
Oklahoma	7,570
Oregon	8,620
Pennsylvania	83,250
Rhode Island	9,420
South Carolina	2,820
Tennessee	6,780
Texas	14,260
Utah	4,140
Vermont	3,430
Virginia	8,980
Washington	22,180
West Virginia	7,570
Wisconsin	16,980
Wyoming	1,780

### Giant Plane from St. Louis

ST. LOUIS, Aug. 26—W. E. Workman, general manager of the Handley-Page Aeroplane Mfg. Co., delivered a talk here last week to members of the Chamber of Commerce at a luncheon in which he told of factories to be built in this country. Immediately after the luncheon a movement was started to raise \$50,000 to build a giant plane here to fly to the war zone, where it will be offered in service. Some progress has been made in raising the fund.

## New Physical Tests for Airmen

Medical Research Laboratory Employs Apparatus Giving Standard Examination

WASHINGTON, Aug. 24—All men who have won their wings in the United States Air Service are now required to pass a new heart, lung, ear and eye test to establish their physical and mental fitness when high in the air, and particularly to indicate at what heights they are in a condition to fly. Cadets receive a test before they finish their schooling; flyers are given these tests periodically to eliminate any whose physical or mental efficiency has become in any way impaired.

These tests are the result of study and investigation by the Medical Research Laboratory at Hazelhurst Field, Mineola, N. Y., whose staff has devised apparatus and determined upon a standard examination for classifying pilots.

To stay in the rarefied air at an elevation of 20,000 ft. for any length of time has been found to be a strain on even the most physically perfect. It has also been discovered that many of the most seasoned flyers cannot undergo the sudden quick changes in altitude, occasioned by diving and climbing, without physical deterioration. It was recognized as too great a risk to subject these men to actual flying tests, and so the medical laboratory at Hazelhurst Field undertook to devise some way of getting the same results by means of a ground test.

In the early tests the pilot was placed in a steel, airtight cylinder from which the air was gradually exhausted and then replaced, to simulate a flight into the rarefied air of high altitudes and back to earth, but to-day the pilot sits comfortably in the same room with his examiners. His nose is clamped so that he cannot breathe through it. Over his mouth is placed the breathing apparatus, which is connected by tubes with a tank of measured air and with instruments that record every breath he takes. The air is analyzed at various stages of the run. As fast as he exhales, the air is taken into a reservoir, where it is cleared of carbon dioxide, and then returned to the tank. Gradually he uses up the oxygen and thus air conditions of high altitudes are duplicated. The higher one goes up, the rarer the air becomes; just so with the man under test; after a certain time he has consumed an amount of oxygen which leaves the remaining supply just equal to the oxygen available at a certain altitude. Time takes the place of height in the test. "All the way up," so to speak, several specialists watch him—one his heart, pulse and blood pressure, one his eyes, and the others his responses to signals and observations. Records of his pulse and blood pressure are made every other minute. The eyes are tested every three minutes.

The man under test is kept fairly busy, just as he would be piloting a plane. Before him on a table is a bank of small electric lights, one or another of which flashes every five seconds. These he must extinguish as fast as he observes them and before they go out. He has but a few seconds. Below the lamps is a corresponding set of buttons which, when touched with a pointer held in the right hand, extinguishes the respective lights. The observers watch him constantly and check his errors or delayed actions.

Another instrument before him is an ammeter, which acts similarly to a speed dial on a plane, and, accordingly, in the test must be kept at a constant point. One of the examiners, out of view of the pilot, changes the pointer from time to time, and it is up to the pilot to rectify his dial by sliding his right hand along an instrument ar-

ranged to compensate for the change. These two duties keep his right hand pretty busy; his left arm is not used, as it has the blood pressure apparatus attached. He is also keeping a small electric fan motor at a constant speed, the variations in speed being indicated by changes in the hum of the motor; the corrections are effected by a foot treadle, similar to an accelerator on an automobile. His every movement is noted and recorded by the observers, who see if his heart, lungs and eyes accommodate themselves to the altitude.

As time goes on (and the test lasts for about 30 minutes), the pilot becomes a bit groggy or sleepy from lack of oxygen, just as he would at the corresponding altitude, and this condition becomes manifest in changes in the action of his heart, eyes, ears and brain. Along toward the end of his run he may let the motor slow down, forget the indicator entirely, or miss hitting the light buttons. But he is immediately released when his heart shows a strain or his pulse or respiration gets too far from the normal condition.

A few minutes after his release from the apparatus all signs of his recent fatigue pass away and he becomes normal again. But a very important record has been established, his future safety practically assured, and he himself feels that it would be absurd, in view of the facts shown by the tests, for him to try to fly out of his level. Where argument and theory did not convince some headstrong pilots before, they readily accept the inevitable when "shown" to-day.

There are now three classes of pilots; those few who can endure an altitude of over 20,000 ft. without undue fatigue are in class AA and are designated to fly pursuit planes when they reach the front, if they keep within the class in future tests. The men who can stand the work at 15,000 to 20,000 ft. are in class A; from 8,000 to 15,000 ft., class B, and those from the ground up to 8,000 ft., class C.

Future tests may show that some may be moved up a class, say from B to A, or that others may have to be moved down, both for their own good and the good of the service.

#### Electrical Apparatus and Supplies Classified as Essential

WASHINGTON, Aug. 22—The manufacturers of electrical apparatus and supplies will be classified as essential, according to a statement by the Priorities Commissioner to-day. Manufacturers of these commodities, however, will have to pledge themselves to limit their output to essential products and to insure that such products are devoted solely to essential uses as that term may be defined from time to time by the Priorities Division. The manufacturers will be relied upon to supervise their own industries and also the jobbers, distributors and retailers of electrical supplies. Jobbers of these commodities will be permitted to maintain reasonable stocks for sale to Government agencies, war industries and the civilian population, provided the jobbers will pledge themselves to rigidly restrict use of all stocks to solely essential uses and to reduce the jobbing and retail stocks to a minimum.

#### Traverse City Becomes Napoleon

TRAVERSE CITY, MICH., Aug. 26—The capital of the Traverse City Motor Car Co. has been increased from \$150,000 to \$500,000, and the name of the company changed to Napoleon Motors Co. Following are the new officers just elected: President, W. J. Chase; vice-president, C. E. Culver; secretary-treasurer, Frank Trude; chief engineer and general manager, K. W. Oswald; directors, the officers and J. W. Patchin, George H. Curtis and C. S. May. The company has been turning out 1- and 1½-ton trucks and three models of passenger cars.

## Vestibule Schools Meeting Needs

### Intensive Training in 100 Plants Overcoming Serious Skilled Labor Shortage

WASHINGTON, Aug. 23—The serious shortage of 250,000 skilled workers in this country is being met by the factory training school plan, which has often been referred to in AUTOMOTIVE INDUSTRIES, according to a statement by Samuel Gompers, Chairman of the Committee on Labor of the Council of National Defense. The factory training school plan has been adopted by more than 100 large concerns, each employing more than 300 people. It is estimated that 750,000 new skilled workers will be required by Jan. 1, and Mr. Gompers urges all employers to adopt the factory training school plan, which is being furthered by the Committee on Labor.

#### \$1,500,000 Yearly for Training

The 100 factories mentioned by Mr. Gompers are spending approximately \$1,500,000 a year in this business of intensive training of new workers. The training investment is not regarded as an expense as the training itself results in production which equals the production rate of the factory shops.

Outlining the work of the past year by the Committee on Labor, and the possibilities of increasing the numbers of skilled workers Mr. Gompers said that one year ago that section of the committee on labor of the Council of National Defense which has been instrumental in developing the training department or vestibule schools above noted recorded the following as its declaration of policy:

"The section on industrial training for the war emergency is concerned with industrial training only as a war measure. It is not concerned with vocational education in general. In all cases in the existing crisis shortage of labor must be met first by training operatives from allied trades who are unemployed and by advancing operatives of ability from lower to higher positions in the occupation itself. For instance, apprentices should be advanced rather than outsiders. It is possible that many sewing women will be without work, and many men in the building trades. For all such, new and fitting places must be developed where possible. Non-wage earners must not be trained to take places for which unemployed wage earners may reasonably be trained."

#### Aluminum Price Put at 33 Cents

WASHINGTON, Aug. 23—A maximum base price has been fixed on aluminum at 33 cents per lb. f.o.b. United States producing plants, for 50 tons and over, of ingot of 98 to 99 per cent. This price will be effective until March 1, 1919. It was approved by the President yesterday, following an agreement made

between producers of aluminum and the War Industries Board. Differentials for sheet, rod and wire and differentials for quantity, for grade and for alloys will remain those approved by the Price-Fixing Committee of the War Industries Board as effective from July 1, 1918.

These prices will be effective on deliveries made during the period from Sept. 1, 1918, to March 1, 1919, on contracts made during this period; and furthermore, the new prices will be effective on deliveries made during this period on existing contracts which specify that the price shall be that in force at the time of delivery. Deliveries made during the period of Sept. 1, 1918, to March 1, 1919, on other contracts will be at the price stated in such contracts, except that on existing "direct and indirect Government contracts" containing a provision that refund is to be made of the difference between the price stated in the contract and the "Government fixed price, if, as and when made," such difference shall be refunded on deliveries made during the period from Sept. 1, 1918, to March 1, 1919, on presentation of proper proof that the purchasing Government gets the benefit of the refund.

#### New List of Preferred Industries Being Formulated

WASHINGTON, Aug. 22—The War Industries Board is formulating a new list of preferred industries, which will be twice as long as the present preferred list, which contains 32 classes. The extension of the list is due to widely expanded war needs and pressing demands of civilian origin. This new list will be used as a key to the relative importance of all of the country's industrial enterprises. Each industry is being surveyed as to national needs and when the list is once established it will be maintained by a system of priority which will determine the use of the materials, facilities, fuel, transportation, labor and capital needed for them.

The War Industries Board is working with the War Finance Board in the creation of the new list.

An important point in this new list lies in the fact that it will be used as an indication of what constitutes war work. The War Department's "work or fight" ruling will be made by men who are engaged in any of the classes of the essential industries listed. The new table may be expected within a week.

#### Thirty-two Biggan Trailers Daily

CORUNA, MICH., Aug. 22—The daily output of the Biggan Trailer Co. will reach 32 trailers within a few days, or equal to 4 carloads. At the present time approximately 50 men are employed in the plant, which number will be greatly increased as soon as more men can be obtained. The company is working on a government order for 500 trailers for the aviation department and expects to enlarge its plant shortly.

## Landing Field Chain Across Continent

Department of Military Aeronautics to Have Series of Fields 100 Miles Apart

WASHINGTON, Aug. 26—Construction of landing fields and training fields and enlargement of some of the existing fields have been ordered by the Department of Military Aeronautics. A chain of landing fields is being built across the continent at intervals of 100 miles. When they are completed they will be able to supply pilots, oil, gasoline, shelter, machine-shop facilities, maps, charts and barometer and thermometer ratings.

They are being built in New York, Pennsylvania, Ohio, Illinois, District of Columbia, Georgia, Texas, California, Arkansas, Mississippi, Alabama, New Mexico and Nebraska. The fields will no doubt enter largely into the location of future training fields, as they can be used for developing fliers, since they are sufficiently close to establish well defined air routes.

Bolling Field, District of Columbia, is to be improved by an expenditure of \$103,150. This field is being used for aerial patrol and protection of Washington as well as a training field for air service officers located in the capital. In addition to hangars and quarters sufficient for 23 officers and 154 enlisted men, there will be a balloon station with captive and free balloons for training observers. A photograph developing hut and a small radio telegraph station will also be features of this field.

The War Department now plans to train fliers in this country in squadrons to be shipped in such form to Europe instead of detachments as heretofore. Forty squadrons have been authorized. Four will be located at Houston, Texas, and thirty-six at Long Island, N. Y.

Major General William L. Kenly, Director of the Division of Military Aeronautics, states that this division is speeding up the training of fliers and is making ready to produce whatever number of fliers may be called for.

"Training schools," said General Kenly, "are now being grouped in districts so that the cadet fliers may pass from ground, primary, and advanced instruction all in one locality, and when the final test is passed be ready for France. It is also the intention as classes of these cadets finish their training as fliers to organize them into squadrons and brigades so that they may be sent overseas as such and take the air at the front in the formation in which they have been trained.

"Our study and observation and also the experience of officer instructors who have been overseas make us confident that this country offers the best training ground, not excepting England and France. This is primarily so because we have unlimited room here in the

United States. We are now equipping our flying fields with experienced instructors.

"In England and France the population is so great and uninhabited areas are so few and far between that it is difficult to locate even half a dozen training fields, to say nothing of several dozen. Over there, for instance, it is difficult to establish a gunnery school for fear of the damage that might be done to non-combatants or even to buildings. Gunnery schools require great areas of open ground in isolated districts. It is easy to locate such fields in the United States and at the same time have them accessible.

"The spirit of the West and the morale of officers and men, no matter whether they came from the North, East, South or West, is altogether splendid. They are absolutely fearless, show a high grade of intelligence and are bound to give a good account of themselves.

"One of the fields I visited was Mather Field at Sacramento, Cal. This field has a record of 250,000 hours of flying without a fatality. Another interesting place was the balloon field at Arcadia, Cal., where I saw seven balloons in the air at one time. The site of this field is a ranch back of which mountains rise to elevations the tops of which offer the same atmospheric conditions as the cadet gets suspended high in the air in the balloon basket. By taking the cadets up in these mountain tops, the instructors can train a large number at a time in observation and range-finding work, instead of limiting the classes to a few pairs in balloon baskets.

"We want good men in the Air Service, and we will need them in generous numbers. As soon as the new draft regulations are determined, I will venture to say that there will be unlimited opportunity for young men of the right calibre in flying schools and on the ground, for both this country and overseas."

### Naval "Hydro" Station for Morehead City

GREENSBORO, N. C., Aug. 26—The location of army activities in Charlotte, Wilmington, Raleigh and Fayetteville is to be followed by the establishment of a naval aviation station at Morehead City.

The Secretary of the Navy indirectly has confirmed reports that a hydro-aeroplane station is to go to Morehead City. It is understood that the naval training station is to be located at Camp Glenn, a site hitherto used by the National Guard of North Carolina as a rifle range and training camp.

### Oakland Employs Wives of Soldiers

PONTIAC, MICH., Aug. 26—The Oakland Motor Car Co. is giving the wives and sisters of employees who have gone into Government service preference in awarding factory positions. Women are employed in many departments, and the company reports they have proved themselves very efficient and versatile.

## Dope Making Plants Nearly Ready

Eight Chemical Units for Aircraft Bureau to Produce All Ingredients for Dope

WASHINGTON, Aug. 26—Eight chemical manufacturing plants, built for the Bureau of Aircraft Production, estimated to cost \$7,000,000, are now nearing completion. They will produce the necessary ingredients used in the manufacture of "dope" for coating airplane surfaces, immense quantities of which are used monthly, last month's supply alone running into 200,000 gal.

There are two principal types of "dope" now in use in the U. S. Air Service: cellulose nitrate "dope," used on training planes, and cellulose acetate "dope," used on all planes shipped overseas. Acetate "dope," when properly made and applied, is believed to give a better, more permanent and less inflammable coating than nitrate "dope." The characteristics of acetate "dope" are important in connection with the use on combat planes which are subjected to attacks with incendiary bullets.

Early in the preparation of the air program a standard "dope" was adopted and steps were taken to overcome the shortage of the ingredients and chemicals for the manufacture of cellulose acetate "dope." To-day, American plants, operating for the chemicals section of the Bureau of Aircraft Production, are turning out such materials as acetate of lime, methyl alcohol, acetone, glacial acetic acid and methyl ethyl ketone. From these materials "dope" is manufactured by several firms throughout the country for release through the chemicals section to plane manufacturers, aviation schools, fields and supply departments in this country and abroad.

The general method of doping the wing surfaces is to apply three or four coats of the "dope," intervals of several hours elapsing between the application of each coat. Because of the volatile nature of the thinners of solvents used to dissolve the "dope," the liquid portion evaporates quickly and the air in the vicinity becomes laden with the slightly injurious vapors of the solvents. On account of this evaporation the major portion of the solvents is lost, but steps have been taken to preserve the health of the workers and also to recover the solvent. Approved methods for recovery now make it possible to save from 50 to 85 per cent of the solvents lost during the process of doping and drying. Special "dope" containers are also provided which will reduce evaporation.

### Flags Fly on Milwaukee Plants

MILWAUKEE, Aug. 26—A service flag containing three gold stars, one silver star and 177 other stars was unfurled over the main office of the Wisconsin Motor Mfg. Co. at Milwaukee with impressive ceremonies on Aug. 23.



## Federal Approval for Road Building

### Beginning Next Month Road Material Cannot Be Delivered Without Formal Permission

WASHINGTON, Aug. 26—Federal approval will be required for all highway construction, according to the regulations made public to-day and effective next month, by the United States Highways Council, which governs highway and street work during the period of the war. Formation of this council was announced recently in these columns. It comprises representatives of the War Department, Agricultural Department, War Industries Board and Council of National Defense.

"No manufacturer," the council's announcement says, "will furnish any road-building material until the project has been approved by the United States Highways Council."

The proposed work that should be first submitted to the United States Highways Council through the appropriate State highway department is defined as follows:

"All proposed highway, street, culvert and bridge construction, reconstruction and maintenance involving: (a) the issuance of bonds; (b) the use of rail or water transportation; (c) the use of coal or oil as fuel; (d) the use of cement, brick, asphalt, oil, tar, crushed stone, or steel (also sand and gravel where shortage exists) as highway material."

The council urges that new highway and street construction be confined to most essential needs, and announces that it will give first consideration to the maintenance of highways already completed. Reconstruction is to be favorably considered only where it is clear that maintenance is no longer possible except at prohibitive cost.

New construction, it is announced, will be given consideration by the council in the following order:

First, highways and streets of military value, used regularly for the transportation of military supplies in considerable quantity, for the movement as an established practice of army-truck trains, or essential to the efficient operation of a military cantonment, post, or plant;

Second, highways and streets of national economic value, serving directly to promote the national welfare and not merely local welfare;

Third, unfinished contracts involving contractual obligations (incurred prior to April 5, 1918, where bond issue is involved) which may not be disturbed without serious consequences;

Fourth, streets and highways which although not of national economic importance are of extreme local importance, and the construction of which has progressed to such a point that serious hardship would be caused if their construction or completion should be postponed.

The council is soon to begin, in co-operation with the Bureau of Public Roads of the United States Department

of Agriculture, and the State highway departments, preparation of a program of road and street construction, reconstruction and maintenance throughout the United States for the working season of 1919.

The purpose is to approximate the character and amount of work deemed essential for 1919, with the amount and character of financing and materials involved, and the probable demand on rail and water transportation and labor supply. The preparation of the program in each State is to be in charge of the State highway department.

The United States Highways Council is composed of representatives from the Department of Agriculture, the War Department, the Railroad Administration, the War Industries Board, and the Fuel Administration. Logan Waller Page, director of the Bureau of Public Roads, is chairman of the council.

### Airplane Ambulance Successful

WASHINGTON, Aug. 26—Following the successful operation of the first ambulance plane at Gerstner Field, Lake Charles, La., General Kenly, commanding the Division of Military Aeronautics, has had all flying field commanding officers supplied with photographs and drawings of this new emergency air carrier, with orders to complete the equipment at once. The nine Texas fields have already finished their equipment.

The airplane ambulance is used in reaching scenes of accidents occurring at a distance from the flying field hospitals and in localities difficult to reach quickly with automobile ambulances. It is in turn followed by an automobile ambulance by road or overland as fast as is possible.

A standard training plane is used for the new airplane ambulance with the rear cockpit cleared and enlarged sufficiently to permit of a combination stretcher-seat that allows the injured man to rest easily. He is slightly propped up with his head toward the pilot and his feet and legs extending into the fuselage. The patient is securely strapped in and made quite as comfortable as in a regular ambulance. The real value of the plane is its speed, but it also assures a far more gentle and comfortable trip than is to be had in a rolling and bumpy automobile.

## Limit Coal Storage in East

### Fuel Administration Fixes Amounts Industrial Plants May Accumulate and Carry

WASHINGTON, Aug. 26—The tremendously increasing demand for coal for special war purposes in the eastern part of the country, particularly for the Navy and Transport Service, is making it necessary to draw more heavily on the Eastern coal fields than was originally contemplated.

It has therefore been decided to limit the amount of coal storage that industrial plants would be allowed to accumulate and to carry on hand and to fix a uniform amount that each State may accumulate.

United States Fuel Administrator Garfield announced the basic policy of the Fuel Administration as to storage as follows:

### April, 1919, Deliveries for Excess Coal

"Coal in excess of that required for current operations shall be delivered to plants not on the preference list of the War Industries Board only when it is not in demand for use before April 1, 1919, by consumers on said list, namely, railroads, the Federal Government, states, counties, public utilities, retail dealers, or manufacturing plants on the Preference List.

"In carrying out this policy, allowance shall be made for differences in distance from the mines and for differences in transportation conditions which may require more or less storage at the beginning of winter to insure uninterrupted operation until the following spring."

The following report, framed by a committee of State Fuel Administrators aided by officials of the Administration, was adopted by the conference and concurred in by Dr. Garfield:

"The maximum limits of storage indicated for the several States or parts of States defined hereafter are as follows:

### Maximum Number of Days Storage Bituminous Coal Allowed Until Further Notice

	Steam Coal		By-Product and Gas Coal			
	Public Utilities	Preferred Industries	Non-Preferred Industries	By-Product and Gas Plants	Preferred Industries	Non-Preferred Industries
Maine .....	120	90				
Mass., Vt., N. H.,						
Northern N. Y. ....	90	60	30	90	60	0
Conn., R. I. ....	75	45	20	75	45	0
Southern N. Y., N. J.,						
Del., Eastern Pa. ....	30	30	15	45	30	0
Md., D. C., Va., N. C.,						
S. C., Ga., Fla.,						
Western Ohio .....	30	30	15	45	30	0
Western Pa., W. Va.,						
Eastern Ky., Eastern						
Ohio .....	30	20	15	45	30	0
Lower Michigan .....	90	45	20	60	60	0
Ill., Ind., Mo. ....	..	..	..	60	60	0
Wis., Minn., N. D.,						
S. D., Upper Mich. ..	..	..	..	90	90	0

### Hare Made Packard Vice-President

DETROIT, Aug. 26—Emlen S. Hare has been elected to a vice-presidency of the Packard Motor Car Co., Detroit. He will retain his position as president of the Packard branch in New York, but will remove to Detroit within a few weeks. The rapid development of the Packard company's work for the Government has absorbed President Alvan Macauley's time and energies to an extent that warranted the creation of the new office for which Mr. Hare has been chosen. He joined the Packard forces early in 1916 in the capacity of special sales representative of both the New York and Philadelphia branches. Within 6 months he was given supervision of the truck department of the Packard Motor Co. of New York. A month later he was promoted to general manager, and later was made president.

J. J. Wright, for 2 years manager of the Ford branch at Memphis, has been promoted to manager of the branch at St. Louis, where new offices will be opened, the assembly plant there having been turned over to the United States. Wright succeeds W. C. Anderson, made manager of the assembly plant at Chicago. C. S. Williams, of the Louisville branch, becomes manager at Memphis.

Glen A. Sanford has been appointed sales manager of the rim division of the Jaxon Steel Products Co., Jackson, Mich.

B. A. Guy, secretary and assistant general manager of the Curtiss Aeroplane & Motors Corp., Buffalo, resigned Aug. 15.

R. T. Hodgkins has been appointed general sales manager of the Cleveland Tractor Co., Cleveland. For the past 4 years he was general sales manager of the Studebaker Corp., and previous to that was connected with the Yale & Towne Mfg. Co., New York.

L. S. Nold, formerly of the Electric Vehicle Co., also the General Electric Co., on Aug. 23 became identified with the Mitchell Motors Co. as secretary and treasurer. W. H. Armstrong, for 8 years secretary and treasurer of the Mitchell company, resigned to devote his time to other interests in Racine.

Bert B. Fornaciari, secretary and general manager of the Harvey Motor Truck Co., Harvey, Ill., for 9 years, has been appointed production manager and chief engineer of the Midland Motor Car & Truck Co., Oklahoma City. W. B. Burgess, in charge of the cost, time and stores departments of the Harvey company for 2½ years, and assistant to Fornaciari at Harvey, has also joined the Midland forces as assistant production manager.

C. B. Meyers has been appointed manager of the sales promotion department of the United States Motor Truck Co., Cincinnati. He has been with the company for 6 years, starting as stenographer

## Men of the Industry

### *Changes in Personnel and Position*

#### Squires Will Leave Signal

DETROIT, Aug. 23—John Squires, chief engineer of the Signal Motor Truck Co., has handed in his resignation to the company to become effective Sept. 1 and will go into business for himself. S. Deutsch, vice-president of the company, will take up his duties when the position becomes vacated.

#### Hood Forms Garage Company

DETROIT, Aug. 26—Wallace C. Hood, who recently resigned as sales manager for the King Motor Car Co., Detroit, has formed the Foster-Hood Sales & Service Co. Mr. Foster was also formerly connected with the King company in the capacity of service manager. The Foster-King company will do general garage work, automobile painting, top recovering, etc., at 418 Jos. Campau Avenue.

and filling subsequently the positions of purchasing agent and sales manager from the time of its reorganization.

Charles M. Wallace, formerly purchasing agent of the Buda Motor Co., Harvey, Ill., and later with the Mitchell Motors Co., has been appointed manager of the purchasing department of the Erd Motor Co., Saginaw, Mich.

#### Ordnance Board on Metallurgical Matters

WASHINGTON, Aug. 26—In order to assure the more complete co-ordination of the various ordnance departmental activities along metallurgical lines, it has been decided to establish a Board on Metallurgical Matters. The appointment of this board will also assure the complete co-ordination of similar activities of the different divisions of the War Department and the War Industries Board.

The personnel of the board is as follows: Dr. G. W. Sargent, Engineering Division, chairman; Lieut.-Col. W. P. Barba, Production Division; Major A. E. White, Inspection Division, representing the Ordnance Department; Lieut.-Col. F. B. Richards, of the office of the Assistant Secretary of War; L. L. Summers, representing the War Industries Board, and William H. Smith, representing the manufacturers.

The board will act not only for the various sections of the Ordnance Department, but also in connection with the manufacturers working for and with the department in the production of war material, and will gather the most recent and complete information on all metallurgical products.

#### Swope Appointed Assistant to Baruch

WASHINGTON, Aug. 22—Herbert Bayard Swope has been appointed by the War Industries Board as an associate member. He will act as assistant to Chairman Bernard M. Baruch. Mr. Swope is a well-known editor who has studied war problems both in this country and abroad.

L. W. Hamilton has been elected president and general manager of the Lane Motor Truck Co., Kalamazoo, Mich., succeeding Dr. W. W. Lang, who has resigned. E. W. Bitzler has been appointed secretary and treasurer.

H. B. Garman has been appointed manager of the Detroit plant of the Steel Products Co. He was formerly superintendent of the plant, in which are manufactured drag links, brake and truss rods, propeller tubes, etc.

W. F. Winkleman has resigned as special representative for the Liberty Motor Car Co., Detroit, and is now associated with the Heath-Duplex department of the McCord Mfg. Co., Inc. He has been identified with the automobile industry for the past 12 years.

W. H. Yule, head of the mechanical goods department of the B. F. Goodrich Rubber Co., Akron, has been placed in direct charge of the company's relations with the Government. He has been in charge of mechanical goods sales for 2½ years, rising to that position from the managership of the Goodrich branch at New York City.

P. R. Preston, advertising manager, Rock Island Plow Co., Rock Island, Ill., has resigned and gone into the service with a machine gun company.

George V. McMahan, who was sales manager of the Detroit branch of the Remy Electric Co., has been promoted to assistant general manager of the Remy Electric factory at Anderson, Ind.

Alexander Dow, an inventor and a prominent witness in the Perlman rim case, has been commissioned a captain in the ordnance department. He is at present stationed at the Western Cartridge Co., East Alton, Ill.

#### Eagle No. 2 Launched at Rouge

DETROIT, Aug. 26—Eagle No. 1 is rapidly nearing completion at the Ford shipbuilding plant and will be ready to start shortly. Every piece of machinery, bolt and nut or piece of pipe used has been carefully measured and standardized, so that for all future boats everything will be ready to fit in place before launching. Eagle No. 2 was launched last Tuesday; Eagle No. 3 will leave the ways early this week, after which the chasers will go almost at the rate of one a day.

**Janesville Starts New Plant**

JANESVILLE, WIS., Aug. 26—The Janesville Machine Co., Janesville, Wis., recently acquired by the General Motors Corp., as the nucleus of a new tractor and implement manufacturing industry, has broken ground for the first unit of its proposed new tractor plant in Janesville. The main building will be 214 x 540, with a wing 50 x 250, and arranged for machining, assembling and erecting farm tractors. Later a complete foundry unit will be added. It is hoped to have the first unit ready by Nov. 1. In the meantime the original plant of the Janesville Machine Co. will be enlarged and changes made to make the production one of farm implements and tools suitable for tractor combinations. The initial investment in the new tractor plant will be approximately \$250,000. The Sampson sieve grip will be manufactured exclusively.

**60 Per Cent General Motors Capacity War Work**

DETROIT, Aug. 26—The General Motors Corp. is already on about a 60 per cent war work basis, and by winter it is believed 75 per cent of the capacity of all G. M. C. plants will be on a war basis. The Oldsmobile, Oakland, Chevrolet and Buick will all be truck producers, in addition to the G. M. C. Truck Co., Pontiac. The passenger car makers will produce  $\frac{1}{2}$  to 1-ton models, while the G. M. C. Truck Co. has models of  $\frac{1}{2}$  to 5 tons.

**Brisk Blast Co. Reorganizes**

MONROE, MICH., Aug. 23—The Brisk Blast Co., formerly of St. Louis, Mo., now located in Monroe, was recently reorganized, J. L. Phelps of St. Louis having disposed of his interests in the company. New officers of the company are: President, C. B. Southworth; vice-president and treasurer, Charles McIntyre; secretary, J. F. Meyer. This concern manufactures automobile accessories and airplane parts.

**Remy to Have New Administration Building**

ANDERSON, IND., Aug. 24—A new administration building is being erected by the Remy Electric Co. The general offices of the company have been moved into temporary quarters until the new building, which will occupy the ground where the old Remy administration building stood, is completed.

**Hartford Plant for International Steel**

MILWAUKEE, Aug. 26—The International Steel Products Co. has selected Hartford, Wis., as the location of its new plant, which will be devoted largely to the manufacture of the "Uvee" muffler. The concern has purchased a site of  $3\frac{1}{2}$  acres near the plant of the Kissel Motor Car Co. at Hartford and will start building operations this week. Hartford capi-

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

tal has taken a large financial interest and will be the controlling factor in the new works.

**More Room for Schacht**

CINCINNATI, Aug. 24—The Schacht Motor Truck Co. has begun the erection of an addition to its plant which will increase its capacity to 3000 trucks a year. It now turns out about 1200. The enlarged plant will employ about 800 men, and will cost about \$300,000. The new plant will be completed by the first of the year.

**More Tractors From Peoria**

PEORIA, Aug. 26—The Wilson Tractor Co. has been organized here and will have temporary headquarters at 213 South Water Street. The promoters will shortly open a factory to manufacture farm tractors. Articles of incorporation have been secured, the capital stock being fixed at \$5,000. The incorporators include J. B. Barrett, D. O. Wilson and M. E. Dryden. In the near future a factory site will be purchased and a building of large size erected.

**Maxwell Production Down**

DETROIT, Aug. 23—The Maxwell Motor Co., which has gone into war work on a large scale jointly with the Chalmers, has cut its production of passenger cars sharply. For the 6 months ended June 30 its output was about 50 per cent of the total of a year ago, or 22,000 cars, as against 43,500. Its truck production decreased from 12,000 to 4000.

**13,979 Cars a Week on Akron-Cleveland Road**

AKRON, Aug. 26—A striking illustration of the use of the highways by motor vehicles was presented by a census for a week taken in March of vehicles traveling over the 40-mile stretch of Ohio roads between Cleveland and Akron. The registration gave a total of 13,979 vehicles, of which only 685 were horse-drawn. Fifteen per cent of the total were motor trucks, which carried 5014 tons of freight, as compared to 6630 tons shipped by three railroads. Thirty-three thousand people were transported in passenger automobiles.

**Packard Declares Dividend**

The Packard Motor Car Co. has declared a regular quarterly dividend of  $1\frac{1}{4}$  per cent on the preferred capital stock, payable Sept. 16 to stockholders of record Aug. 30.

**Doehler Enlarges Plant**

TOLEDO, Aug. 26—The Doehler Die Castings Co. has begun the erection of two new buildings, to cost \$100,000, which will be used principally for the manufacture of airplane bearings and other war products. One building, which will be an addition to the machine-shop, is to be 160 by 50, four stories high. The other, 50 by 120, will be a new foundry building. It is expected that the new buildings will be completed within 3 or 4 months. To obtain increased production, 500 employees will be taken on in addition to the 800 or 900 at present working in the plant.

A new department also will be started with the completion of the new machine-shop. Heretofore all aluminum die castings have been made in the Brooklyn plant. A large number of machines will be installed and the castings will be manufactured here.

The Dohler company has large Government contracts for war materials, including shells, depth bomb fuses and airplane parts, and recent contracts call for approximately 90 per cent of the airplane bearings used by the Government in all types of machines. Besides furnishing bearings for the new airplanes, the Doehler company already has made more than 500,000 bearings for United States aero training stations.

**Reo Awarded Tractor Order**

LANSING, Aug. 26—The Reo Motor Car Co. has been awarded an additional Government contract for artillery tractors, the quantity of which or the proposed date of delivery is held confidential. It is known, however, that the work on the second contract, supplementing the first award of 3000 tractors, will keep the Reo plant working to capacity for nearly a year.

The Reo company will continue to manufacture trucks until such time as steel needs conflict in any way with Government war needs. There are certain departments where the production of trucks will not interfere with tractor production, for the time being at least. The truck plant, which previous to the additional tractor contracts, had been converted into strictly a tractor production plant, is now shipping carloads of tractors daily on the original contract. Four milling machines are to be installed in this plant for work on tractor frames, each of which handles two tractor frames at a time. A 12-hour schedule is being maintained, with over-time work when necessary. To facilitate Government work the Reo baseball league has abandoned its schedule and there are no more Saturday half holidays.

**Overland to Make Liberty Engines**

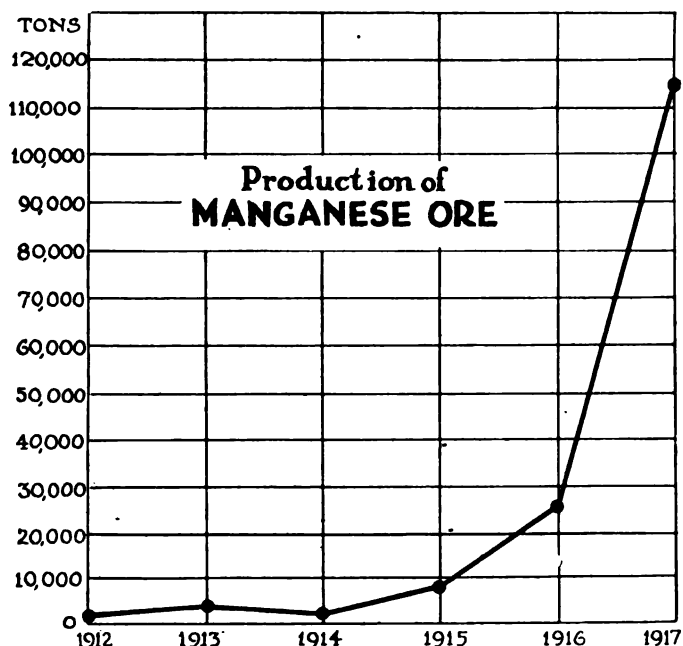
ELYRIA, OHIO, Aug. 26—The Willys-Overland plant in this city has announced it will begin the manufacture of eight and twelve-cylinder Liberty engines. The plant will operate 24 hr. a day, giving employment to more than 2000 men.



# AUTOMOTIVE MATERIALS MARKETS

## Material Market Prices

<b>Acids:</b>	10 oz., yd. .... .24
Muriatic, lb. .... .02-.03	<b>Copper:</b>
Phosphoric, ct. .... .35-.39	Elec., lb. .... .26
Sulphuric (60), lb. .... .09	Lake, lb. .... .26
<b>Aluminum:</b>	<b>Cotton:</b>
Ingot, lb. .... .33	Egypt, carded, lb. 1.20-1.30
Sheets (18 gage or	Peelers, combed, lb. 1.05-1.20
more), lb. .... .40	Peelers, carded, lb. .95-1.05
Antimony, lb. .... .14%-.14%	Fabric, Tire (17% oz.):
Burialp:	Sea Is., combed, lb. 1.65-1.70
8 oz., yd. .... .18%	Egypt, combed, lb. 1.25-1.35



The annual production of manganese ore showed a decided increase in 1916. In 1917 the increase was tremendous

<b>Fibre (1/4 in. sheet base), lb. .... .50</b>
<b>Graphite:</b>
Ceylon, lb. .... .07 1/2-.25
Madagascar, lb. .... .10-.15
Mexican, lb. .... .03%
<b>Lead, lb. .... .08-.09</b>
<b>Leather:</b>
Hides, lb. .... .18-.35 1/2
Nickel, lb. .... .40-.43
<b>Oil:</b>
Gasoline:
Auto., gal. .... .24 1/2
68 to 70 gal. .... .30 1/2
<b>Lard:</b>
Prime City, gal. .... .2.30
Ex. No. 1, gal. .... .1.60
Linseed, gal. .... .1.90
Menhaden (Brown), gal. .... .1.25-1.27
Petroleum (crude), Kansas, bbl. .... .2.25
Pennsylvania, bbl. .... .4.00

<b>Rubber:</b>
<b>Ceylon:</b>
First latex pale crepe, lb. .... .63
Brown, crepe, thin, clear, lb. .... .60
Smoked, ribbed sheets, lb. .... .62
<b>Para:</b>
Up River, fine, lb. .... .68
Up River, coarse, lb. .... .40
Island, fine, lb. .... .59
Island, coarse, lb. .... .57
Shellac (orange), gal. .... .7 1/2
Spekter ..... .09 1/2-.09 3/4
<b>Steel:</b>
Angle beams and channels, lb. .... .03
Automobile sheet (see sp. table)
Cold rolled, lb. .... .06 1/2
Hot rolled, lb. .... .03 1/2
Tin ..... .84
Tungsten, lb. .... .2.40 1/2
Waste (cotton), lb. .... .12%-.17

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping.....	6.20	6.10
Automobile body stock, extra deep stamping.....	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
<b>Automobile Sheet Extras for Extreme Widths:</b>		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
<b>Black Sheet Extras to Apply to Narrow Widths:</b>		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the Invoice Pittsburgh price for corresponding primes.		

## Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co. .... .	62	64	..
*J. I. Case T. M. Co., pfd. .... .	80	83 1/2	..
Chalmers Motor Co., com. .... .	4 1/2	5 1/2	..
*Chalmers Motor Co., pfd. .... .	20	30	..
*Chandler Motor Car Co. .... .	87 1/2	89	+1 1/2
Chevrolet Motor Co. .... .	139	141	+7
*Fisher Body Corp., com. .... .	36	36 1/2	..
*Fisher Body Corp., pfd. .... .	89 1/2	91	..
Fisk Rubber Co., com. .... .	60	61	+1
Fisk Rubber Co., 1st pfd. .... .	98	103	-1
Fisk Rubber Co., 2nd pfd. .... .	78	83	..
Firestone Tire & Rubber Co., com. .... .	104	108	-2
Firestone Tire & Rubber Co., pfd. .... .	94	96	..
*General Motors Co., com. .... .	162	164	+9
*General Motors Co., pfd. .... .	81 1/2	81 1/2	+ 1/2
*B. F. Goodrich Co., com. .... .	44	45	-1 1/2
*B. F. Goodrich Co., pfd. .... .	98 1/2	100 1/2	..
Goodyear Tire & Rubber Co., com. .... .	150	155	-2
Goodyear Tire & Rubber Co., pfd. .... .	97 1/2	98 1/2	..
Grant Motor Car Corp. .... .	2 1/2	3	- 1/2
Hupp Motor Car Corp., com. .... .	2 1/2	3 1/2	- 1/2
Hupp Motor Car Corp., pfd. .... .	78	80	-1
International Motor Co., com. .... .	27	32	+2
International Motor Co., 1st pfd. .... .	50	55	-10
International Motor Co., 2nd pfd. .... .	36	40	+1
*Kelly-Springfield Tire Co., com. .... .	48	49	-1
*Kelly-Springfield Tire Co., pfd. .... .	80	87	..
*Lee Rubber & Tire Corp. .... .	19 1/2	20	-2 1/2
*Maxwell Motor Co., Inc., com. .... .	26	27	+ 1/2
*Maxwell Motor Co., Inc., 1st pfd. .... .	56 1/2	57	+2
*Maxwell Motor Co., Inc., 2nd pfd. .... .	20 1/2	20 1/2	+ 1/2
Miller Rubber Co., com. .... .	105	108	..
Miller Rubber Co., pfd. .... .	95	97	..
Packard Motor Car Co., com. .... .	110	120	..
Packard Motor Car Co., pfd. .... .	94	97	..
Paige-Detroit Motor Car Co. .... .	17	19	..
Peerless Truck & Motor Corp. .... .	15	17	+1
Portage Rubber Co. .... .	106	108	-4

	Bid	Asked	Net Ch'ge
Reo Motor Car Co. .... .	14 1/2	15 1/2	+ 1/2
*Saxon Motor Car Corp. .... .	6 1/2	7 1/2	- 1/2
Standard Motor Construction Co. .... .	12 1/2	13	- 1/2
Standard Parts ..... .	60 1/2	..	+10 1/2
*Stewart-Warner Speed. Corp. .... .	56 1/2	57 1/2	..
*Studebaker Corp., com. .... .	43 1/2	44 1/2	-1 1/2
*Studebaker Corp., pfd. .... .	81 1/2	90	-3 1/2
Swinehart Tire & Rubber Co. .... .	45	55	-1
United Motors Corp. .... .	32 1/2	33 1/2	+1 1/2
*U. S. Rubber Co., com. .... .	62 1/2	63	+1 1/2
*U. S. Rubber Co., pfd. .... .	104 1/2	105 1/2	+ 1/2
*White Motor Co. .... .	45 1/2	46 1/2	- 1/2
*Willys-Overland Co., com. .... .	19 1/2	19 1/2	..
*Willys-Overland Co., pfd. .... .	81 1/2	83 1/2	- 1/2

\*At close of business Aug. 27. Listed N. Y. Stock Exchange.

## OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS	Bid	Asked	Net Ch'ge
Auto Body Co. .... .	16 1/2	7 1/2	..
Bowen Roller Bearing Co. .... .	135	140	+2
Chevrolet Motor Co. .... .	5 1/2	5 1/2	+ 1/2
Continental Motor Co., com. .... .	14	17	..
Continental Motor Co., pfd. .... .	75	90	..
Edmunds & Jones, com. .... .	149	156 1/2	+2
Edmunds & Jones, pfd. .... .	..	14 1/2	..
Ford Motor Co. of Canada. .... .	12 1/2	..	..
Hall Lamp Co. .... .	..	120	..
Michigan Stamping Co. .... .	..	94	..
Packard Motor Car Co., com. .... .	..	17 1/2	..
Packard Motor Car Co., pfd. .... .	9 1/2	10 1/2	..
Paige-Detroit Motor Car Co. .... .	14 1/2	15	..
Prudden Wheel Co. .... .	..	..	..
Reo Motor Car Co. .... .	..	..	..
<b>INACTIVE STOCKS</b>			
Atlas Drop Forge Co. .... .	..	25	..
Kelsey Wheel Co. .... .	..	25	..

# Industrial Review of the Week

## A Summary of Major Developments in Other Fields

### Production of Bituminous Continues to Decrease

Production of bituminous coal continues to decrease in spite of all efforts made by operators and Fuel Administration officials to speed up production. The causes for the poor output still remain the chronic ones of insufficient cars and slacker labor. Many of the producing districts report that their operations have been forced to suspend for periods ranging from half a day to four days because they were given no cars to load. Not only does this poor transportation situation result in meager tonnages, but patriotic labor that is anxious to prove its good intentions toward the country at the present time is denied the opportunity to work steadily.

During the week ended Aug. 17 inadequate car supply and labor shortage combined to keep the output of soft coal down to 11,910,000 net tons, which is far below the weekly figure of 14,270,000 net tons considered necessary to meet essential demands. It is a foregone conclusion that some drastic policy will have to be put into effect if war work is not to suffer, and an intimation of the manner in which the situation will be met is indicated by the announcement of the Fuel Administration that stocks of steam, by-product and gas coals are not to be hoarded, regardless of whether the consumer with the reserve stores is in a preferred or non-preferred industry. Mandatory limits have been set on the number of days' supply of fuel which may be stored by industries in different sections of the country, and the Fuel Administration will see to it that these limits are not exceeded.

The movement of coal to the Northwest shows signs of improvement, though the tonnage is still considerably behind pre-season estimate. Bituminous coal loaded on vessels at lake docks during the week ended Aug. 17 amounted to 1,109,611 net tons, an increase over the week preceding of 85,192 net tons. Supreme efforts will be required if the Northwest's requirements are to be met before the close of the lake season.—*Coal Age*.

### Aircraft Report Unfair to Industry (Continued from page 377)

which the committee gets away from the European parallel and apparently forgets entirely that the aircraft development in England, France, Italy and Germany was carried on entirely by the automobile industry, and that it was the logical industry, and the only one well fitted to take up the work. We cannot see where any other industry could have been found so well qualified to do the work in America.

The report seems in many places to be based on the complaints of some aircraft manufacturers that were in existence

previous to the war, but who had no conception of or facilities for production manufacture. Those from the automobile industry who entered into the aircraft program have been criticized on the grounds of favoring the industry, which criticism has been unjust. It would be impossible to find manufacturers better qualified to carry on the work than those who had been given the task.

It is true that the orders might have been spread over more companies, as has been done in England. This, of course, would have worked against production, and undoubtedly those in charge of the program had in mind concentrating production in a few large companies in order to meet the requirements.

The question of manufacturing tools and jigs for production, and the enormous difficulties involved, has not been given due consideration in the report. The spirit of the report seems to be a general condemnation of the aircraft activity to date, and after reading the evidence of many who were heard by the committee you cannot but conclude that the report is unfair to the industry. It has not given that prominence to much of the evidence that should have been brought out in the report. It savors too much of nailing the complete responsibility on an industry and whitewashing the Government side of the question. It is not fair to censure one and overlook the other.

The report will have one value, if its general circulation in America is permitted, namely, that of educating the public to a great extent on aircraft. Practically every person examined in connection with it admitted the greatness of the task and the inexperience of the nation.

This report should serve as a great educator. It is true it tells some unpleasant things, some that will have a depressing effect throughout the country; but we are in war, and must lay our cards on the table. If we have to go through the fire and water, let us do so now, and get on firm ground, so that we can correct those abuses of government and industry which have taken place in the last 16 months.

### General Motors Increases Stock

WILMINGTON, DEL., Aug. 27—At a special meeting of the stockholders of the General Motors Corp it was voted to increase the capital stock from \$200,000,000 to \$300,000,000. The preferred stock was increased from \$50,000,000 to \$100,000,000, and the common from \$150,000,000 to \$200,000,000. A bonus plan providing for the distribution of 10 per cent of the net earnings each year to the employees of subsidiary companies as a reward for their part in the success of the respective subsidiaries was also approved.

### 23,000,000 Tons of Steel Needed Before End of Year

With more emphasis than ever the War Industries Board has put before the steel trade in the past week the imperative call for rails, plates and shell steel. New needs cabled from France have added to the gap between capacity and requirements, and the amount now wanted in the last four months of the year will bring the total for the second half up to 23,000,000 tons, as against an estimate of 20,000,000 tons early in July and probable production of 17 to 18 millions for the six months.

Yet output does not increase, and every nerve must be strained to make up in September for the inroad made by an unusual number of hot and highly humid days in August.

A swelling of overseas demand, due to the aggressive activities of the Allied forces, has changed greatly the operating schedules of the mills. Urgent calls have been received for rails, rolling stock and shell steel, and, temporarily, some home needs, even cars for our own roads, may have to stand aside.

The details of the \$5 a ton concession on implement steel are being arranged. The cold-rolled shafting schedule was arranged in a New York meeting last week.

Last year's heavy accumulations of export steel at Atlantic ports waiting for ship room were cut down 700,000 tons in the first seven months of this year. Mills have been urged to build up stocks for France at seaboard against the railroad blockades of winter, but thus far have fallen steadily behind the ocean movement.—*Iron Age*.

### Coffin Protests to Congress

(Continued from page 360)

eration to the contents of my letter of Aug. 14, to the end that both the Senate and the press may be informed as to the correct status of the three organizations involved in the governmental aircraft program, namely, the War and Navy departments and the non-executive, advisory Aircraft Board.

Much misunderstanding of the situation has arisen because of the dual functions of the officer members of the Aircraft Board, namely, advisory and non-executive when sitting with the board, but executive when functioning as the heads of Army and Navy bureaus. All technical and executive work as to selection of types of machines and their production has by law and by necessity rested until within the jurisdiction of the governmental departments, upon which the civilian members of the board have been dependent for all information and for all contact with military and naval air service progress.—H. E. COFFIN.

## Aircraft Contracts Placed

WASHINGTON, Aug. 26—Following is a list of contracts made by the Bureau of Aircraft Production:

August 12, 1918

1867-D. Wright-Martin Aircraft Corporation, New Brunswick, 2000 Hispano Sulza 300-hp. engines.

Curtiss Aeroplane & Motor Corp., Buffalo, plain hexagon head bolts with castellated nuts.

Curtiss Aeroplane & Motor Corp., Buffalo, machine bolts and castellated nuts.

Armstrong Bros. Tool Co., Chicago, Ill., 2400 structural wrenches, 100 C clamps. Hoosier Veneer Co., Indianapolis, 17,000 ft. walnut lumber.

Pickrel Walnut & Veneer Co., St. Louis, Mo., 40,000 ft. walnut lumber.

George W. Hartzell, Piqua, Ohio, 95,000 ft. walnut lumber.

Des Moines Sawmill Co., Des Moines, Iowa, 500,000 ft. walnut lumber.

Howell & Lesser, San Francisco, Cal., spares for 75 JN4D planes, elevators, landing gears, rudders, wings, etc.

Curtiss Aeroplane & Motor Corp., Buffalo, sets dual controls for 436 JN6H advanced training planes.

Curtiss Aeroplane & Motor Corp., Buffalo, 91 sets dual controls for JN4D planes.

F. A. Requarth Co., Dayton, 75 gear training models.

United States Aircraft Corp., Redwood City, Cal., spares for 50 JN4D planes, elevators, vertical fins or stabilizers, landing gears, rudders, wings, etc.

Curtiss Aeroplane & Motor Corp., Buffalo, 26 sets upper wings, with ailerons.

General Motors Corp., Flint, 5000 Liberty 8-cylinder motors.

Packard Motor Car Co., Detroit, 100 Liberty 12-cylinder aviation engines.

4465. Norwich Chemical Co., Smethport, Pa., 4500 gal. acetone.

W. S. Gray & Co., New York City, 5000 gal. methyl ethyl ketone.

American Cyanamid Co., New York City, 2350 lb. urea in containers.

### Goodyear Claims Its Policies Not Understood

AKRON, Aug. 23—The Goodyear Tire & Rubber Co. in commenting on the charges made against it by the Federal Trade Commission claims that it has not required dealers to sell Goodyear products exclusively nor has it asked them to confine their services to Goodyear tires exclusively. The company has merely pointed out the necessity, from the consumer's standpoint, for this service, and has insisted that dealers upon signing the company's contract undertake to render the agreed service. The company further claims that it has made no effort to curtail, control or restrict the operations of

## Contracts

dealers, simply insisting that the consumer must be served.

The complaint of the Federal Trade Commission is based on a preliminary investigation. As yet the Goodyear company is not aware of the nature of the investigation and has not had an opportunity to explain the facts in the case. When this opportunity is presented, the company feels confident that all the items in the charge will be cleared up.

To the company the whole problem gets back to the sincerity of its service station plan and the motive underlying it. The company believes that if the Federal Trade Commission now knew that the whole aim and effect of the company's policy is to aid tire users to conserve tires, get more mileage and hence cut down tire expense, this complaint would not have been made.

Claiming to have based all its policies on thorough investigation, careful analysis and expert legal advice, the company believes that when the facts are known to the Federal Trade Commission the complaint will be dismissed.

### 270 Airplane Mail Trips

WASHINGTON, Aug. 24—From May 15, when the Air Mail Service was inaugurated, to Aug. 12, when the military authorities turned over the service to the Post Office Department, a total of 20½ tons of mail was dispatched between New York and Washington. This included 270 flights covering 421½ hr. of flying, with a total of only sixteen forced landings. This information was made public to-day in a letter by Postmaster General Burleson to Secretary of War Newton D. Baker, advising him of the completion of the transfer of the equipment and the flying operations of the Aerial Mail Service from the War Department to the Post Office Department.

### A Navy Department Contract Placed

WASHINGTON, Aug. 24—The Bureau of Supplies and Accounts of the Navy Department has placed the following contract:

Cadillac Motor Car Co., Detroit, Mich., spare parts.

### Two Contracts Are Placed by the Army

WASHINGTON, Aug. 24—The Quartermaster General of the Army has placed the following contracts:

Ford Motor Co., Detroit, Mich., spare parts for cars.

The Goodyear Tire & Rubber Co., Akron, Ohio, tires.

### Moline Tractor Notes

NEW YORK, Aug. 22—The Moline Plow Co., Moline, Ill., manufacturer of the Moline farm tractor as well as Moline farm machinery, has placed an issue of \$6,000,000 serial notes on the market, the money being used to fund bank loans which have been incurred to take care of the increased manufacturing activities, stock, raw materials and general expansion of the company.

The notes will bear date of Sept. 1, 1918, and will fall due in six installments beginning with Sept. 1, 1919, and running until Sept. 1, 1924. The notes will yield 7½ to 7% per cent interest.

The present capitalization of the company is as follows:

First 7% preferred stock..\$7,500,000  
Second 6% preferred stock. 1,500,000  
Common stock .....10,000,000

The company's sales for the 11 months ending July 31, 1918, were \$17,315,036, as compared with \$13,140,450 for the preceding 12 months.

### Firestone Sales to Touch \$75,000,000

AKRON, Aug. 26—The Firestone Tire & Rubber Co. estimates its sales will approximate \$75,000,000 for the fiscal year, allowing for the restrictions on the importation of crude rubber and the production of pneumatic tires. The company is devoting its plant to rubberized fabric, balloons and gas masks.

# Calendar

## ENGINEERING

Sept. 2—Cripple Creek, Colo. American Institute of Mining Engineers.  
Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

## ASSOCIATIONS

Oct. 7-12—Milwaukee. American Foundrymen's Assn. and 5 allied organizations. Milwaukee Auditorium.

## SHOWS

Aug. 29—Laconia, N. H. Tractor demonstration County Farm Bureaus). M. C. Wilson, Director, Agricul-

ture Extension, Dunham, N. H.

Aug. 28-30—West Raleigh, N. C. Tractor demonstration (Farmers' Convention, College Farm). Dr. R. Y. Winters in charge.

Aug. 30—Campton, N. H. Tractor demonstration (Albion Farms). H. G. Gulliver, Mgr.

Aug. 30—Cheshire, Conn. Tractor demonstration (New Haven County Farm). Mr. Harvey, Mgr.

Aug. 30-Sept. 8—Detroit, Mich. Automobile exhibits, State Fair.

Sept. 2-6 — Hartford, Conn. Tractor demonstration (State Fair). Will F. Landon, Secy.

Sept. 2-7—Indianapolis, Indiana.

State Fair. Indianapolis Automobile Trade Assn.

Sept. 5—Medina, Orleans Co. Tractor demonstration (State Fair) Food Commission. Calvin J. Huson, Director.

Sept. 8-20—Greely, Weld Co., Colo. Tractor Show, Central Community Fair.

Sept. 9-14—Milwaukee. Milwaukee Automobile Dealers, Inc. Fourth Annual Wisconsin State Fair. Hart J. Ruddle, Mgr.

Sept. 9-14 — Syracuse, N. Y. Tractor demonstration (State Fair). J. Dan Ackerman, Secy.

Sept. 12-13—Marion, O. Tractor demonstrations, Farm Bureau Associations. M. C. Thomas, County Agricultural Agent.

Sept. 17-20—Riverhead, L. I. Tractor demonstration (County Fair). Harry Lee, Sec'y.

Sept. 30-Oct. 4—Trenton, N. J. Tractor demonstration (Trenton Fair). Harry B. Salter, Supt.

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration, State Fair.

Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.

## RACING

Sept. 2—Uniontown. Uniontown Speedway Assn.

Sept. 7 — Chicago. Chicago Speedway.

Sept. 21—Sheepshead Bay.

Oct. 5 — Cincinnati. Cincinnati Speedway.



# Complete Text of Senate Aircraft Report

## REPORT RECOMMENDS

- |   |  |
|---|--|
| 1—One-man control of aircraft activities.             | 5—Encouragement of invention in aircraft activities. |
| 2—Commission of engineers to go to France.            | 6—More protection for aircraft patents.              |
| 3—Wider distribution of engine and plane manufacture. | 7—Cost of construction defects be carried by maker.  |
| 4—Great expansion of our air policy.                  | 8—Better fire protection at factories.               |

## REASONS FOR FAILURE ARE

- |  |  |
|--|--|
| 1—Ignorance of aeronautical problems by automobile industry. | dominated work entirely too much.                                    |
| 2—Standardized engine program has                            | 3—Should have more quickly taken up manufacture of European designs. |

## MISCELLANEOUS

Criticises severely the patent cross-licensing scheme.

Gives reason for failure of Bristol plane.

Complete information on our flying fields:

Manufacturers' difficulties with tool and jig production not given enough prominence.

Complete information on our plane program, including De Haviland 4, Handley-Page, Caproni, Bristol and other types.

European aircraft engines that we are now manufacturing.

Over 100 different witnesses examined for evidence.

The following is the text of the report of the sub-committee on Military Affairs, which was appointed to investigate aircraft invention in the United States:

### Summary

On April 6, 1917, the United States entered the war.

On June 8, 1917, public announcement was made that a great fleet of 25,000 aeroplanes was about to be created, and would be decisive of the war months before an effective army could be put in Europe.

July 24, 1917, Congress appropriated \$640,000,000 to carry out the aircraft program. This fund has been, either by

actual expenditure or by commitments, exhausted. A further appropriation of \$884,304,758 has been found necessary.

In the opinion of the committee a substantial part of the first appropriation was practically wasted.

While much good work has been accomplished, for which due credit should be given, it must nevertheless be admitted that our aeroplane program has, up to the present, presented many aspects of failure. To some of these we call attention:

While an army of three and one-half million has been raised, the aircraft situation is as follows:

a—Six hundred and one De Haviland

4's have been embarked for France up to Aug. 1, 1918.

Of these, sixty-seven had reached the front by July 1.

On Aug. 7 a squadron of eighteen De Haviland 4's flew over the German lines. Details of its performance have not been received. The character and construction of the De Haviland 4 is further discussed in paragraph i and in the body of this report.

b—We have not a single American-made Chasse (or plane of attack) upon the battle front.

c—We have not a single American-made heavy bombing plane upon the battle front.

d—We have not developed and put in quantity production a successful Chasse, or fighting plane.

e—Our attempt to create a fighting plane was centered in an attempt to adapt the Bristol Fighter and the De Haviland to the Liberty motor. The Bristol was, without sufficient tests, put in quantity production, over \$6,500,000 expended, and the lives of several gallant men sacrificed, when the machine was condemned and its manufacture discontinued.

f—The Standard J training machine was equipped with the Hall-Scott engine and put in quantity production. After more than 1200 had been manufactured at a cost of \$6,000,000 the machine thus equipped was condemned as dangerous and placed in storage.

g—The Spad is a Chasse or fighting plane of the highest type. Early in September an oral order was given to the Curtiss Aircraft Co. for the manufacture of 3000 of these machines. Work was at once begun and drawings practically completed.

On Sept. 27, Colonel Clark and Major Vincent (one of the inventors of the Liberty motor) concluded that the machine could not be operated with a Liberty motor.

On Oct. 8 the contract was canceled, the reason given being that the single-seat fighter was regarded as obsolete. But the fact is that on April 23, 1918, a contract was let to the Curtiss company to build 1000 single-seat fighters, known as the S. E. 5, which is the English equivalent of the French Spad.

In addition to this, our Government is now using upon the battle front every Spad machine it can secure from the French, but has only been able to obtain about 418 of them.

i—The cancellation of the Spad contract and the failure of the Bristol left us without either a single or a two-seat fighter, except the De Haviland 4, which was originally designed as a two-seat fighter and which we are equipping for reconnaissance, photographic, bombing and fighting purposes.

Contracts for 8500 were let at various times. Up to Aug. 1, 1000 had been delivered, and a number forwarded to General Pershing. An inspection and test developed numerous mistakes, both in design and workmanship. Work upon the planes was stopped until the defects could be remedied. In part this appears to have been accomplished in the field, for a squadron of eighteen planes has been sent across the German lines.

k—As early as the month of October, 1917, we were in possession of the necessary facilities to construct the Caproni, a powerful and successful heavy bombing plane, approved both by Italian and English aeronautical engineers.

Expert Italian engineers have been upon the ground since the month of January, yet the fact remains that we have up to date constructed only one experimental machine which is equipped with Liberty motors.

Nearly a year has elapsed since we might have begun work upon these ma-

chines and by this time have been in quantity production.

l—The Handley-Page heavy bombing machine furnishes another example of delay. Plans were furnished the Signal Corps in the summer of 1917, but were not then availed of. Contracts for spare parts were not made until February, 1918. Deliveries of these spare parts did not begin until August, 1918. A sample plane ordered in March, 1918, was flown last July. Tests are not yet complete.

#### Causes of Failure

In the opinion of the committee the disappointing results above set forth are chiefly due to three causes:

I. That the airplane program was largely placed in the control of the great automobile and other manufacturers, who were ignorant of aeronautical problems.

II. These manufacturers undertook the impossible task of creating a motor which could be adapted to all classes of flying craft. It is not too much to say that our airplane program has been largely subordinate to the Liberty motor.

III. We failed at the beginning of the war to adopt the common-sense course of reproducing the most approved types of European machines in as great numbers as possible. This should have been carried on coincident with the production of the Liberty motor. This sound policy has very recently, but after a lamentable lapse of time, been adopted.

#### One-Man Control

The mistakes and errors referred to would probably have been largely avoided if the aircraft program had been under the control of one man, assisted by skilled aeronautical engineers and practical flyers to design and test our machines, with production made subordinate to them.

This brief summary is not a wholesale condemnation of our aircraft program. Much has been accomplished. The committee is glad to report that while it believes there are yet many things to be remedied, nevertheless we are approaching a period when quantity production of planes may soon be hoped for.

#### The Aircraft Board

As originally composed, representatives of the automobile industry featured this organization, presumably due to the theory that aircraft engine and plane production were analogous pursuits. The latter was therefore submitted to the custody of men skilled in automobile production. A board thus equipped naturally depended upon motor-car engineers and manufacturers for the solution of aviation problems. But the analogy between the two pursuits virtually begins and ends with the fact that each uses a gas-explosive motor. Hence difficulties in design and production would tend to increase until such conditions were recognized. This fact must have been demonstrated to the board through its initial experiences, for Major Downey states that in the beginning the board wanted much authority with little responsibility.

"They wanted the Signal Corps to

execute contracts and stand back of them, the board to be in an advisory capacity, and still control the situation."

Later, when—

"They saw the crash coming the board passed a resolution reaffirming the fact that they were only acting in an advisory capacity."

Organization under the Aircraft Board was unsystematic and ineffective. The chief officer of the Signal Corps was the nominal head, under whose ostensible supervision bureaus of engineering, equipment, supplies, lubrication, production, etc., were established, many of whose functions ill defined, conflicted with or overlapped each other. Contractors, inventors, material men, everyone having business with this part of the service and directed from one official to the other could not well transact their business and secure results with directness and efficiency. While this condition seems to be inseparable from official business routine in Washington, it featured largely in aviation from the start, materially hindering production on the one hand and diffusing responsibility therefor upon the other. Fairness, however, requires the statement that the identification by Congress of aircraft production and administration with the Signal Corps was unfortunate. The primary needs and importance of that corps as then defined were fully equal to the experience and efficiency of its commanding officer.

#### How Italy Started

When Italy entered the war she made a careful study of aerial warfare upon the French front as then developed. Her engineers then selected the most efficient types of French flying planes and immediately put them into production under the supervision of skilled French artificers. Coincident with this policy she began the development of airplanes on her own account. Her armies were, therefore, rapidly equipped with an excellent service, afterward supplemented by machines equally effective, but of Italian design and driven by Italian motors. By this means she avoided delay in production. She also promoted the development of her engineering genius by employing it under practical conditions upon the front with the best machines that France had produced.

#### The Bolling Mission

Your committee does not understand why the Aircraft Board did not adopt this obviously essential policy. The Signal Corps dispatched a commission to the front, headed by Colonel Bolling, instructed to secure all needed information, evidently for that purpose. Col. E. V. Clarke, the aeronautical engineer of the commission, made an elaborate report, having Colonel Bolling's approval, recommending the production of three English, two French and one Italian plane, but the report was not heeded. Designs for these and other types were placed by the allied Governments, or by the inventors themselves, at the board's disposal, with assurances of expert aid to their vigorous construction.

An ostensible reason assigned for the board's inaction was the difficulty of translating metrical into linear measurements, and of obtaining quantity production of foreign motors. But the tardy acceptance and manufacture of some of the models and designs revealed the imaginary character of this objection. The board took some of the planes placed at its disposal and attempted with ill success to materially change them for American production. The general purpose of the changes seems to have been designed to adapt them to the Liberty motor, but this normal action should have been paralleled by their manufacture, both as to plane and engine, in strict accord with the plans as submitted.

#### Planes for Liberty Engine

Ultimately, and in the autumn of 1917, the board adopted one French and two English types of fighting planes to carry the Liberty engine. These were the Spad, the Bristol and the De Havilland 4. Colonel Clarke was instructed to redesign the Bristol upon the English model, retaining its wing load of about 7.1 lb. in a total weight of 2937 lb.

Hundreds of changes afterward made in this design by Signal Corps and production engineers without consulting Colonel Clarke increased the wing load to about 9.2 lb. per foot, with an approximate weight of 3700 lb. Some of these changes were required by the increased strain of the heavier and stronger motor upon the structure. The machine was finally put into production and then abandoned after the test of July last, and after an expenditure of more than \$6,500,000 and the loss of several valuable lives.

The overload placed too great a strain upon the wings, and this, with bad construction, compelled the board to stop production. The money loss may be partly recovered by salvage. The loss of life and of months of precious time through the need of substituting another type of plane for the Bristol and then producing it are matter of far more serious concern.

#### The Spad Contract

In September, 1917, the Signal Corps contracted with the Curtiss company for 3000 one-seated Spad planes. This is an excellent French biplane, then and now in use on the front. In October the contract was canceled, the reason given therefor being that it was done at the direction of General Pershing. Inasmuch, however, as General Pershing's cablegram concerning the subject bears the date of Dec. 14 following, we must accept the statement of the Curtiss company's officials that the board canceled the contract because it desired to equip the plane only with the Liberty eight-cylinder motor, which was found impracticable. The Liberty 8 was about that time discarded.

The plane was too light for the Liberty engine, so its production was suspended. The French use the Hispano-Suiza motor with this plane, and the Curtiss people assure us that their contract would long ago have been completed and the planes

in the service at the front had the manufacturers been permitted to proceed with production. No attempt was thereafter made to manufacture single-seater fighters, ostensibly because of the Pershing cablegram, until May last, when Mr. Ryan placed an order with the same company for 1000 SE5 planes. This is substantially the English equivalent of the Spad and will probably be in production during the coming autumn. It is manifest that if the manufacture of the SE5 is proper at this time, then the discontinuance of the manufacture of the Spad was a mistake, regardless of who is responsible therefor.

The plans for the Caproni and the Handley-Page bombing machine were available to the board soon after our entry into the war.

#### The Caproni Episode

Early in the summer of 1917 the Standard Aircraft Co. was instructed to hold its plant at Elizabeth, N. J., in readiness to build Caproni planes.

About Sept. 15 a verbal contract was made with the Curtiss company, formally confirmed on Oct. 8, 1917, to build 500 Caproni planes. This contract was never carried out, because no information was furnished to the Curtiss company, although it repeatedly endeavored to secure the same. Afterward it was canceled, and contract for the Bristol Fighter was substituted.

As early as October, 1917, at an international conference in Paris concerning a general aviation program, the Italian inventor, Caproni, was summoned to meet Colonel Bolling, one of the heads of the aviation section in Paris. An arrangement was ultimately made by which Captain D'Annunzio and a force of workmen and engineers were to be brought to America to produce in American plants Caproni machines. Captain D'Annunzio and nineteen of the best men of the Italian factory arrived in the United States on Jan. 17.

In January, 1918, the Standard company was given a verbal order for 1000 Capronis, fifty to be assembled and 950 to be sent overseas knocked down. Drawings were prepared, but no official order was given for the machines.

On Jan. 25 Captain D'Annunzio and his men came to the plant, began work on a hand-made machine. A witness describing the transaction states that—

"They (the aeroplane authorities), in February, began to back and fill on whether they were going to build Capronis in quantity, and by March 2 it was practically settled that they would not build Capronis in this country at all, except the ones we were working on and two or three for experimental purposes.

"As a result of that we took the Handley-Page as a substitute."

Captain D'Annunzio states that he had expected upon his arrival in this country that everything would be ready. "They were wiring and cabling Italy, asking for the engineers of the Caproni plant. I requested General Tozzi, who is head of the Purchase Mission in Washington, to help me clear up the matter. So we pro-

voked a lot of meetings between myself, Colonel Deeds and some other officers. \* \* \* It was just the same as before, because no decisions were reached. \* \* \* I found they were undecided as to whether they should make that machine, although demonstrations had been given before the European Military Mission," etc.

Finally Captain D'Annunzio was authorized to build the first experimental machine for American engineers. That machine was finished and flown on July 7. In the meantime, and about April 12, the Fisher Body Co. obtained an oral contract for 250 Capronis, which was later canceled. Again, about May 18, 1918, the Curtiss Aeroplane Co. was given an order for 500 Capronis, and on the same day the Fisher Body Co. was given an order for 500 Capronis. It is understood, however, that nothing will be done to carry out this order until the experimental machine has been tested out. This precaution is proper.

During the interval of delay both of the Italian pilots who came to this country were killed in other machines, and the Caproni program is now awaiting the arrival of Italian pilots and the testing of the experimental machine.

Over 12 months of time has been thus consumed since the Caproni came under serious consideration.

#### Handley-Page Offer

Plans for the Handley-Page machine were supplied to the Signal Corps in the summer of 1917 by the owner, with full permission to use them. Its engineers made a number of changes in them, beyond which nothing was done with them. Hence, the representative of the owners in the early winter demanded their return. They were delivered to him as changed.

In February last contracts for 1000 sets of parts, afterward reduced to 500 sets of parts, were made with various contractors, to be assembled in Great Britain for the use of the American Army. From 60 to 90 days are required for the assembly of a Handley-Page machine. Twenty of these have been embarked, and we are informed that they will continue to go in constantly increasing quantity, reaching 140 for the month of February. Had these contracts been let last October they could have been completed and delivered by the 1st of July.

One sample machine constructed by the Standard Aircraft Corporation was completed and given its initial flying test on July 6 last. If further tests prove satisfactory the design will go into quantity production. Had the machine been ordered last summer it should be in quantity production now.

#### 1200 Planes Discarded

The production of training planes has been fairly adequate. One type, the Standard, of which there were 1200, has recently been discarded because the Hall-Scott engine which drives it has proven unsatisfactory, but there is no reason to apprehend that training plane production will fall below the requirements of the



service. The designers and manufacturers of this plane insisted that with a good engine it is all right, and this insistence will be tested. If successful they can be made available hereafter. But General Kenly and his assistants found them highly dangerous because of the motor and ordered their retirement. The machines cost the Government about \$6,000,000.

#### The De Haviland 4

The De Haviland 4 is the only so-called fighting plane now in actual production. Outstanding contracts call for 8500 of them. They are being manufactured by the Dayton-Wright and the Fisher Body companies, with smaller contracts to the Standard and one or two other producers. On August 1 a total of about 1000 of these had been delivered, all but a few of which had been turned out by the Dayton-Wright concern.

The first plane of this type was embarked for France during the latter part of February of this year, but never reached port. Up to July 1, 286 had been shipped abroad, of which 67 had reached headquarters in France. On August 1 601 had been embarked. A number of them were delivered to Gen. Pershing's headquarters in June, and upon inspection were found to contain many defects, some of which were serious, others of less importance. Under date of June 26 General Pershing cabled the War Department enumerating many defects and stating explicitly that the machines could not be used until some of them were corrected. Also that all planes of this class should be thoroughly tested and inspected before being shipped to him. This obvious requirement General Kenly had insisted upon observing, but sent them over in the instance considered without doing so, because of an overseas order requiring it.

#### Defects in De Haviland 4

Some of the defects enumerated in this report, in the opinion of every expert flyer who has been examined by the committee, rendered the machines more than ordinarily dangerous. Their opinion differed as to whether or not corrections can be made to make the machines safe, but the assertion that the plane is very unsafe in the condition in which it has been up to this time delivered from the factory was practically unanimous. Deliveries of the machine continued notwithstanding, and many were sent to France in precisely the condition complained of in Gen. Pershing's cable. The explanation offered for continuing delivery of these defective planes is that the corrections could be made overseas, and a force of American officers and mechanics under command of Lieut. Col. Hall was dispatched to France about the middle of July with orders to make them. Your committee is of opinion that the planes should never have been permitted to leave the factory in their defective condition, and the fact that they were permitted to go shows either a lack of appreciation of the situation, a disregard for it, or a very poor system of inspection. On August 2 an order was issued

to all the factories directing that no more of them be delivered until the corrections required were made. We are informed that production under these new conditions is about to be resumed.

In July 155 of these planes were delivered to the Navy, about 50 of which were shipped abroad and approximately 100 crated and delivered at the seaboard for shipment. At this stage four of them selected from the lot were sent to the Navy testing field at Miami, Fla. A test and inspection there revealed the same defects that were reported by General Pershing and some others. The commandant, Capt. McCaughtry, immediately reported this fact to the Navy Department with the result that a cable was sent to Admiral Sims apprising him of the defective condition of those previously sent, while the 100 in crates at the port of embarkation were rejected and returned to the Aircraft Board.

Forty De Haviland 4's sent to a Long Island Field about this time and tested out in the vicinity of New York were pronounced structurally weak and defective. With the production of the De Haviland 4 it has been the same story of changes. Many of these have been made in the plane since the board determined upon its manufacture. Some were unimportant, some extremely so; many of them undoubtedly necessary to its adaptation to the Liberty motor. But they have been made for the most part by automobile and mechanical engineers, having little or no experience in aviation engineering.

#### 54 Perfect Machines Delivered

On the 28th, 29th and 30th of July three squadrons of 18 machines each, 54 in all, having been overhauled by American and French mechanics at an American aviation base behind the French lines, were delivered to the front under their own power. These planes are said to have received the approval of Capt. de Haviland after a careful inspection. Assuming this to be true, it indicates that the machines sent over have been carefully inspected and the defects remedied. On August 7 one squadron of these, comprising 18 machines, under command of Gen. Foulois, made an expedition across the German lines and returned in safety to their base. This marks the date of the use of the first American-built plane over the enemy's lines. The committee has no information regarding the character of their performance.

The character of the evidence concerning this machine, ranging from qualified approval to severest condemnation shows that the De Haviland 4 is chiefly available for observation or reconnaissance purposes. That the War Department and the Aircraft Board share this view is best evidenced by the fact that it is to be replaced by a machine of later design as speedily as may be possible without complete suspension of production.

With the exception of the S. E. 5 and the Handley-Page, in parts, no other type of fighting plane can be produced in quantity before 1919.

The U. S. D. 9 plane is a redesign of

the British D. H. 9, being a great improvement on the D. H. 4. But the U. S. D. 9 has not yet fully responded to the tests of the military bureau and will go into production only when it does so. The U. S. D. 9A, another and later design, now under test, promises to be a satisfactory machine. If the promise is fulfilled by the test, the design will be adopted and substituted for the De Haviland 4.

Recognizing the fact that the United States would not produce planes in quantities early in the war, the board contracted with the English and French early in 1917 for a supply of fighting planes. Of these 2,114, according to the latest testimony we were able to receive, have been from time to time delivered. This enabled us to maintain 13 squadrons of 18 fliers each on the front, a force which is wholly inadequate to meet requirements of modern warfare. It should also be stated that as our troops are moving to France in great numbers, the disparity may increase until we get into quantity production. It is proper to call attention to the fact that at an investigation of the War Department by the Military Committee, held in January and February, 1918, the committee was assured that the French could and would furnish all the combat planes we needed, provided we would send them the raw material, and that this material was being furnished. This assurance was given when the committee showed anxiety at the continued delay in the shipping of planes.

In January General Squier and Colonel Deeds testified to this fact and Secretary Baker gave similar assurance to the committee. The facts, however, are as shown by the testimony of General Kenly, given on July 20, that the plan failed for two reasons. We quote his testimony:

The French contract practically fell down, as you know. \* \* \* It was due to what I consider two reasons. In the first place, the contracts with the French were dependent upon the sending of raw material that was to be furnished by us, and we did not live up to our agreement. \* \* \* In the second place, the increase in German activities in the air caused a change of program in French aviation construction. \* \* \* The French contracts fell down, so that we became more or less dependent upon what could be furnished on this side.

Besides this, many of the machines our men are now forced to use in France are unsatisfactory, but not more so than those used by the French themselves. An Army officer recently at the front testified that the American troops are using many antiquated machines purchased from the French that were discarded by them a year and a half ago. They are using the Sopwith 1½ strutter, which has been declared unsafe by the French and British for observation work. They are using the A. R., equipped with Renault 220, which has a ceiling of only 10,000 feet. They use a Spad two-seater, which is unreliable and unsatisfactory. They were using a few French Briquet machines and the Sampson, which is a

French machine. It is therefore reassuring to reflect that all commands are unified in France, with all lines of the service under a common protection.

### Praises Liberty Engine

The Liberty 12-cylinder engine is an excellent one for the heavier planes and certain other purposes. Its weight of 825 pounds and its 400 horsepower makes it too heavy and too powerful for the lighter types. It is not yet perfect, but it is improving under repeated tests and experiments, which disclose defects for elimination and suggest changes and readjustments of its parts. It is now in quantity production, more than 4,000 having been delivered, and it is approved by our allies, who are anxious to obtain more of them than we can at present supply.

In the development of this motor the Aircraft Board has performed an important task, for which due credit should be given. But the announcement that it had been evolved in a few days was unfounded, and the notion which was encouraged that it could be used for planes of all sizes and character was largely responsible for delays to our plane program.

Motor production has proved to be a formidable task, magnified in some degree by the reluctance of the designers to promptly accept and act upon suggestions of imperfections from competent engineers and critics and fliers and make changes in conformity with them.

### Making Foreign Engines

The manufacture of the best foreign motors, among which are the Rolls-Royce, Hispano-Suiza, and Fiat, contemporaneously with the development of an American engine would have been the sounder policy. That it was partially adopted later confirms this conclusion. We are doing what should have been done a year ago and are producing a 150 and 180 horsepower Hispano-Suiza motor in quantity. Deliveries of the Le Rhone, Bugatti, and 300-horsepower Hispano-Suiza will follow.

American concerns are making the Rolls-Royce motor for the British Government and should long since have been making them for ours. The smaller types of Hispano-Suiza are serviceable for the lighter and faster planes. In view of these conditions, the apprehension of a year ago that we could not produce foreign motors in quantity because of their metrical measurements and intricacies of construction, requiring manual instead of machine work, which we did not possess, becomes untenable.

No fighting plane of American or other design has been built around the Liberty engine, although it is an axiom in aeronautics that planes must be adapted to motors. The Aircraft Board authorized some attempts at this all-important work, one by Capt. Le Fere and one by Col. Clarke, the first of which is being tested and developed by the board, with good prospects of success. This should have been done before, as the type must be made effective before the best performance of the Liberty motor can be secured. A Curtiss design also gives promise of

satisfactory results in the near future. The motor can be used in some other models with good results, but until a Liberty plane is successfully built around a Liberty motor by competent aeronautic engineers and thoroughly tested out our air program will not be complete.

### Poor Inspection System

The Signal Corps inspection system has paralleled that of the producers. In some instances it has functioned badly, with the result that defective material has at times been accepted and material condemned and reported to chief inspectors has found its way back to the producer. In some factories the finished product has been accepted, although not up to requirements. Generally speaking, the production and inspection systems of the manufacturers seem to be more co-operative than competitive. We have found no collusion between the official and the private inspector, but the inspection in the past has been bad. The faults of the system are in part due to the incompetency of the inspectors. We are informed that the system has undergone and is now undergoing a radical transformation and is being remedied as rapidly as skilled and efficient operators can be secured.

### Our Training Fields

The training fields are each designed for 600 enlisted men, 300 cadets, and 72 officers, a total of 972 men, which, owing to the exigencies of the service, have at times been exceeded. This arrangement requires a total of 54 structures of all sorts for each standard field. In addition to these, there are repair and supply depots, balloon schools, experimental stations, radio laboratories, warehouses, quarantine camps, temporary barracks, photograph schools, etc.

Up to May 25, last, there were 31 fields, including balloon schools and experimental stations, and 37 miscellaneous projects comprised in the above recital, not including the training schools at various State and other universities, nor projects recommended but not yet approved by the War Department. Their estimated cost is \$52,511,134, of which \$39,356,407 have been expended, exclusive of a field at Miami, Fla., established by Co. E. A. Deeds, a member of the board, on his own responsibility (and without the knowledge or sanction of the head of the equipment division having charge of the work), and a night flying route from Dayton, Ohio, to Rantoul, Ill., by way of Indianapolis. The cost of these extra projects was over \$400,000. This night flying route was used for the first time on the night of August 12 between Dayton and Indianapolis, and was pronounced satisfactory by Gen. Charles E. Lee and Capt. J. Fitz Morris, of the British air service, and the aviators who made the trip.

The Equipment Division had some difficulty in securing material for construction prior to the advent of Mr. W. C. Potter, now assistant director of the Production Board, since which time there has been much improvement.

The contractors for the work at Lang-

ley field and the fields at Dayton were not satisfactory. Upon the whole, the work of construction proceeded fairly well and the structures on most of the fields have been completed.

Langley Field, near Newport News, Va., consisting of 1,650 acres, was selected prior to our entry into the war for a training and experimental field. The estimated cost of its needed buildings, not yet completed, is \$3,664,050, of which \$2,305,697 have been expended. It seems to have been wisely chosen and well fitted for testing and experimental work.

### Dayton's Flying Fields

Nevertheless, it was practically abandoned last year for that class of work, and McCook Field, at Dayton, Ohio, consisting of but 200 acres, and practically inclosed by river, trees, and telephone and telegraph wires, was selected instead and leased at an annual rental of \$12,500. The reason assigned to the committee for this change was the lack of transportation facilities at Langley, although a spur connecting it with nearby railway systems had been constructed by the Government for its express accommodation prior to the transfer. The insufficiency of this reason is emphasized by the fact that about the same time the board selected the Wilbur Wright training field, near Dayton, requiring the construction of a trolley line by the Government, at a cost of \$175,000, which is its only line of transportation. The field is now being used by the Bureau of Aeronautics for its military testing plant. McCook Field is not only too small for satisfactory experimental flying, but its environment is unfavorable to its use for that purpose. The board has, however, equipped it with structures costing \$920,100.

Adjoining the Wilbur Wright Field is a large warehouse, built at a cost of some \$500,000. In this warehouse are stored great quantities of supplies, many of which, like machine guns, radio batteries, photographic accessories, etc., are manufactured in the East. To send them hundreds of miles west for storage, re-shipping them over the same route back to the seaboard when needed for overseas uses, is waste. It needlessly adds to railway congestion and should be corrected.

Your committee visited but a few of the training fields, of which Wilbur Wright Field, above referred to, was one. It comprises 2,200 acres and belongs to the Dayton Conservancy Association, and is designed as a part of the bed of a great reservoir to hold back the flood waters of Mad River. Much of it is low and swampy, either on a level with or slightly above the normal level of the stream flow. Any considerable rainfall floods a great portion of it and a rain of 36 hours last March caused an overflow of nearly 2 feet above the floors of the hangars, thus seriously threatening the planes with damage and suspending training completely. A drainage system, since installed, is said to have improved this condition, but your committee is informed that the Signal

Corps was advised by competent authority against locating a field upon these premises because of its low and marshy character, and the judgment of the officers and fliers at the field and familiar with the ground was a unit against its adaptability. An excellent stretch of ground within 4 miles of this field, traversed by railway and high above the river level, admirably drained by nature, was available to the board when Wilbur Wright Field was selected.

The large sums expended upon the Dayton-Wright Field, amounting to \$2,878,699, and requiring an ultimate total of \$3,097,777, and its use for testing purposes, probably demands its present retention if the drainage system referred to shall prove fairly effective. But when the dam is completed—the reservoir is to be filled—the buildings must be removed, or they will otherwise be submerged.

More recently the board, desiring an additional field near Dayton, was offered an acreage adjoining the Dayton-Wright Airplane Factory on the east. Inasmuch, however, as insistence was made that the lease be executed to the Dayton-Wright Co., as lessee, for the use of the board, the rental to be made an item in the cost of airplane production, the representatives of the board very properly declined the suggestion, and the project is still incomplete. We feel obliged to note in this connection that shortly before negotiations for the McCook and the new field, Col. E. A. Deeds, a member of the Aircraft Board, was the owner of the first and a part owner in the second. He sold and transferred them to interests with which he had been identified, and which now own them.

#### Aviation Contracts

At the outbreak of the war but few concerns were engaged in airplane and motor construction; but there were concerns devoted to other pursuits, and potentially capable of producing both in quantity if encouraged to do so. The need for planes in volume, and as rapidly as possible, prompted Congress to make the largest single appropriation for the Signal Corps which up to that time had ever been made. Since then our engine-producing capacity has been fairly enlisted, while that of plane production has not been properly encouraged. A number of plane manufacturers, like the Wittmann-Lewis Co. of New Jersey, and in the business years prior to the outbreak of the war, have been unable to obtain contracts; while a number of concerns like the Dayton-Wright Co. and the Standard Co., have been practically organized since the war, and the former was given enormous contracts before its factories were completed.

Companies assured of capital and factory space have been denied contracts because they were not going concerns, while other companies in similar condition have received contracts, notwithstanding their present lack of producing equipment. No one official controlled or supervised the making of agreements or their execution. Beginning and ending with the Aircraft Board, the head of production,

the director of supplies, the head of the contract section, and perhaps other links, made up the chain of procedure. Adopting models of proved efficiency, and then putting all responsible producers at work upon them, would, in the opinion of your committee, have greatly expedited, as it would have guaranteed, the performance of the aircraft program.

#### Money for Makers

To aid in the construction of the Dayton-Wright plant and the Elmwood plant of the Curtiss Co., the board made generous advances of money, and to them was given the task of making and supplying other contractors with plans, designs, blue prints and specifications for the accepted types of machines, exclusive of bombing planes. This gave these concerns great advantage over their competitors, which thus became dependent upon them for material without which the work of production could not begin, and when begun was subject to suspension and delay, with changes in construction and design. Moreover, the Curtiss Co. exacted a fee for copies of plans, etc., of 1 per cent upon the contract price from other contractors, which, although added to the cost of production, was paid to the Curtiss Co., adding a considerable aggregate sum to its revenues.

The number and amount of contracts for planes and motors assigned to concerns at Dayton and Detroit, and the number and character of aviation fields at Dayton could not fail to attract the attention of your committee. Due to her vast automobile industry, Detroit doubtless possessed greater facilities for gas-engine production than any other American community, and the Fisher Body Co. was well equipped for the manufacture of planes in quantity. A generous recognition of these facts was therefore inevitable.

But Dayton possessed no such advantages. Her manufacturing interests were for the most part in other directions. Industrially considered, the concentration of the greater part of the new pursuits in these two cities may perhaps be justified, but the committee is forced to the conclusion that the personnel of the Aviation Board, from its formation to its reconstruction, explains the fact.

#### Blames Aircraft Board

The civilian personnel of the board, and their more prominent subordinates, were composed of gentlemen a very considerable number of whom lived in these cities, and before or at the time of entering the Government service were leaders in and identified with the industrial development of their respective communities. The divestiture of their interests by transfer to others was a laudable though essential step toward qualifying them to public service, but the granting of major contracts to old associates, the transfer of the experimental station from Langley to Dayton, and installing it upon an inadequate tract quite recently the property of a member of the board, the tender, and qualified acceptance, of a second field formerly owned in part by the same member, the selection of the

Wilbur Wright Field, physically and geographically unsuited for the purpose, and the giving of huge contracts for airplanes to a corporation created since the war began, of which he was one of the first officers, and owned exclusively by his former partners and business associates, have provoked, and we think justly, much of the public comment which made the investigation imperative and much of the resentment of less favored manufacturers in other localities. It is also a distinct argument for those who assume to fear, and who assert, that aviation, through the board, is to be made the subject of ultimate automobile control. This feature of the subject is, as heretofore stated, under full investigation by the Department of Justice.

#### Against Cross Licensing

Although this subject has been referred to a special subcommittee for investigation, it has constantly obtruded itself upon our attention, hence we can not avoid referring to it.

The National Advisory Committee of Aeronautics, confronted with the necessity of satisfying the claims of patentees and avoiding possible delays threatened by conflicting patent rights, determined upon mature consideration to settle these difficulties through the agency of a Manufacturers' Aircraft Corporation, to be composed of those engaged in the industry and empowered to license all aircraft contractors, who should pay a royalty to the company upon all planes and parts to be constructed and to assign to the company for the common use all patents or applications therefor owned or controlled by the licensees. The bulk of these royalties was to be paid to the Curtiss and the Wright-Martin Cos. as compensation for the use of certain patents until each had received \$2,000,000. These were to be charged against cost of production and paid by the Government. The agreement was sanctioned by the Department of Justice and approved by the Secretaries of War and the Navy.

The committee has not heard a word in approval of it. It is condemned by every airplane manufacturer outside of the immediate beneficiaries. Those executing the license agreements have done so under protest because the Aircraft Board recommended or required it.

Criticisms of it are numerous, the most serious of them being that it subjects manufacturers to onerous requirements by its beneficiaries, such as assessments for the use of plans and specifications, the purchase of the material and accessories from favored houses the assignment and surrender of valuable patents and patentable devices of the Aircraft Association upon terms prescribed by itself, the discouragement of invention, and the inevitable control of the aircraft industry by that association or by some other interest through its agency. Your committee sympathizes with many of these sentiments, and notwithstanding the Aircraft Production Board as now officered no longer requires or recommends the execution of the agreements



by contractors, we believe the arrangement should be abrogated. We regard it as vicious and as designed to reap large profits by taking advantage of the necessities of the Government. The basic patentees should, of course, if the patents are valid, be compensated, but this should be done by the Government directly whenever the courts finally determine who the owners are and the patents should then be made free to all manufacturers.

New patents of meritorious character should be similarly acquired by the Government as they appear. Such a course would stimulate invention and promote the development of an art which is still in its cradle.

This is not a new departure but rather a reversion to an original policy, for Congress in 1917 appropriated \$1,000,000 for the purchase of aircraft patents, which sum is still available, and if insufficient for the purpose it can be easily increased. The Government should never be made the victim of a patent monopoly which it generously created for the sole protection of the inventor against infringement by persons and corporations.

#### Production Difficulties

Much can be said in extenuation of the disappointments encountered in aircraft production. The industry is new and highly technical. Mechanics skilled in the art were few when the war began, and of aviation engineers there were scarcely any. Production capacity was undeveloped, and even planes for training were not immediately obtainable. Up to January, 1917, only 118 airplanes of all types had been delivered to the Army, 64 of which were made in 1916, and there was no aircraft organization either in the Signal Corps or out of it. The Bolling Commission was not sent to Europe until June, and its report was not received until September. But for the glowing forecast and optimistic announcements which the board and others made to the public from time to time regarding its actual and prospective performance, and the certainty of speedy and unlimited production, public disappointment would not have been so pronounced nor public resentment so widespread. Great Britain in 1915 and 1916 experienced delays, miscarriages, and expenditures. Instead of profiting by her experiences the board incurred similar ones and accentuated them by representations and assurances which were not warranted by the actual facts.

The order of the President creating a Military Bureau of Aeronautics and a Director of Aircraft Production and the appointment of Gen. Kenly and Mr. Ryan as the heads of the two divisions is an improvement upon the previous situation, and a number of the conditions we have criticized have been or are in the process of being corrected and better methods instituted. For example, a single board of engineers formed by combining the technical and production engineering sections and headed by a chief selected by Mr. Ryan, with the approval of Gen. Kenly, has been established; one testing

board under the command of a single officer has succeeded the double system formerly doing the work. The Military Bureau, under agreement with the director, after thorough experiment by actual fliers and aeronautic engineers, now determines the character of machine to be produced, and the business of the director is to produce it.

#### Committee Recommendations

1.—The inspection of the finished product and other material is now the work of Gen. Kenly's division and is to be done by thoroughly competent officers. Work not satisfactory to Gen. Kenly or not up to the requirements of his Bureau is rejected. Co-operation for the common end has been, and we hope will be, observed by the heads of the two divisions and required from their subordinates. The loose ends of the former organization have been gathered up as rapidly as possible, and the results of the improved conditions are already apparent in some directions. But the system is still subject to the criticism that it is dual in character, which is unsatisfactory, since it may at any time lead to differences and to division of responsibility. We are constrained, therefore, to renew the committee's recommendation of last April, sustained by the opinion of every man whose views were consulted by us; that the whole subject should be under the control of one man. Our present organization is faulty because divided into two parts with a man of strong will and opinion at the head of each division. While these two divisions are correlated, they may not be permanently co-ordinated. Your committee therefore believes that the importance and magnitude of aviation as a permanent branch of our military organization requires one directing and responsible head both for its efficiency and speedy development. Its classification with the Army and Navy as a distinct arm of the service is essential to this end.

Of comparative insignificance at the outbreak of hostilities in 1914, aviation has become indispensable in modern warfare. Without aircraft no army can any longer hope to triumph or, indeed, to escape inevitable defeat. Without aircraft the most powerful navy must in these days remain upon the defensive. The aircraft force of Great Britain and France each outnumbered the regular army of the United States when we declared war, and ours should soon be as large as theirs. It is a distinct arm of the service. Great Britain and France, recognizing its supreme importance and the need of its swift expansion, last year each converted it into a department of its own, whose head, as minister of the air, ranks as an officer of the cabinet, who is held responsible for efficiency of production and manufacture and an efficient force of aerial fighters. We should do likewise—create a department of aviation, under the control and supervision of a secretary, and ranking with those of the Army and Navy. We would thus place power and responsibility in the hands of a single man, organize a service

not alone for this war but for all time, and establish for the forces of the air the same policy of administration that has so long governed those of the land and of the seas.

The cost of equipment and maintenance is rapidly approaching that of the Navy, while training for aviation is as distinct and as technical as that for West Point and Annapolis.

The creation of the department of the air would unify the service, thus removing all friction between the Army and the Navy divisions of the service by subjecting both to the control of a common head. Differences between them under present conditions are unavoidable and, while more disagreeable than serious so far, they will arise from time to time, tending to seriously disturb the service, besides interfering with production.

2. A commission of engineers and pilots for observation at the front, formed in relays and reporting in person to the department at frequent intervals, is also imperatively demanded. The betterment of the air service through the exigencies of actual warfare is rapid and important. They should be accurately and promptly reported in detail to the home office, and this can be efficiently done in no other manner. Similar conditions have long been maintained by our allies, whose policy in this regard we will do well to adopt.

3. But your committee feels that the prime need of the hour is machines in continuing quantity, and the production of them should be accelerated by enlisting the constructive activities of all responsible concerns engaged or which can be engaged in the business to full capacity. We cannot, while the war lasts, have too many effective planes. Supremacy of the air means a speedy triumph. We have hundreds of trained pilots waiting for planes, whose services must be postponed for their production.

Planes to be useful must have motors. These too should be in production in every factory that can and will turn them out, due allowance being, of course, made for other equally insistence requirements for ordnance, ships and the like. If this is done, the results for 1919 will then compensate somewhat for the disappointments of the current year.

4. The rapid development during the war of the aeroplane and its effective use as an important arm of the military makes it imperative that America give greater attention to the perfection and production of aircraft. This should be done not only as a war measure but as a commercial and industrial necessity.

The importance of a powerful air force, and an abundance of heavy artillery cannot be overstated in bringing the war to a speedy and successful conclusion. With our vast resources in raw material and our facilities for manufacture we can, by the adoption of a broad program and with the assistance of our allies, obtain the complete supremacy of the air.

Without hesitation or delay we must give attention to this expansion of our aircraft policy. The inventive and pro-

ductive genius and energy of America must be devoted to the creation and improvement of new types of aircraft and engines. Our present program must be greatly enlarged. The United States should establish at Government expense college and university courses in aero dynamics and mechanical engineering, in addition to courses for training fliers.

While quantity production is essential to the complete equipment of our armed forces, quality should not be sacrificed to quantity. The aeroplane requires the highest degree of skill in workmanship and the very best kind of materials.

The aeroplane is a product of American genius, but the credit for its development largely belongs to other nations. America should meet this challenge by bringing the aeroplane to still greater perfection.

5. The inventive genius of the nation should be encouraged in the most effective way. A Bureau of Inventions, recently established by the War Department, is a step in the right direction. A persistent complaint, doubtless in a large degree due to the disappointment of men whose devices have not been pronounced practicable, is that under the administration of the old board scant consideration has been given to new devices and suggestions. This seems principally to have resulted from the absence of any well-defined individual agency having full authority to deal with the subject. One man, the designer of a model for a dirigible with a car integral with the Blimp, began with the Advisory Committee and was passed on from one officer to another until he finally completed the circle and was referred back to the committee which started him on his journey. About six months were consumed in making the circuit and nothing was accomplished. A plane designer encountered a similar experience, with the added one that his plane was crushed to pieces in a sand test which was declared satisfactory by those who made it but wholly unsatisfactory by those empowered to make final decisions. Many, perhaps most, of the so-called inventions brought to the notice of the authorities in times like this are of no importance. But if the germ of something new and useful can be detected in one of a multitude of models, the time and energy expended in discovering it will redound to the benefit of the nation.

6—Ample protection should be extended by the Patent Office to applicants for patents for inventions relating to the public welfare and defense. This is demanded not so much for the inventor as for the nation. Authority for this now exists, but it seems to be exercised at times and disregarded at others. Additional legislation may be necessary to make this precaution effective, but in the meantime a suggestion from the Production Board to the Commissioner of Patents regarding applications for inventions relating to aircraft would doubtless shield the application from all publicity, thus assuring its indemnity against disclosure to enemy interests.

7—The margin of profit on some con-

tracts, particularly for motor production, is altogether too high. According to the estimates of the accounting division they appear to be for the Liberty motor at one of the plants 33.6 per cent; for Liberty engine aluminum pistons, 285 per cent on capital invested; for the Le Rhone, 92.8 per cent on cost of production; and on the D. H. 4 plane about 50 per cent. This is largely due to the primary unfamiliarity of officials with the cost of rapid manufacture of novel products in great and urgent demand.

The high cost to the Government having been now demonstrated, we feel sure that future contracts will result in great saving to the Government.

8—Planes and engines rejected because of defective construction or materials not furnished by the Government direct should be at the cost of the producer. Existing agreements require payment from the Government for everything delivered, presumably because they have passed official inspection. But when producers are required under their agreements to bear the expense of an inferior product, on the perfection of which human life is absolutely dependent, their own inspection will be of the best, and good workmanship will inevitably result.

9—Your committee, in inspecting the aircraft plants have noticed the great danger of destruction by fire owing to hazardous processes of manufacture, hasty construction, lack of automatic sprinkler and other fire protection.

The burning of any of these factories in whole or in part at this time would be a catastrophe, for it would greatly cripple the aircraft program.

We urgently recommend that the requirements of the Fire Prevention Bureau of the National Council of Defense, composed of fire insurance experts, for better fire protection in these factories be made immediately compulsory by the Director of Aircraft Production, and that a stipulation be inserted in future contracts compelling a compliance with such recommendations.

#### Gasoline Conservation Requested

(Continued from page 379)

greater than the July consumption of 1917, while production was 27 per cent greater than in July of 1917.

The request calls only upon the owners of cars east of the Mississippi River because those west of the river are in or close to the production field and are not affected by the transportation problem which is another factor. Transportation east of the river is devoted so largely to war work and to carrying oil and gasoline for shipments overseas that some eastern localities have already encountered serious gasoline shortages.

The Conservation Department of the Fuel Administration points out that there are over 5,000,000 automobiles in use in the United States, and that if each passenger car owner will do his utmost to conserve gasoline, preventing spills, racing of engine, etc., each owner can probably save from  $\frac{1}{2}$  to 1 pint per day, which in itself would effect a sufficient saving to meet the excess demand.

The Conservation Department plans to establish oil conservation districts throughout

the country, placing automobile dealers at the head of each district together with committees to be composed of newspaper men, automobile club representative, oil industry representatives, garagemen and dyers and cleaners. These committees will in turn appoint deputies for each county. Huge posters will be displayed everywhere, and all garages and oil stations will be instructed in every means of gasoline and oil conservation. The Fuel Administration is desirous of securing conservation of oil and gasoline without issuance of any direct orders, and is adopting the plan of intensive education for that purpose.

Following is the complete statement by the Fuel Administration:

The United States Fuel Administration considers it necessary that a limited conservation of gasoline be undertaken, in the States east of the Mississippi River in view of the increasing demand for gasoline for war purposes and the paramount obligation of meeting promptly and fully all overseas requirements.

An appeal is made, therefore, to the people of the United States east of the Mississippi River to exercise rigid economy in the consumption of gasoline during the next few weeks as a necessary and practical act of patriotism.

War necessities are being and will continue to be promptly and fully met, but this is the period of the year when consumption of gasoline is at its highest, and the increased domestic demands, together with the extensive military operations in France, have rendered necessary, for a limited period, the adoption of safeguards against possible shortage.

In view of the difficulty, if not the impossibility, of differentiating between the various uses to which automobiles are applied, the United States Fuel Administration believes that the greatest measure of economy can be effected with the least interference with the business of the country through the discontinuance of the use of all classes of motor vehicles, motor boats, and motorcycles, on Sundays.

The United States Fuel Administration therefore requests that in the section of the United States east of the Mississippi River there shall be a discontinuance of use of the vehicles above specified, including all such as are operated for hire, on each Sunday hereafter until notification that the need for such discontinuance has ceased.

#### Decreases in Bituminous and Anthracite Production

WASHINGTON, Aug. 27—Less than 12,000,000 tons of bituminous coal were produced for the week ended Aug. 17, the first time that production has been below this figure since June 22. The output was 11,910 tons, 379,000 tons less than the preceding week, but 1,597,000 tons greater than in the corresponding week of 1917.

Anthracite production for the week of Aug. 17 was 1,924,000 tons, a decrease of 127,133 tons as against the preceding week, and also a decrease of 63,800 tons as compared with the corresponding week of last year.

The bituminous mines produced 79.7 per cent of their full-time output during the week of Aug. 10. Car shortage was responsible for a loss of 9.8 per cent; labor shortage, 4 per cent; mine disability, 4.2 per cent; no market, 0.4 per cent; all other causes, 1.9 per cent.

# AUTOMOTIVE INDUSTRIES

GENERAL LIBRARY  
SEP 10 1918  
NEW YORK, N.Y.

## The AUTOMOBILE

Vol. XXXIX  
No. 10

PUBLISHED WEEKLY  
NEW YORK, SEPTEMBER 5, 1918

Ten cents  
Three dollars

## Why Hudson Dealers Have Faith in the Hudson Future

Talk with a Hudson dealer and you talk with a man who has every confidence in the future. He is satisfied that the Hudson foundation he is building on is a solid one.

He is not only sure of the quality of the car he sells but he is sure of the manufacturing and sales policies behind it.

He realizes more than ever the long-range vision with which Hudson plans.

He knows that no temporary, abnormal condition is going to obscure Hudson foresight and cause hasty, ill-advised decisions.

He knows that in spite of curtailment the Hudson name will be kept shining as brightly as ever — not only by consistent advertising, but by performance in the hands of thousands of users.

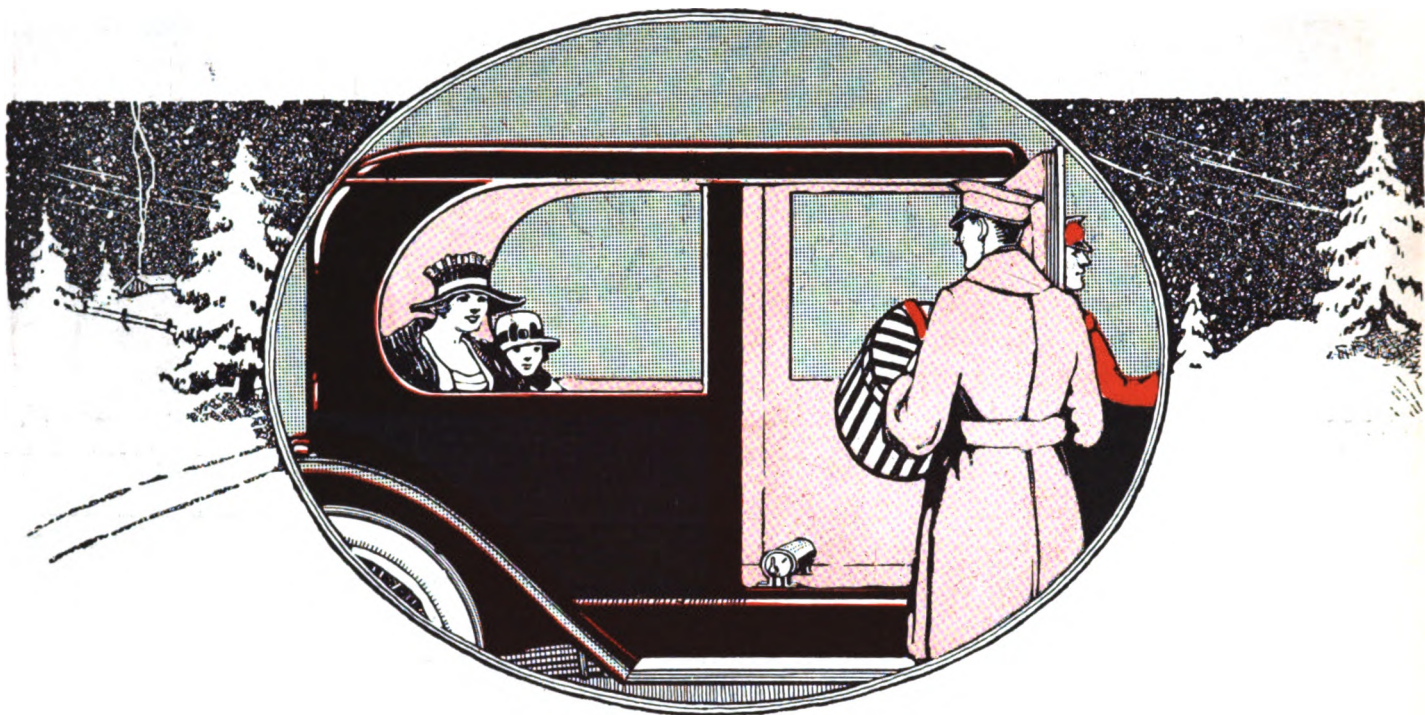
Thus, when the war has passed, the crisis will have proved the Super-Six even more thoroughly perhaps than the speedway — hill climbs — and cross-country tours.

Hudson dealers will have a foundation more solid than granite upon which to build their post-war business.



**Hudson Motor Car Co., Detroit, Michigan**





## UTILITY *Protected Foot Rail* HEATER

# NOW IS THE TIME TO PREPARE FOR WINTER

Cold weather will soon be here with a greatly increased demand for Utility Protected Heaters in limousines and enclosed cars.

The Utility Heater is the accepted standard of motor car heating. Its principle is sound, logical and convincing. It insures perfect driving comfort, even in the coldest weather, by tempering the atmosphere of the car to any desired degree. It keeps you warm all over, as though you were in a carefully heated house.

UTILITY Protected Heater—installed in place of the foot rail—is the heater universally recommended by thousands of motorists during the past season—the heater jobbers catalog and the heater manufacturers install as standard equipment.

Ease of installation, attractive appearance, freedom from dust, odor or trouble make it the highly desirable heater. We shall be glad to quote on manufacturers' requirements for standard equipment.

*DEALERS—178 more jobbers than last season are now handling the Utility Protected Heater. There must be a mighty good reason.*

## THE HILL PUMP VALVE CO.

Archer Avenue and Canal Street

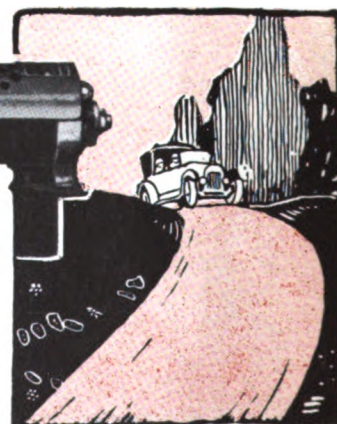
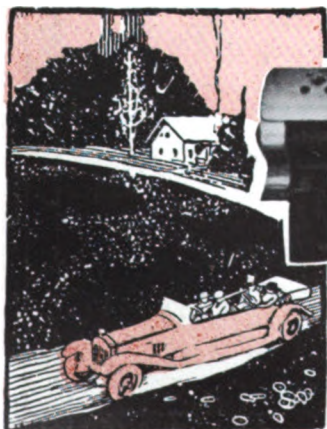
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*Manufacturers of Famous UTILITY Auto Specialties*

### PRICES

Utility Protected Heater.....	\$20.00
Utility Front Seat Heater.....	12.50
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# **AUTOMOTIVE INDUSTRIES**

## **AUTOMOBILE**

VOL. XXXIX

NEW YORK, THURSDAY, SEPTEMBER 5, 1918—CHICAGO

NO. 10

## **Delay in Bombing Planes for War Program**

### **Day and Night Bombers as Essential as Chasse and Reconnoitering Types**

#### **Maker Asserts Small Profits Are Made on Liberty Engines**

### **STORY OF FAILURE OF BRISTOL FIGHTER**

**N**EW YORK, Sept. 5—The Senate subcommittee report on aircraft has served to emphasize the fact that we are little more than starting on our program of building bombing airplanes, which in the judgment of not a few European aircraft students must constitute perhaps a dominating factor in our aircraft activities.

We have made progress in building a type of reconnoitering plane in the De Havilland 4 that is useful in such work, as well as in directing artillery fire and photography, but which as a bombing plane is useless, because of its inability to carry a load of bombs capable of doing any material damage. It is only the bombing planes with bomb-carrying capacity of upwards of 2 tons that can work the havoc that must be accomplished if we are to destroy the factories of the enemy, destroy his submarine bases and break up his lines of communication. We could not accomplish this with fleets of chasse or reconnoitering planes even if we had them in the tens of thousands. We must have the giant night bombers with a long radius of action and also the lighter day bombers with their higher speeds and ability to fly at greater heights.

What we need and must have is a synchronized program on the four leading classifications of air-

planes, namely, chasse or fighting planes; reconnoitering planes, day bombers or night bombers.

The production for all four types should come along together in their correct numerical quantities. Our aerial program is lacking in its completeness unless each of these four divisions is given its due consideration at the proper time. It is poor policy to needlessly stock up with chasse machines and then not be able to take advantage of the gain so accomplished by failure to do the necessary day or night bombing that should follow.

To illustrate: If we put our entire airplane production at 100 per cent and divide it into the four divisions, chasse, reconnoitering, day bombers and night bombers, we might give figures such as: Chasses, 20 per cent; reconnoitering, 15 per cent; day bombers, 25 per cent, and night bombers 40 per cent.

These figures are only intended to indicate how the entire scheme of activity should be divided off according to the necessities of the war. All four must be carried on simultaneously. We cannot spend a year on one class and then take up another. All four are needed now and we should be as nearly equally advanced on one as on any of the others. It is unfortunate that we are not.

The biggest men in the automobile industry who risked in a great many instances great sums of money in order to help make the aircraft program a success are not backward in condemning the Senate report.

At the present time the automobile industry has over \$35,000,000 invested entirely in the manufacture of Liberty engines. The profits on the total number of engines already made cannot as yet be accurately estimated, as insufficient time has elapsed to make complete cost calculations. As an example, however, Packard, which was the first to get into production, made less than 5 per cent on its first order, which was for 600 of these engines. Up to Sept. 1 Packard had shipped 3,169 Liberty engines.

### More Liberty Contracts Offered

In spite of the fact that the Senate report gives the impression that the automobile industry gobbled the Liberty engine business to the exclusion of smaller concerns who were more fitted to do the work, the Government is now using every effort to get the automobile industry to accept additional orders for greater quantities of Liberty engines. The question immediately arises, why does the government not go to the concerns which the Senate report indicates should be the ones to manufacture these engines?

The answer is obvious, since it is well known that only concerns which are highly adapted for quantity engine production can enter the program with any hope of meeting requirements.

As production goes ahead, the cost on these engines is decreasing. This is always the case as the personnel becomes more skilled and the routing of the production is changed to meet the demands for better efficiency. It was for this reason that it has been possible to revise downward the figures on the Liberty engine cost.

As pointed out last week, this started at \$6,000 and was afterward reduced to \$5,000, which was set as the bogey figure. These contracts are now under process of revision to fix the cost price as \$4,000.

### Cost of the Liberty Engine

IT IS UNDERSTOOD THAT A CLAIM IS SOON TO BE MADE THAT THE AUTOMOBILE INDUSTRY HAS BEEN FORCED TO TAKE \$1,000 LESS FOR THESE ENGINES. THIS IS NOT TRUE.

The truth of the matter is that the government according to its contracts is given 75 per cent of any saving below the bogey cost of \$5,000, so that when the cost is reduced to \$4,000 the saving to the government is \$250 per engine, as the \$750 would be turned over to the government, anyway, due to its original contract.

The original Aircraft Production Board has been criticized for making incorrect engineering decisions. This cannot be true, as the original Aircraft Production Board had no executive power. It was simply an advisory board and did not have an engineering staff, such as would be required for making determinations as regards materials and design. An

idea of the limited functions of the board, which was really a clearing house for the army and navy aircraft divisions, may be gained from the fact that out of the total of \$640,000,000 appropriated the board had the spending of \$100,000.

### Delay in Adopting Foreign Types

Considerable curiosity is displayed in the industry regarding the cause of a real delay in adopting foreign types. A careful survey of the situation indicates that there are two real reasons for this. In the first place, the foreign governments, feeling that after 3 years of indecision on our part in entering the war it was unlikely that we would enter immediately heart and soul into the conflict, were rather dubious about turning over their plans to us. It was not until this country really showed that it had entered fully into the struggle with all its resources that real co-operation was extended. There is no criticism attached to this, as it was but natural. Knowing the history of America in the automobile business, French manufacturers wanted to be assured that in giving us all their secrets they were not simply furnishing us with information that would allow us to take a dominant position in the airplane industry after the war. It is known that confidential bulletins to this effect were circulated among the French manufacturers, and it is no discredit to their patriotism or business acumen that this was done. It must be remembered that at that time this country had not fully proved itself.

Throughout the entire situation it must be borne in mind that conditions now are altogether different from what they were 6 months ago. The success of the Liberty engine and its development by the automobile industry have been the real causes which have opened the door of foreign assistance.

### Would Not Listen to Experts

On the other hand, it is claimed that we would not listen to the advice of foreign experts. The testimony of those who had actual experience in foreign manufacture was not seriously heeded, and this accounts for delays in adopting types of planes like the Caproni, which is now proving itself of the greatest value.

RIGHT AT THIS TIME THE PLANE DESIGNED BY THE FRENCH COMMISSION UNDER CAPTAIN LE PERE, WHICH IS CLAIMED BY MANY EXPERTS TO BE THE BEST TWO-SEATED COMBAT PLANE THAT HAS EVER BEEN DESIGNED, IS APT TO BE TURNED DOWN. The reason given is that it necessitates a slightly different manifolding system for the Liberty engine. It is claimed that this would interfere with standardized production, although it does not affect the engine itself in any other way except for the manifolding. In the light of past experience, let us go slowly on discarding a plane which seems to have excellent production qualifications besides giving a performance which is a delight to pilots for speed and climbing ability.

One feature that has been clarified considerably by the report of the subcommittee of the Committee



on Military Affairs, U. S. Senate, is that relating to the troubles with the Bristol fighting plane, which was practically adopted and recommended for production by the committee sent abroad in the summer of 1917 to select the best type of fighting plane to be built in America. The committee selected the Bristol and a sample machine was shipped from Europe to Washington, where it arrived Sept. 1, 1917. At that time the go-ahead was given and the work turned over to Lieut.-Col. Clarke, who had a set of British drawings from the factory to assist him.

### Lack of Co-operation

From that date forward the story of the Bristol development until the cancellation of the contract a short time ago, after an expenditure of \$6,482,000, is nothing but an unpleasant tale of lack of co-operation among the various interests involved, and apparent delays which it is impossible to explain and which the committee making the investigation has made no effort to explain. The following chronology serves as a panorama of the development of the work on the Bristol from Sept. 1, 1917, until the cancellation of the contract.

Before taking up this chronology a few facts regarding the Bristol should be understood. As built in England the fuselage was arranged for a 190 hp. Rolls-Royce engine, but when its manufacture in America was decided upon, the Liberty 12 was selected as the power plant, and in September, 1917, the Liberty 12 was in the earlier processes of development and it was 4 months later before it was emerging from its constant succession of changes.

In fitting the Liberty 12 there was considerable increase in weight, approximately 185 lb. in all. The Rolls-Royce engine weighed 615 lb. and the Liberty 12 would range from 800 lb. up. This increase in weight added very considerably to the pounds per square foot of wing area that the planes would have to carry. The Bristol had a wing area of 450 sq. ft. and with its complete weight at approximately 3700 lb., which included all equipment, it had to carry or support 9.2 lb. per sq. ft. of wing area. If the area of the tail portion were added, this weight per square foot would be reduced to 8.25 lb. This load is very heavy when it is appreciated that the French Spad, from which the English Bristol was an adaptation, has a load of 7.3 lb. per sq. ft. and the D.H. 4, or De Haviland bombing plane, has a load of 6.1 lb. per sq. ft.

### Extra Load Factor in Failure?

It does not appear whether this extra load which the Bristol had to carry was a prime factor in its failure or not, but when the early test flights of the Bristol were made at the Curtiss factory it did not carry its equipment and the machine flew with a total weight of 3000 lb., whereas its weight when fully equipped would approximate 3700 lb.

Perhaps the greatest trouble with the adapting of the Bristol to American ideas and to the Liberty engine resulted from a failure to have experienced, qualified men engaged in the work. It was neces-

sary to make numbers of changes due to the difference of length of the engines, as well as the differences in weight, and there was a lack of good, practical aviation experience in this, the work being done by men who had a lot of theoretical information but were sadly lacking in practical experience.

About the middle of October the best airplane designer, who was a real practical man, left the job, because he was not willing to work with those connected with the Liberty engine program. The work was then turned over to a designer who, while he had a good theoretical education, seems to have been lacking in practical experience.

In addition to this handicap in the question of design, there were not a few other difficulties that caused delays. The work of adapting the Bristol after starting in Washington, Sept. 1, 1917, was moved from place to place, and on Nov. 1 it was decided to ship the Bristol plane and all blueprints to the Curtiss factory at Buffalo, where the work was to be done. On Nov. 17, 2000 of the planes were ordered and the work was supposed to be pushed ahead. The report contains letters indicating delays due to the fact that instead of a separate department being given over at the Curtiss plant for this work, it was for quite a time carried on in the open factory, which resulted in numerous delays.

### Many Other Delays

There were many other delays in connection with blueprints. In one case these were held up for a week when the department was moved from Washington to Dayton. There was another delay when part of the organization was moved to McCook Field in Dayton.

The first Bristol machine was flown at the factory on Feb. 28, and the next day when the wings were removed it was found that two wing beams were ruined where holes for hinge pins had been drilled off, necessitating new wings.

When the Bristol was taken to the flying field on March 2 the wings were damaged on the way to the field. The flying field was in a very poor condition and there was trouble with the oiling system on that date. There was no heat in the hangar, no telephone, no spare parts, or portable tools, and drilling had to be done by hand.

On March 5 the first real flight of 5 min. duration was made, but the plane flew with only 3000 lb. weight, not having any equipment. It had to come down, due to engine trouble, sooted spark plugs, and the landing gear was broken.

It was expected that a new landing gear would be arranged and another flight made in a few days, but it was March 22, or over 2 weeks, before another flight was made. One time there would be no pilots, another time it was bad weather, and another time the field was in poor condition.

On March 22, a 15-min. flight was made.

On March 24, the machine flew 1 hr., attaining an altitude of 10,000 ft. and a maximum speed, with a cross wind, of 121.5 m.p.h. The report does not state whether the machine flew with a 3000-lb. total weight or not on this occasion.

Four days later the Bristol caught fire on the flying field and was badly damaged, and it was on April 5 before a new machine could be had to replace the old one.

While this rather incomplete testing program was being carried out various changes had been made. On Jan. 27, thirty-five changes in construction were approved by those in charge of the work.

The report shows that for periods of 8 days there was very little speed in production due to errors in construction and changes in parts.

While this whole course of development was proceeding the army officials of the Signal Corps seemed to be impressed with the fact that the Bristol was one of the best machines. Extracts from the report show that on Jan. 9, when those in charge of the work were at Buffalo, they reported that the Bristol fighter we were copying was very successful. As late as Feb. 13, another army officer reported that the Bristol construction and design was very satis-

factory on the Western front. It was in March and April when rumors began to leak out regarding the failure of the Bristol plane. Some accidents occurred and various reports were circulated as to the reasons for these. It was the general feeling that the original British machine which was copied was at best a tricky type, but that in the American adaptation these characteristics were intensified, making the machine really unsafe.

The report states that the constant effort to change from the tried-out Bristol principles of design and to inject changes of construction to cover careless workmanship or poor materials were responsible for the failure of the job. This, coupled with a lack of concentrated experienced inventive engineering ability, in perfecting the undeveloped features of design incident to the changes, seems to complete the long list of reasons for the signal failure of the job. The report shows that all changes in design were crude.

## Problems Involved in Bomb Sight Design

**Bombs When Released Acted On by Three Forces, Momentum, Gravity and Air Resistance—Wind May Also Be a Factor—Present Bomb Sights Require the Manipulation of at Least Three Scales and Are Too Complicated**

By a Member of the British Aircraft Mission

THE following notes form a brief discussion of some of the outstanding features of bomb sighting; it is not possible to discuss the question exhaustively in a short article, but it is hoped that the main features are clearly dealt with.

Let us consider a bomb attached to an aeroplane in such a way that its axis is parallel to the longitudinal axis of the machine; the bomb is said to be horizontally suspended. In order to make matters quite definite let us assume that the aeroplane is travelling at 100 ft. per sec. (about 70 miles per hour), is flying at an elevation of 6000 ft., and there is no wind.

### Trajectory of Falling Bombs

When the bomb is released by the pilot it falls to the ground along a curved path called its "trajectory." The forces acting on the bomb are three in number: (1) its horizontal forward momentum, due to a velocity equal to that of the aeroplane to which it was attached, (2) the pull of gravity. This force acts vertically downward and gives the bomb an acceleration of 32 ft. per sec. per sec., (3) the resistance of the air. This force acts along the longitudinal axis of the bomb. The air resistance can not be neglected in the design of bomb sights, but since the effect it produces on the trajectory is not very great, we may, for rough calculations, leave it out of account at first.

Considering then the two first forces, we have a horizontal forward velocity of 100 ft. per sec. and a vertical downward acceleration of 32 ft. per sec. per sec. By

means of the simple laws of mechanics we can make the following table:

Time from moment of release, secs.	Horizontal Travel, ft.	Vertical Travel, ft.
0	0	0
1	100	16
2	200	64
3	300	144
4	400	256
19.4	1940	6000

If we plotted these figures, or even by comparison of the figures themselves, we should see that they conform to the well known curve known as a parabola ( $y^2 = 4ax$ ). Only half the curve is present, since the bomb starts from the apex at the moment of release. The "x-axis" is vertical and the "y-axis" horizontal.

We have therefore established that under ideal conditions of no air resistance, the bomb follows the curve, common to all projectiles, of a parabola.

### Air Resistance Causes Trail

Consideration of the effect of air resistance leads us to the conclusion that the bomb will take a little longer to reach the ground and will not travel quite so far forward as it would under the ideal conditions. It will be easily seen that under the ideal conditions, if the aeroplane kept straight on after it had dropped the bomb, the bomb would remain always vertically underneath the machine, since it is travelling forward at the same pace as the machine. That this is very nearly the case may be proved by watching a bomb drop through a hole in the floor of a machine. It will be noticed, especially at big

heights, that the bomb does lag behind a little. The distance between the point on the ground vertically under the aeroplane and that where the bomb actually strikes is called the "trail" of the bomb. The distance is very roughly 4 per cent of the height from which the bomb was dropped. Thus in our case the "trail" would be about 240 ft. The air resistance, and in consequence also the trail, varies with the type of bomb, being smaller for bombs of a good streamline shape than for those whose shape is bad.

From this it may be seen that the trail of a bomb is a most important factor and must always be taken into account in designing a bomb sight. In the rough outline which follows, for simplicity's sake the trail has been neglected. From tables which have been calculated in England both from theoretical and practical considerations, it is merely a matter of calculation to apply the necessary corrections.

The bomb then travels along a parabola, the apex of which is at the point of release. The bomb sight has got to tell us when we are at the right point for release.

### Effect of Wind

At the beginning we assumed that there was no wind. This is, however, never the case in practice, and it must be borne in mind that the bomb follows not the air speed, but the ground speed of the machine. If  $A$  is the air speed of the machine,  $W$  the wind speed and  $G$  the ground speed of the machine for upwind bombing, we have  $G = A - W$ ; and for downwind  $G = A + W$ . We therefore see that for determining the point of release we must know (1) the height of the machine, (2) the ground speed. The height we know from the aneroid. The air speed of the machine we know from the air speed indicator, but the wind speed is generally not known. How then is the ground speed to be determined?

Three methods have been used from time to time:

(1) A direct observation by stop watch of the time taken to pass between two objects whose distance apart is known.

(2) Observation of the drift of the machine when flying at right angles to the wind.

(3) Determination of the velocity of the wind by observing the movements of Archie gunfire bursts or balloons.

Method (1) is laborious and, involving as it does the use of a stop watch, is not to be recommended.

Method (2) is fairly easy to apply at low heights, but at great heights presents considerable difficulties.

Method (3) is perhaps the ideal method, and, since it enables one to find the velocity of the wind above the clouds, is probably the method of the future.

Any of the methods may be checked by means of the use of a spotting bomb, the "sighting shot" of the rifle range.

### Three Scales to Operate

Up to the present time even the best bomb sight in use has had three scales to manipulate: one for height, one for air speed and one for wind speed. All these three only determine an angle, the angle subtended by the target at the point of release, which is the thing that we are after all the time.

It is probable that in the near fu-

ture the scales will be reduced in number to one, a scale of angles only. Not only will this enormously simplify the work of the pilot, but in addition it will render the application of corrections determined by the use of spotting bombs very much easier.

Having now determined the point at which to release the bomb, we have got to find out how to get to this point, and this is the most difficult part of bomb sighting.

The whole difficulty lies in determining in the air the direction of the true vertical.

It is comparatively easy to keep an aeroplane flying level fore and aft. The difficulty is to keep it level sideways. A pilot will often get one wing as much as 6 deg. down without noticing it and this, at the height of 15,000 ft., will put the apparent vertical over 500 yards to the side of the true vertical. The application of gyrostatic devices is not easy. The instruments are so delicate that they are easily put out of action in the air and also require much attention. In addition they are very expensive. It is probable that the use of a simple sight involving the use of a short period pendulum will prove to be the sight of the future.

The foregoing remarks have given a brief and extremely sketchy outline of the principles underlying a bomb sight. Much ingenuity has to be used in putting the principles into practice in designing a sight. The great features to aim at in bomb sight design is simplicity in design and ease of manipulation in the air. A pilot cannot make use of instruments which require him to go through complicated actions in the air. There is a tendency also from time to time to make clockwork sights; these are based on a fallacy, since the ease of running of the clockwork depends to a quite unknown extent on the temperature of the oil used for lubrication. This introduces such complications as to make the sights useless.

### The New French Tanks

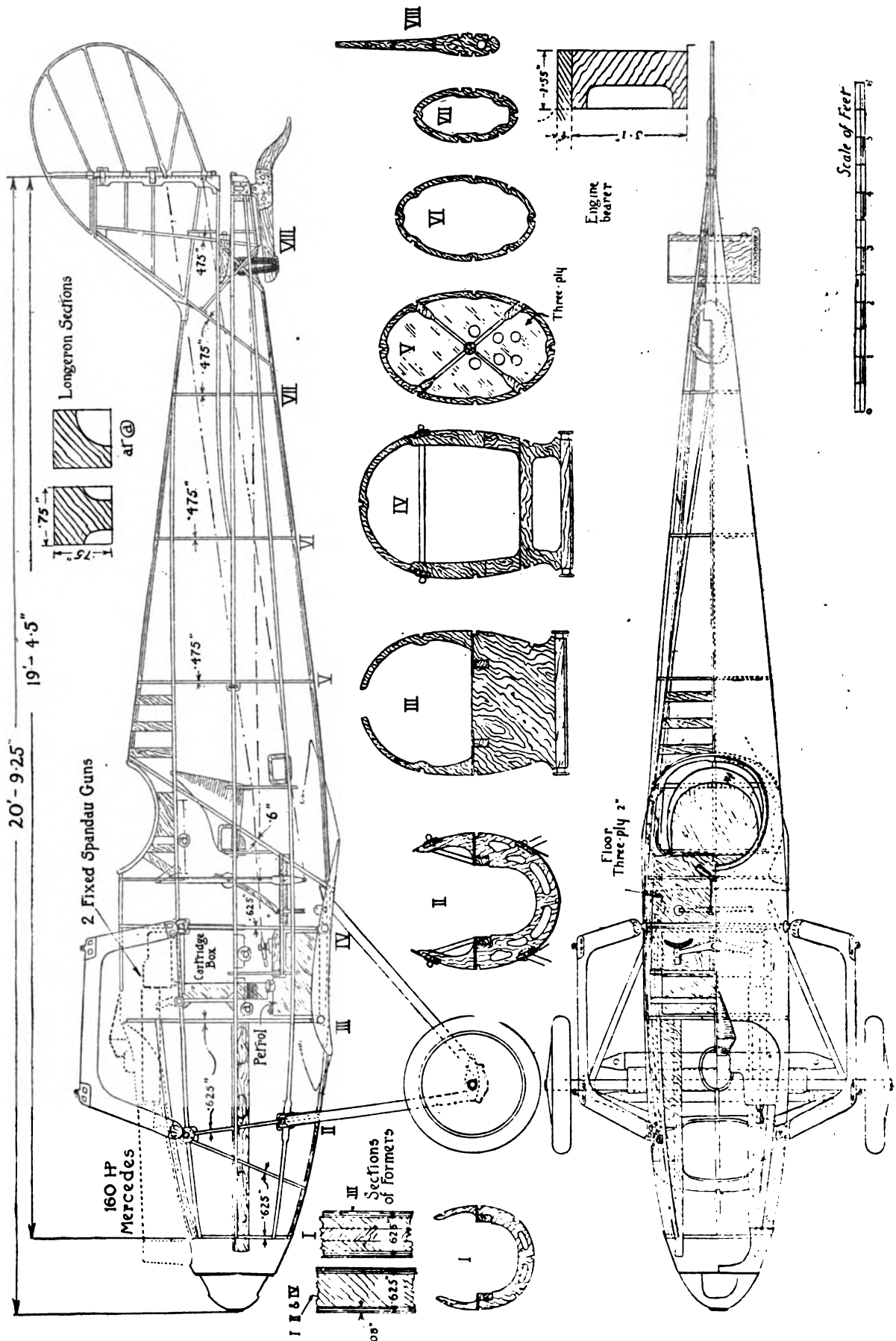
SOME details of the new French tanks have reached us by way of London. They are of small size and have been referred to as mosquito tanks. Their construction is very much along automobile lines. In front sits the driver, protected by armor plate all around except for very narrow slits to give him enough of a view to drive by. A gunner occupies a turret at the middle of the machine, and the armament consists either of a gun or a machine gun.

### An Argument for Protection Against Dust



**A**ND a demonstration of the need for air cleaners. The speed of the tractor has developed many new problems for the designer of farm machinery of which none is more important than the protection of wearing surfaces from dust and mud. The happy medium between these two almost never exists. The speed of the moving parts makes either a more dangerous agent of destruction.





Scale drawings of the Pfalz fuselage in plan and elevation

# Details of the Pfalz Single-Seater

Performance Records Obtained in England—Machine Is of the Plane-and-a-Half with Vee Struts—Body Construction of Plywood Formers and Covering

**I**N the June 6 issue of AUTOMOTIVE INDUSTRIES we published the specifications and some general information regarding the Pfalz single-seater scout. Recently a detailed description of the machine with numerous illustrations appeared in *Flight* of London, from which the following is culled. The description was obtained from a machine at the Enemy Aircraft View Rooms.

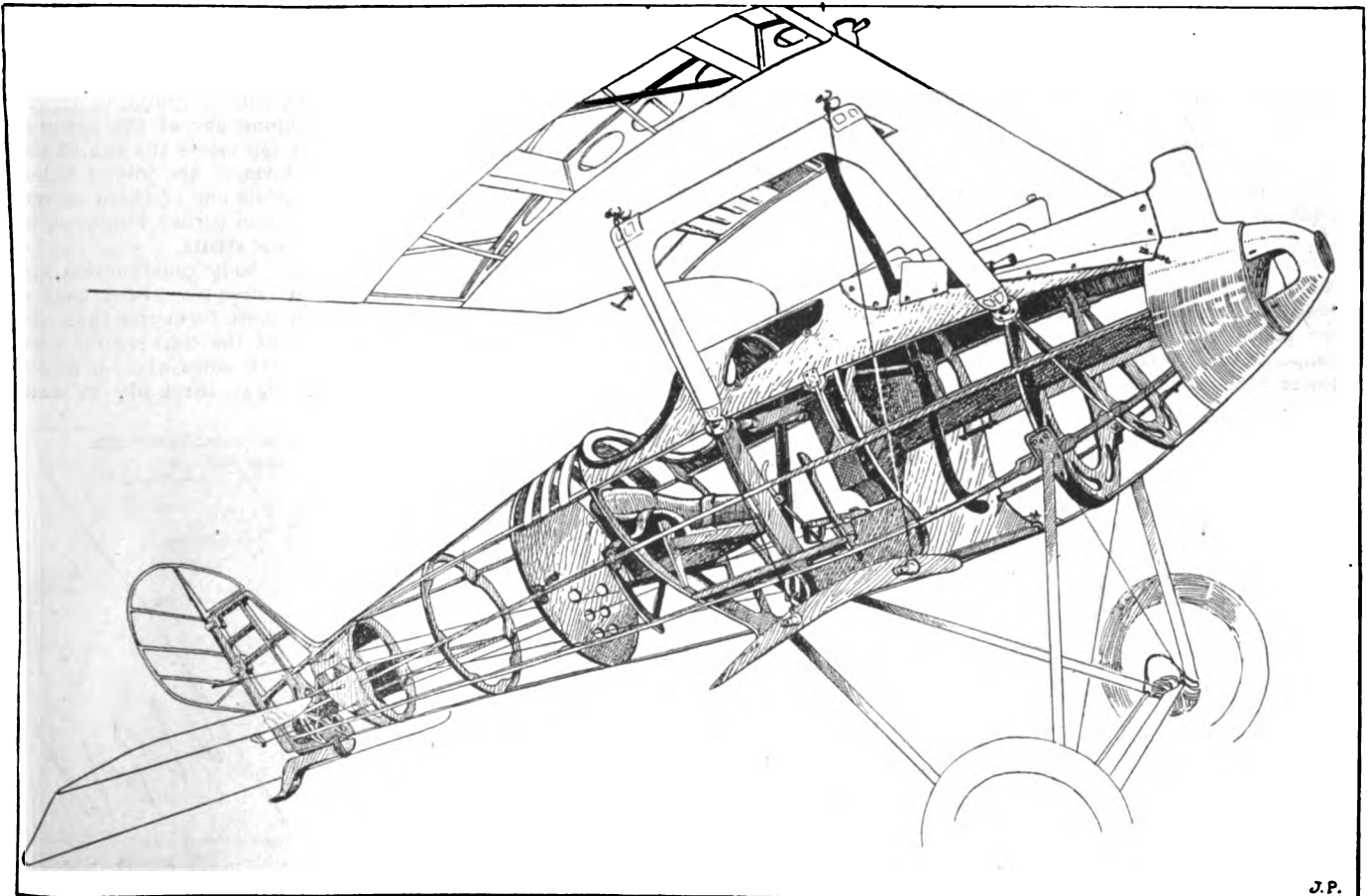
About a year ago German aircraft firms began to pay more attention to cutting down head resistance of their machines. Thus the Albatross firm turned out some single-seater fighters, incorporating the Nieuport type wing bracing and the semi-monocoque body of streamline shape. It was on machines of this type that the pilots of the "Richthofen Circus" did much of their fighting. Then there was the Roland fighter, in which attempts were also made at streamlining the body, but which went rather farther and made the body so deep as to serve directly as a support for the top plane. Finally we have the Pfalz, in which streamlining has been carried a little farther still, inasmuch as the attachment of the lower wings takes the form of wing roots formed integrally with the body and the object of which is presumably to avoid sharp corners at the juncture of wings and body. The wing arrangement of the Pfalz also differs slightly from that of the Albatross in that the inter-plane struts do not come to a point on a single lower spar, but are separated at their lower ends by a short horizontal piece, evidently so as to enable the struts to take care of the twisting moment due to the travel of the c.p. better than can be done with a point attachment.

An examination of the Pfalz biplane gives the impression of very low resistance indeed, and with an engine of 160 hp. one naturally expects the machine to have an excellent speed. Tests carried out in England do not, however, confirm this first impression, and the following particulars of performance can only be regarded as disappointing in view of the promising appearance of the Pfalz.

## Performance Criticized

The rather unsatisfactory performance may be explained by figures given in the table. The body appears to be of good streamline form, but against this must be placed the fact that the maximum cross sectional area is comparatively large, owing to the deep body reaching nearly to the top plane. As regards the wing bracing, this is simple enough as far as concerns the number of wires and struts, but the cables are not faired, and as they are of rather large diameter, their resistance at maximum speed may reasonably be assumed to be fairly high. If, however, the detrimental resistance is considerable, the wing resistance is probably no less so, the wing section being of the deeply cambered type so favored by German designers, and which has, generally speaking, a somewhat high drag, although its lift is good.

Constructionally the Pfalz single-seater is even more interesting, showing, as it does, considerable departures in detail design from other German makes of the same class, on which its fundamental arrangement is evidently founded. This refers especially to the Albatross fighter single-seater, which is



J.P.

Perspective view of the Pfalz fuselage stripped of its plywood shell

characterized by the same main features, such as large top plane and small bottom plane, one pair of interplane Vee struts on each side, plywood, streamline body, etc. Apart from minor differences in shape, the Pfalz designer has chiefly struck out along original lines in the construction of the body. Whereas in the Albatross one finds the same oval formers connected by longitudinal rails, the manner of applying the three-ply covering is totally different in the two machines. In the Albatross the plywood is put on in small pieces covering only a bay or so; the covering of the Pfalz is in the form of long strips spirally laid on, the strips of the two layers forming an angle with one another.

According to the official report on the tests the following data were established:

**Pfalz Scout, No. G. 141**

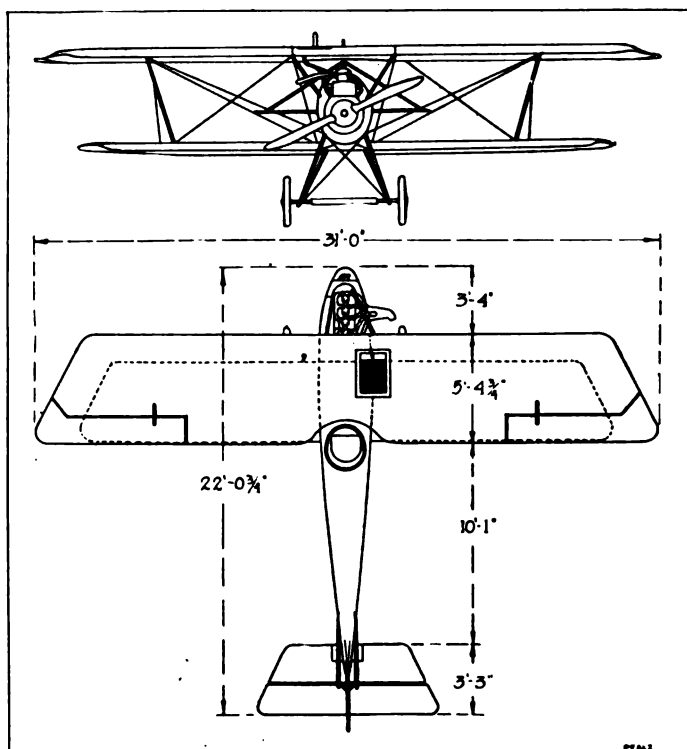
Engine	160 hp. Mercedes.
Number of crew	One.
Military duty	Fighter.
Propeller	Axial, Berlin.
Total military load	281 lb.
Climb to 10,000 ft.	In 17 min. 30 sec.
Speed at 10,000 ft.	102½ m.p.h.; rev., 1,400 r.p.m.
Rate of climb	360 ft./min.; rev., 1,310 r.p.m.
Climb to 15,000 ft.	In 41 min. 20 sec.
Speed at 15,000 ft.	91½ m.p.h.; rev., 1,325 r.p.m.
Rate of climb	100 ft./min.; rev., 1,280 r.p.m.
Estimated absolute ceiling	17,000 ft.
Greatest height reached	15,000 ft. in 41 min. 20 sec.

The total military load is made up as follows:

Pilot	Lb.
Two Spandau guns	180
Dead weight	70
	31
<b>Total</b>	<b>281</b>
Weight per sq. ft.	8.56
Weight per hp.	12.84
Total weight of machine, fully loaded	2,056
Weight of machine, bare, with water	1,580
Military load, less crew	101
Crew, as above	180
Fuel, 21½ imp. gal.	155
Oil, 4 imp. gal.	40
<b>Total</b>	<b>2,056</b>

There are in all eight longerons at the top, one at the bottom, one half-way up on each side and four at what would be the corners in a rectangular section body. These longerons run the whole length of the body, with the exception of the top one, which is terminated just to the rear of the engine, and are attached to the formers as shown in the sketch. The longerons are stop-chamfered so as to leave them solid at the formers, into which they are sunk and secured by a wood screw. The formers themselves are built up of smaller pieces of spruce, lap-jointed and covered each side with a facing of three-ply wood.

Reference has already been made to the fact that wing roots are formed integrally with the body. These roots account for the peculiar shape of formers III and IV. Judging by these formers the cross-sectional area is unduly increased at this point, although this may partly be made up for by the shape of the plywood covering, which merges the lines of the lower plane into the curves of the body. It is, perhaps,

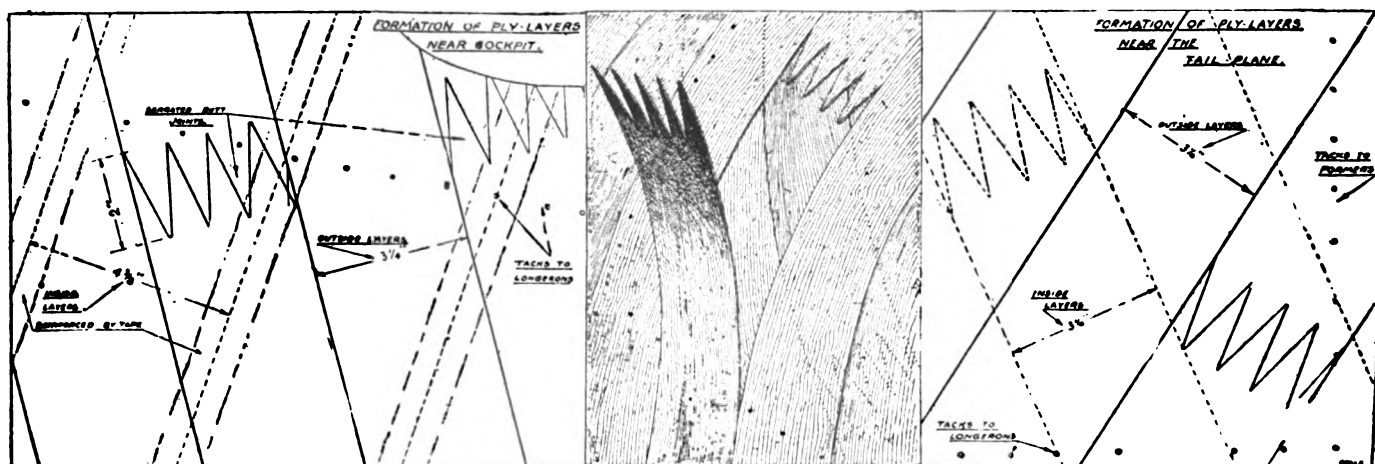


Plan and front elevation of the Pfalz

open to doubt whether or not this elaborate arrangement is worth while. Constructionally it must necessarily entail considerable extra work, and aerodynamically it does not look as neat and efficient as the Albatross way of doing the same thing by frankly letting the bottom plane abut directly on the curved sides of the body.

From the perspective view of the Pfalz body, it will be noticed that some of the formers are sloped in relation to the others. Thus, for instance the former in the neighborhood of the pilot's seat slopes back so as to bring it approximately into line with the rear chassis struts, while rigidity is lent to the front portion of the body by sloping one of the formers carrying the engine bearers until its top meets the top of the next former. In this point also the formers are joined to the front struts carrying the top plane, while one of them serves, at the point of attachment of the bottom corner longeron, to transmit the load from the front chassis struts.

One of the difficulties of monocoque body construction has always been that you cannot bend three-ply sheet over a double curvature. That is to say, in sheet form the three-ply will bend willingly to the curvature of the converging sides of a flat-sided body; but as soon as the sides are no longer flat but have a curvature however slight, three-ply in sheet



Illustrating the method of covering the fuselage with plywood



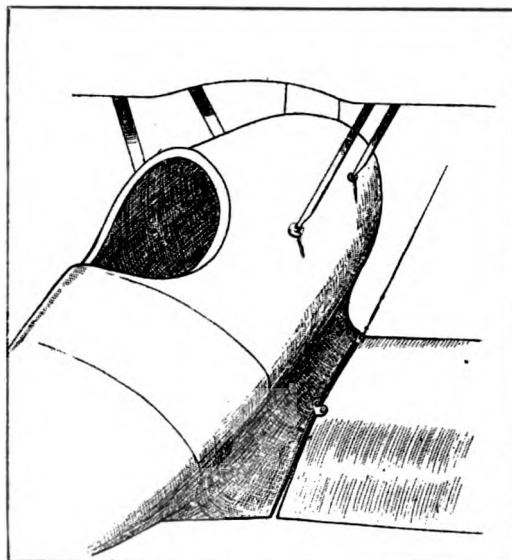
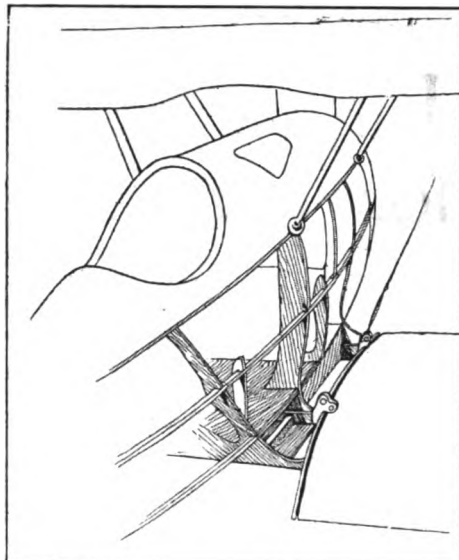
form cannot be employed. In the Albatross this difficulty is overcome by using small sheets, covering only one bay, and forming, in reality, although it is not noticeable, a series of straight bays. In the Pfalz a different method has been employed. The body covering consists of two layers of three-ply, each less than 1 mm. thick. The plywood is evidently manufactured in sheets, and before applying to the body is cut up into parallel strips of about 3 to 4 in., the width apparently varying considerably throughout the body. The first layer of three-ply is then put on by bending it diagonally around the body, attaching it by tacking to the various longerons, en route, and cutting each narrow strip at the top and bottom longerons, which form the terminals, so to speak, of the three-ply covering, which is thus applied in two halves. The second layer of strips is then laid on top of the first, but at a different angle, to which it is secured by gluing, and finally tacked to the longerons. The inside layer is reinforced, in the front portion of the body, by gluing tapes over the joint between adjoining strips of plywood. This and other details are shown in one of the illustrations. In order to spread a joint in the plywood over as large an area as possible the joint is made, as shown, in a sort of saw tooth or serrated butt joint style. This, in brief, is the fundamental construction of the Pfalz body, and differs considerably from other makes. The weight can scarcely be any greater than the girder type of body, but as regards strength we have no information. As a compromise between sheet three-ply covering and true monocoque construction the Pfalz method would appear to have certain advantages.

(To be continued)

### British Dope Investigation

IT hasn't been all smooth sailing in carrying through the aircraft programs of foreign countries, as is well shown by a recent report of a Select Committee on National Expenditure dealing with the dope situation.

In the early days of the war cellulose acetate was not manufactured in England. The principal sources of supply, apart from Germany, appear to have been the Usines du Rhone, at Lyons, and the Cellonite Company, Basle. Private manufacturers obtained it from either of these two sources,



The wing roots or stubs of the Pfalz

but the War Office do not appear to have obtained it direct from the Usines du Rhone until late in 1915, after which date, however, the product from those works was regarded as superior in quality to that of the Cellonite Company, Basle.

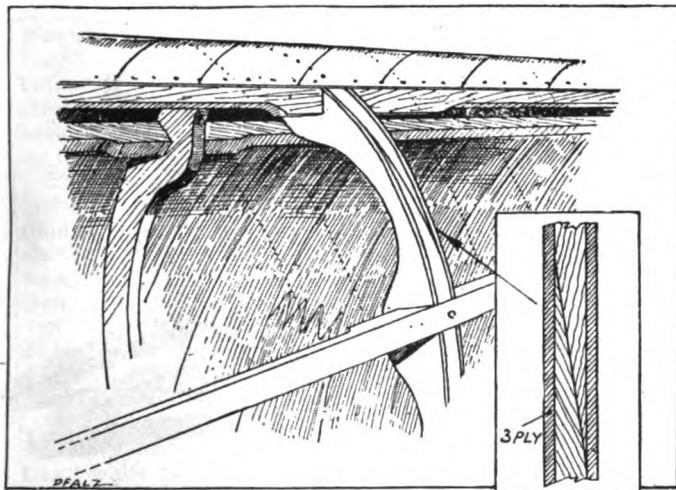
Inquiries were made by the War Office early in 1915 regarding the possibility of manufacturing cellulose acetate in England. After preliminary negotiations with several companies tender forms were issued to three firms in July, 1915, for 100 tons of cellulose acetate to be manufactured in England, the manufacturers to state on their tender form to what extent the ingredients would themselves be manufactured there. Of the three companies invited, the Cellonite Company of Basle alone submitted a tender.

The Cellonite Company of Basle submitted a tender in which they undertook to manufacture in England within six months, but reserved the right to supply up to 50 per cent of the total quantity required from their works in Switzerland.

The Cellonite Company's tender of July, 1915, was accepted by wire on the 19th of July, and negotiations immediately followed for the institution of the required manufacture in England. The representative of the Swiss company, Dr. Camille Dreyfus, at once raised the question of the effect upon the undertaking of possible excess profits taxation, and asked for some assurance that it would not be applied to this new venture. This question was referred by the Contracts Branch, through the Director of Military Aeronautics, to the Finance Branch, and met with an absolute refusal, which was communicated to Dr. Dreyfus. It was finally agreed, however, that the Government would refund the amount expended on plant by the company, up to a maximum equivalent to the excess profits duty actually charged in respect of each year's working during the war.

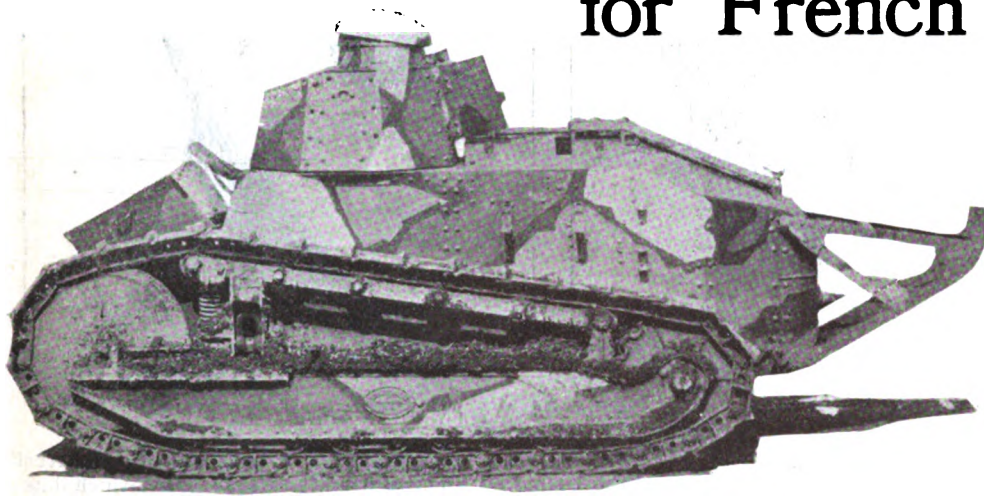
It appears from the report that as a result of this agreement the company went ahead spending money on plant lavishly, but its product left much to be desired both as to quantity and quality. It enjoyed a virtual monopoly and hence was in position to fix its own price. The agreement with regard to the refund of capital expenditure was cancelled in June last, and now it is proposed by the committee that the Government should take over the entire works of the concern, the British Cellulose Company, that a technical committee be appointed to advise upon the necessary steps for the completion of the factory and its efficient management, and that the Government consider immediately the advisability of securing an alternative source of supply of cellulose acetate.

The report concludes: "A private monopoly in a key industry cannot be instituted at Government expense or with Government assistance without arousing criticism and, if only for this reason, the Supply Branch would have been better advised to have secured the full authorization of the Finance Department at every step in their negotiations."



Illustrating shape of body former and method of securing longeron to it

# Renault Builds Light, Speedy Tanks for French Army



*French 2-man tank, which has a speed of 12 m.p.h. and can turn in its own length. The tank is built in the Renault automobile factory and has a 4-cylinder, 40-hp. engine*

**R**ECENT attacks by the French and British have been preceded by great numbers of two-man tanks. These light tanks have been frequently mentioned in dispatches from the front of late and have proved to be a great success in preparing the way for infantry advances. The tanks shown in the accompanying illustrations are those used by the French and have been an important factor in the late offensive of the allied armies. The tank is the production of the Renault automobile factory, having been designed largely in that institution and incorporating a number of features which are original with this concern. The engine is a Renault 40-hp., four-cylinder design, and the track-laying drive is also a distinctive Renault design.

The driver is located at the front end of the machine and the observer, or gunner, is seated in the center or stands upright within the turret. The driver and the gunner both look through slits cut in the armor plate of which the body work is composed, and the turret is mounted on ball bearings, enabling the machine gun carried within it to be pointed in any direction around the entire circle.

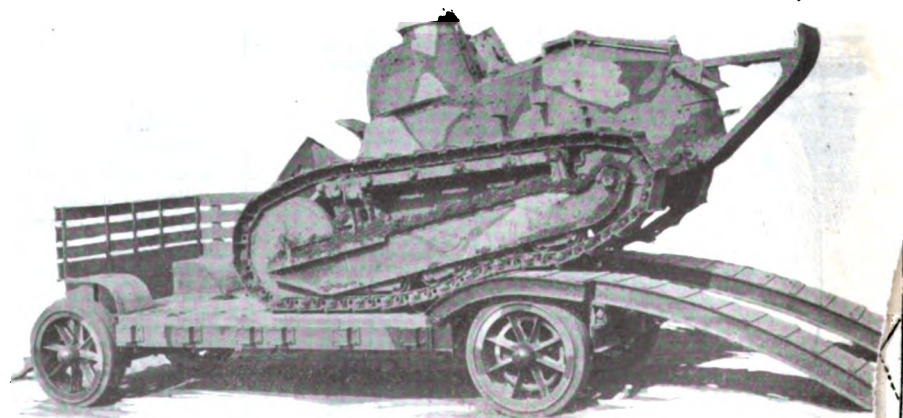
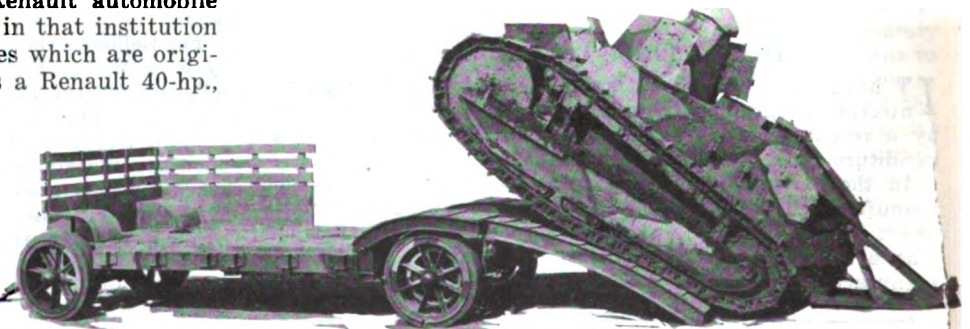
The engine is in the rear of the tank, and propels the vehicle through a clutch and a transmission gearing; then to a transverse shaft through two steering clutches, finally to an outbound reduction gearing, and then to the sprocket which drives the track. The track differs materially from that used on the former tanks and is also considerably different from that used on the caterpillar tractors of this country. The track is driven by a sprocket gear at the rear end and passes over a blank gear, or idler, at the forward end. The adjustment of

the track is maintained by the position of this idler, which governs the center distance from the center of the sprocket to the center of the idler. The tension is also maintained by a roller track frame which is forced upward against the inside of the upper links by means of a coil spring.

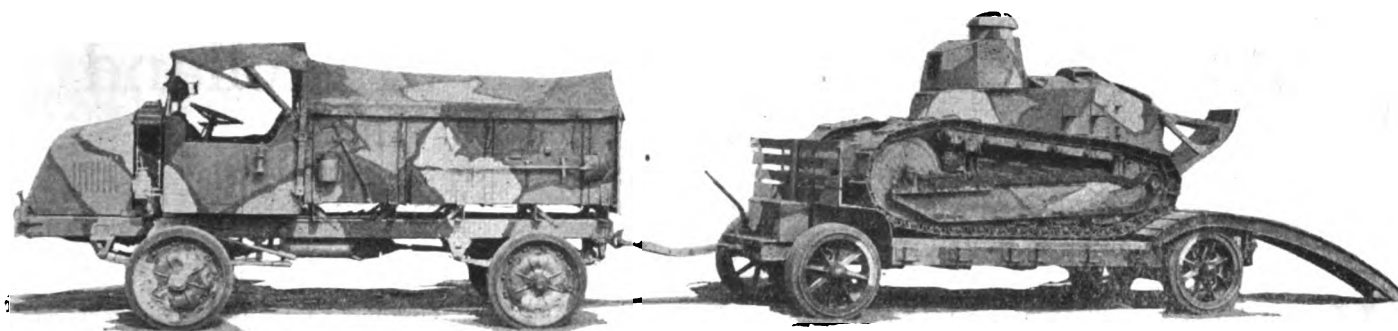
The body of the tank is hung between two track frames. The track frames are inverted U-beams containing the track drive mechanism. The body is suspended at the rear by means of the drive axle, which passes transversely through it and holds

the sprockets on either side, and is also supported by large coil springs on the brackets which connect the body to the track frame at the forward end.

This tank is capable of a forward speed of about 12 m.p.h., and has four forward speeds and one reverse. It can be whirled about in its own length by holding one of the tracks stationary, while the other propels it



*The engine is at the rear, the track differs materially from the usual type and the turret is mounted on ball bearings, enabling the machine gun to be pointed in any direction*



*In cases of emergency the tank is loaded on a trailer and hauled to the threatened point. Its weight of 6 tons enables this to be done with ease. The armor plate is sufficiently thick to withstand machine gun or rifle fire*

around the stationary track as it pivots. The release and engagement of the tracks is controlled by means of steering clutches which are interposed between the transmission and the spur gear reduction which drives the sprockets.

The tanks are fitted with a tail piece on the rear end which permits them to go up inclines almost vertical without tilting over backward. They can negotiate very rough ground and are comparatively light for this sort of service. The weight of the Renault tank is about

6 tons. It is built throughout of armor plate sufficiently heavy to withstand machine gun or ordinary rifle fire. The ability of these tanks to wipe out machine gun nests and in some cases even capture light field artillery pieces has been greatly responsible for the success of recent French attacks. The Whippet type of tank, which has been mentioned frequently in dispatches of late and is even credited with having chased a brigadier-general from his headquarters, is no doubt an English type corresponding very closely to this Renault design.

## Women Industrial Workers in France

THE French have not, as the British have, established training courses and factories in which women are prepared to take up skilled work. At the outset, says Mary Conyngton in a report printed in the *Monthly Labor Review* of the U. S. Department of Labor, they were trained, as far as any training was needed for what they did, by the men with whom they worked. Later on, when it was desired to put women to work demanding a little more skill, the same method was adopted as in England at the beginning of the war—a group of women were put on machine work, a man being told off to supervise, to keep the machines in order, to adjust and repair tools, and generally to do what the women were not capable of doing themselves. In other cases a woman would be set to work as a helper to a man; sometimes she would be assigned to him as a kind of apprentice, being expected to pick up his work as rapidly as possible.

In March, 1917, the minister of armaments addressed a circular to the directors of artillery establishments, pointing out the need of training more workers for skilled operations and giving details of a plan for offering this training. Women, especially those who were young and had shown aptitude for the work, were to be included in this training. Even before this, occasional references had appeared in different ministerial circulars to women employed in work demanding both skill and training. Presumably these have been trained by individual employers for work in their own shops.

The necessity for intense production has led to the installation of automatic machinery and subdivision of labor, two conditions which are usually favorable to a good production on the part of women. Where strength is a requisite the women are said to be less effective than men, but where dexterity and swiftness count, their output is the better.

A former factory inspector of France, writing of the condition of French working women, says that the system of reductions from their piece rates on account of improved services or masculine help tends to increase their output.

At the lathes for 155-shells the women have been provided with pneumatic tackle, and for this reason get a "quarter" while men have a higher wage because they handle the shells by hand. Yet the women succeeded in turning more shells in a day than the men. The women thus obliged to produce 125 pieces while the workmen produce only 100 force themselves continually. War industry has used women to

speed up production. They have frequently set a new pace in factories where it was insufficient.

Officially France has not, up to a recent period, displayed much interest in the question of how the women engaged in these new occupations may fare at the close of the war. There has been some discussion of the matter by various writers on economic and social problems, in which some anxiety appears as to the effect of their competition in lowering wages, but the main concern has been as to the effect on the race of their economic emancipation. When the great increase in the employment of women began some writers argued strongly against the admission of women to the new and better paid occupations, stating frankly that if a woman can earn living wages there is little chance that she will marry, or, marrying, consent to bear children. The government, however, does not seem to share this fear, for it has lately called on the Committee on Women's Work to investigate and report on the best way of utilizing industrially the women who will be set free as the demand for munitions declines.

The committee, after taking counsel with trade-unionists, women leaders, social workers, and large employers, decided that the first step was to make a survey of the women at present employed, and of the demand likely to exist for their services at the close of the war. They have accordingly sent out to employers a questionnaire, asking each to return full details as to the number of women at present employed, with their industrial history, and also to give an outline of what plans the employer has for his own business after the war, stating how many women he will then wish to employ. The committee also asked for the opinions of those questioned as to the best steps to be taken in order that the "valuable collaboration" which women have given to munition work may be continued to the advantage of peace industries. The results of this investigation are not yet at hand.

ACCORDING to *L'Industrie Electrique*, great difficulty is being experienced in France in getting sufficient platinum for electrical work, and the Société des Experts Chimistes de France has suggested a tax on all luxuries using this metal. Various alloy substitutes are proposed, including gold palladium, which costs about half the price of platinum, and certain nickel chromium and iron silicon alloys.



# The Automobile Outlook in Holland

A Market Not Neglected Previous to the War—Native Industry Practically Non-Existent—Many New Fortunes Created May Lead to Big Demand When Peace Returns

By a Correspondent

**H**OLLAND is a small country with fairly good roads which, as a rule, are very narrow. The country is quite flat and in the greater part of the country the roads are paved with small brick, but in the southeastern part there are a few roads made of concrete.

Previous to the war, every kind of car, whether of English, French, Belgian, Italian, German or Austrian make, was represented in Holland, and practically all American cars too. Even American firms with no reputation in the United States were among those doing business in Holland. As a matter of fact, I do not know a single country in the world where more different makes of cars were represented than in Holland.

In my estimation the annual sales in Holland did not exceed 1,200 cars, and with the exception of a few makes which did a fair business, most of the makers sold from 1 to 6 cars a year in this country; competition, therefore, was very keen, as for one buyer there were at least 20 agents offering 20 makes.

The total number of motor cars in use in Holland is very difficult to get hold of, as the officials to whom I have addressed an inquiry several times do not want to give that information to me (a foreigner). They are evidently afraid that I would take advantage of the information.

I estimate the total number of cars in use in the Netherlands at between 6,000 and 8,000.

Up to the beginning of the war, only the very rich people made use of cars. Large numbers of Dutch people who could afford to buy a motor car did not think that their means allowed them to keep one.

## War Put Stop to Imports

Since the outbreak of the war practically all importation of cars has ceased, although during the early part of the war the Germans did send, now and then, a few German cars to Holland and more recently they shipped a certain number of Belgian, French and even English cars which they had taken in Belgium or in the north of France and which they had put into proper condition in Germany. The Belgian, French and English governments having strongly protested to the Dutch authorities against these importations of stolen cars, such importations have practically ceased.

In the first year of the war, Holland did import a fair number of American cars, including Overlands, Cadillacs, Hupmobiles, Fords, Maxwells, Hudsons, Oldsmobiles and a few Packards and cars of other makes. Shipping difficulties have stopped these importations.

People in Holland who before the war would never have considered owning an American car (considered as a cheap car) have been compelled by the force of circumstances to buy such cars, and no doubt the American car is considered better now than before the war.

The automobile industry in Holland is only in its infancy. There really is only one works in the country manufacturing cars, and that only on a very small scale, namely, the N. V. Nederlandsche Automobielen Vliegtuigfabriek Trompenburg, Amsteldijk, Amsterdam. This company was established several years ago by Spyker

Bros., an old coachbuilding firm. When the motor car industry started they began to build bodies for chassis made by other manufacturers, and later they decided to build a factory for the making of chassis themselves. They started in a small way and at one time were fairly successful, their products being sold throughout Holland and the Dutch East Indies, besides having a small sale in England.

One of the Spyker brothers lost his life a couple of years before the war when the steamer *Berlin*, belonging to the Great Eastern Railway Line, foundered off the mouth of the Hook of Holland Canal. The other brother not being in position to continue the business alone, this was turned into a stock company, and at present Henri Wynmaelen, the old flyer known from the "European Circuit," is managing director of the concern.

## Building Aeroplanes Now

The Trompenburg company is now building aeroplanes for the Dutch government and is also trying to build cars; but under the present conditions this is quite impossible, no material being available in Holland and no importation of same being possible.

The capacity of the Trompenburg works, however, is very limited, and I do not think they can make more than a couple of hundred cars a year if they manufacture the units themselves. I have been told, however, that after the war they expect to build cars from units made for them in the United States.

Besides the Trompenburg factory, there is a small place called "Eysink" in Amersfoort which pretends to be a factory of motor cars but which is no more than a big repairshop. There is not even a first class repairshop in Holland capable of making new parts for modern machines if necessary.

Dutch people, although rich, are very conservative and do not spend their money so readily as people in other countries. They stick to their money and therefore Holland has certainly not had, up to the present moment, the importance it could have had as an automobile market.

It is possible that after the war, when cars can again be produced at low cost, and freight and insurance will be normal again, so that the American car can be sold in Holland at as favorable a price as in the United States, quite a new clientele for motor cars will be found in this country. This hope seems the more justified because a great many people who had no money when the war broke out have become very prosperous and want to spend their money when circumstances allow it.

## Encouraging the Use of Coal Gas

**W**E understand that the offer by the Automobile Association of England of \$5,000 for the best method of using coal gas on motor vehicles has aroused considerable interest. A number of inventions have been definitely entered for competition, and, in addition, many valuable suggestions motorists and others interested have been received by the Association. Incidentally, the competition has stimulated research and investigation concerning the possibility of using other fuels besides coal gas, gasoline and gasoline substitutes.

# Welfare Work in a Rubber Plant

## What Experience Has Demonstrated Regarding the Requirements of Rest Rooms and the Cost of Maintaining Them—A Hotel for Women Workers

A VERY complete system of rest rooms for girls has been maintained by the B. F. Goodrich Company at its plant in Akron, Ohio, for the past four years. A photograph of one of these rooms is reproduced herewith. It is quite evident that the Goodrich company has gone into this matter with characteristic thoroughness. It is also apparent, from the real luxury and good taste displayed in the furnishing of the room illustrated, that the company believes, when it comes to welfare work, that half measures do not pay.

Manufacturers will be interested in the cost of operating such rest rooms, and we are, therefore, giving the figures for the room shown in the photograph as furnished us by the Goodrich company. The following table of costs gives an idea of the maintenance expense on an annual basis:

Dimensions of room .....	20 x 80 ft.
Rental at 43 cents per sq. ft. ....	\$688
Light .....	25
Heat .....	75
Furniture depreciation (original cost \$900) ....	225
Magazines .....	30
Music and victrola records .....	20
Total annual cost .....	\$1,063

Experience justifies an annual depreciation of 25 per cent on the equipment, and it is considered a mistake to economize too stringently in purchasing the requisite material.

According to the Goodrich company, the chief factors to be considered in the construction and maintenance of a girl's rest room are: Good ventilation, light, spaciousness and quietness. A minimum of 12 sq. ft. per person is considered essential.

While there is but one window in the room illustrated, additional light is secured through skylights and, furthermore, the partitions on two sides of the room do not extend to the ceiling. It is generally considered best, wherever possible, to have rest rooms on the outside of the building so that the girls may look out of the windows and rest their eyes by using them for distant observation. Eyestrain from constant close work is a common cause of nervous disorders.

The room illustrated will serve for approximately 300 girls per day. There are, of course in addition, other rooms where cots are provided to permit complete relaxation for those who require it.

The responsibility of supervision over the rest room in the case of the Goodrich company is delegated to certain com-



*From this view of one of the rest rooms maintained at the plant of the B. F. Goodrich Co. it is apparent that the company believes that welfare work well done pays well*

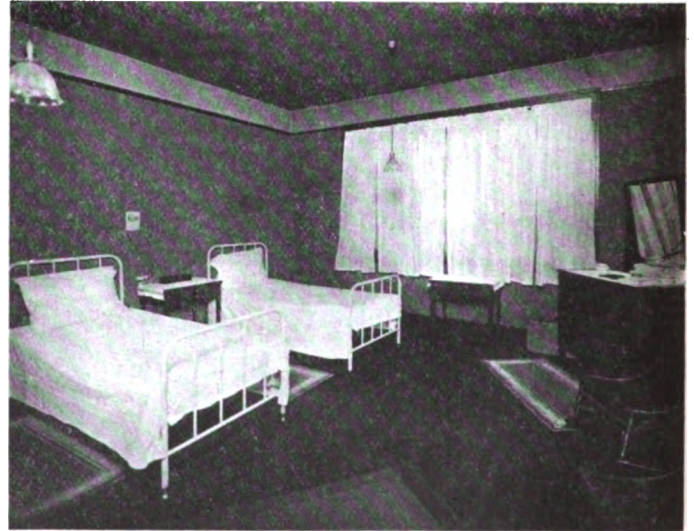




*The Goodrich Co. started its hotel for women employees when the problem of caring for workers who came to the plant from other centers became acute*



*One of the several living rooms each of which is equipped with piano. Visitors are entertained in these rooms*



*One of the double rooms in the Goodrich hotel for women. The charge for a room like this is \$1.50 per week per girl*

petent young women employees who arrange their lunch hours so that they may spend regular lunch time in a supervisory capacity in the rest room. No definite schedule of regulations has been drawn up aside from the general stipulation that in order to retire to the rest room at other than the regular lunch period, it is necessary for a girl to secure the permission of a designated forelady in her department.

The rest rooms in the Goodrich plant are located in the various factory buildings at convenient points.

A group of buildings formerly occupied by a church organization was taken over by the company and converted into something approaching a hotel. One of the buildings was used as a dining room and gymnasium and the other buildings were fitted up as sleeping rooms giving a total of 80 rooms which will accommodate 165 girls.

Girls working at the Goodrich plant may live at this hotel and are charged \$1.50 to \$1.75 each for double rooms and

\$2.25 per week for the single rooms. They are allowed 16 meals per week for \$4.50, these meals including breakfast and evening dinner on the first five days of the week and three meals each on Saturdays and Sundays. The total cost for room and board is, therefore, between \$6 and \$6.75 for each girl and this is said to be much cheaper than accommodations could be obtained anywhere near the plant.

The double rooms, one of which is shown in a photograph herewith, are fitted with twin beds, a dresser, wardrobe, chiffonier and several chairs. A few larger rooms accommodate three girls, but a much greater number are single rooms which are fitted out in a similar manner.

On each floor are ample bath and toilet facilities. In the basement is a completely appointed laundry where the girls may have the use of tubs and electric irons.

The dining room is run on the cafeteria plan and a special point is made to serve only the very best of simple foods.



# Prospects for Tractor Sales in Australia

**I**N the course of time, Australia will prove one of the most attractive fields for the sale of American tractors, in the opinion of Juan Homs, a special agent of the Department of Commerce, who is the author of Bulletin No. 166 of that Department, on Agricultural Implements and Machinery in Australia and New Zealand.

The introduction of farm tractors in Australia has been accompanied by the same vicissitudes that marked the early sale of these machines in the United States and elsewhere. Several years ago, when tractors began to receive marked attention in this country, they were imported into Australia in some numbers. It was found, however, that the purchasers were, as a rule, not prepared or equipped to make a success of their operation. More than to any fault of the machines themselves, their failure must be attributed to the inadequate manner in which they were sold and put in the hands of the purchasers. This was, at least in part, due to the lack of provision made by manufacturers and importers for properly informing the owners with regard to the handling of the machines, and to the inadequate consideration given to the fundamental principles that should have been observed in placing machinery of an unknown type in the hands of the farmers. Most of the machines imported into the Commonwealth during what may be termed the "first period" in the development of the tractor business remain to-day as significant evidence not so much of their unworthiness as of the hasty and ill-advised methods that governed the first attempts to introduce them. This is to be sincerely regretted, for the advent of the smaller, more serviceable, simpler, and better tractor of to-day, with the enormous possibilities that are apparently open to it in Australia, is not so favorably received there on account of the injudicious policy in the past. Notwithstanding the favorable conditions existing in Australia for the tractors made to-day, their popularization will prove relatively difficult. The bitter lesson, learned alike by manufacturers, importers, and users, will not have been in vain, however, if it teaches more progressive, fundamental, and business-like methods in the introduction and sale of tractors such as American factories are turning out at the present time.

## One of the Most Attractive Fields

Time will undoubtedly confirm the opinion of many observers that Australia is one of the most attractive fields for the sale of American tractors. Nearly every condition is present to warrant such expectations. The extensive character of wheat growing is in itself a factor of great importance in this connection, for it can be safely said that more than 80 per cent of the cultivated area of Australia will probably prove economically adapted for their use. The methods of wheat growing in vogue in that country will enable the growers to perform all the necessary operations with one tractor—to the point that horseless farms may become a reality there.

It would be not only useless, but prejudicial and unfair to more progressive manufacturers as well, for any tractor maker to endeavor to market his product in Australia while leaving the entire burden of introduction upon the shoulders of the importer. Such a policy would be extremely harmful, so far as that country is concerned, to the future of the American tractor industry, which has raised such high hopes and holds such bright promise. There is danger that the confidence of the manufacturers in their own machines, based on an intimate knowledge of their construction, may obscure their realization of the fact that their machines at first will be entirely unknown and will constitute a very perplexing problem to foreign importers and users. It is very important, therefore, that they should be warned of this (even though, in certain cases, such caution may not be necessary), and that they should be prepared to instruct their foreign agents carefully during the introductory period. In most cases this will be impracticable unless competent men from the factories

are sent wherever the machines are introduced, to remain for a reasonable length of time, with the object of instructing the agents concerning every phase of the tractors' work, and operation, so as to insure the complete satisfaction of the ultimate buyer. To neglect doing this will prove disastrous to all concerned, and will render futile the hope of building up a permanent, substantial, and growing demand.

In spite of the adverse conditions brought about by the war (chiefly those having to do with the high cost and scarcity of cargo space), a rather large number of small-sized American tractors have been sold in Australia during the past three years. It is felt, however, that the difficulties likely to be met as long as present conditions continue will render inadvisable any great exertions for the time being, but it is to be hoped that as soon as such conditions disappear American manufacturers will look upon the Australian market as one worthy of their very best thought and attention.

## Smaller Sizes Suit Demand Best

Tractors of from 12 to 20 drawbar horsepower will probably prove the most popular and the best adapted to Australian requirements so far as size is concerned, although the country also offers good scope for the sale of a considerable number of larger machines. Quality will generally be a more important consideration, with most buyers, than low price, although it is not unlikely that at first low-priced machines will have a good run. The ultimate results, however, will undoubtedly justify the greater efforts that may be necessary to introduce an improved type of farm machinery, which in the long run has always proved to be preferred by Australian agriculturists. On account of the sandy character of the soil in many of the wheat-growing districts of Australia, machines possessing any special advantages when working upon such soils will probably be in greater demand than those that may prove unsatisfactory under such conditions. There seems to be a tendency in Australia to agree that machines, with tracks will prove more acceptable than round-wheel tractors, but round-wheel machines will not be discriminated against if they prove capable of doing satisfactory work upon light sandy and wet soils. It will be well for American manufacturers to visualize the conditions under which tractors will work when operating machines of the stripper harvester type. Since only the wheat heads are taken off the crop the tractor will be called upon to travel over a heavy growth of straw, which will cause a good deal of slippage unless the wheels are fitted with suitable lugs. Machines that will successfully burn kerosene will also be preferred, although the difference between the cost of kerosene and gasoline in Australia is not so marked as in the United States.

## Best Class of Dealers

It is difficult at this stage to indicate what class of firms in Australia will be best equipped to handle the tractor trade. The firms interested in the sale of agricultural machinery are generally very progressive, and in most cases they may prove quite capable of handling farm tractors. On the other hand, the firms engaged in the sale of motor cars, a good many of which also sell gas engines and other classes of machinery, might prove to be at least as well equipped to take up this business. Owing to the long terms that it will probably be necessary to give in the sale of tractors, the manufacturer should be satisfied concerning the financial resources of any intending agent and importer before giving him the agency. There appears to be every reason to believe that a group of gas-engine and tractor manufacturers could get together and successfully establish branch houses for the sole object of selling this class of goods.

Three or four Australian manufacturers have taken up the construction of farm tractors, and one of them has already succeeded in turning them out in fairly large numbers. One of the few discouraging features in this connection is that a duty of 30 per cent is paid upon imported tractors.

# A Mechanism for Changing Gears Automatically

Relieves the Driver of the Drudgery of Gear Shifting and Prevents Injury to Gear Teeth by Shifting While Clutch Is Imperfectly Released—  
Gears Shifted and Clutch Operated by Engine Power

**A**N interesting design of automatic gearshift has been evolved by Louis Biava of 235 Central Avenue, West Hoboken, N. J. It is adapted for use on passenger cars, motor trucks and similar vehicles, and a model of the device has been applied by Mr. Biava to a Pierce-Arrow truck.

We have had in the past several types of semi-automatic gearshifts in which the operator works a selector and the shifting of gears is effected automatically when he throws out the clutch; also at least one type of automatic gearshift in which the control factor is the torque on the propeller shaft. Mr. Biava's device is similar to the latter in that it is completely automatic, but in its case the controlling factor is the engine speed.

The power required to shift the gears is derived from the engine and is transmitted through a screw shaft *A* which is driven from the engine camshaft and has right and left-hand square screw threads cut upon it at opposite ends, each thread occupying one-half of the effective length of the screw. Upon each end of the screw shaft there is a correspondingly threaded sleeve *B* and the two sleeves are mechanically connected together by a differential gear *C*, comprising bevel gears cut on the adjacent faces of the two threaded sleeves *B*, a ring or spider riding on the outside of the threaded shaft and a set of bevel pinions on same, meshing with the two bevel gears.

## Threaded Shaft Shifts Gears

Ordinarily as the threaded shaft revolves—that is, as long as the engine is running—and there is nothing to hold the sleeves upon it from revolving, these latter turn idly with the shaft. But when one of the sleeves is held from rotating, it is naturally moved along the shaft by the screw threads. This compels the other sleeve, which is oppositely threaded, to turn at twice the speed of the shaft in order that it may move along the shaft at the same speed, and the differential connection between the two shafts permits it to do this. A shifting yoke *E* spans the screw shaft at each end of the sleeves. It acts through the intermediary of two coiled springs *FF* on a sliding bar *G* to which the gear shifter forks *HH* are connected.

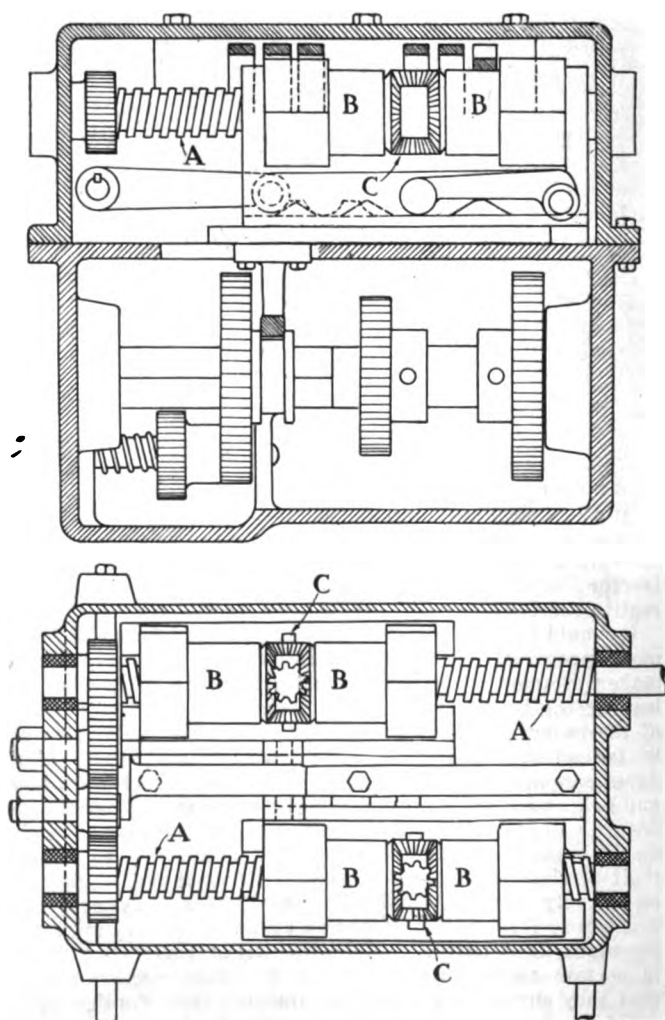
Holding one of the threaded sleeves from rotation moves the sleeves and the sliding gear set connected thereto in one direction, and holding the other sleeve of the set moves the gearset in the opposite direction. As in a three speed and reverse gear, there are always two sliding gearsets, two threaded shafts and two sets of sleeves therefor are required.

A description of the means employed for holding one or the other of the threaded sleeves from rotation is next in order.

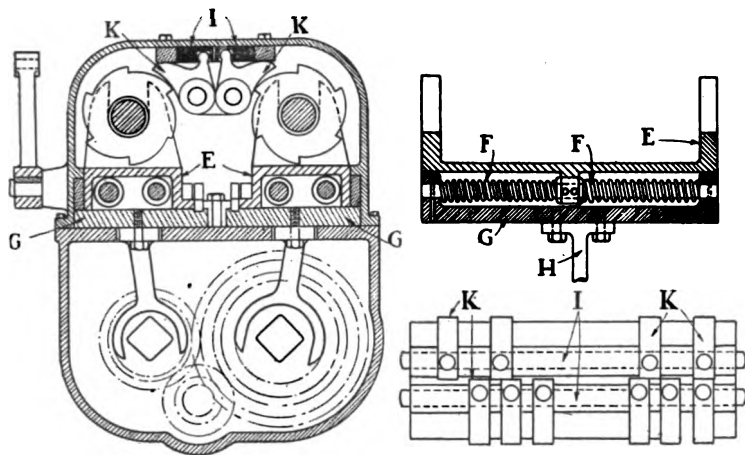
The element which furnishes the effort required to hold

one of the sleeves from rotating is a centrifugal governor connected to the engine. This governor, shown in one of the illustrations, acts on a cam rod *I*, that is, a rod or bar having a cam groove cut in its surface. In this cam groove is lodged the ball-shaped end of one arm of a bell crank *K*, the other arm of which forms a pawl adapter to engage with ratchet teeth on the threaded sleeve *B*. In certain positions of the cam rod *I*, the pawl is free of the ratchet wheel, while in other positions of the rod it is engaged with the ratchet.

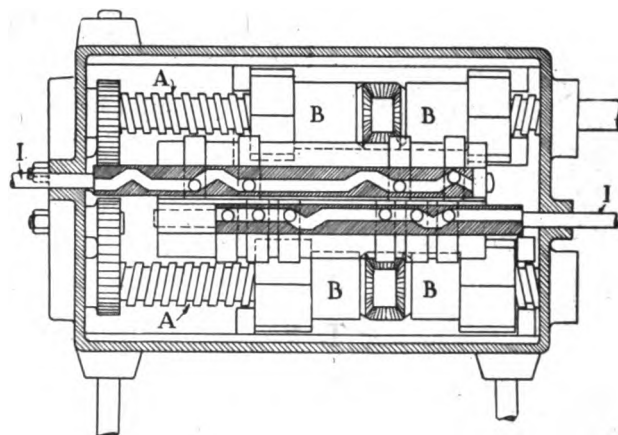
The clutch is automatically released by the gear shifting mechanism, and one advantage of the automatic shift over hand-shifting is that with the former it is absolutely impossible for the clutch to be engaged when the gears are being enmeshed, which sometimes occurs with



Vertical and horizontal sections through gearbox



Details of shifting mechanism



View showing the cam rods

hand shifting and is very destructive of gear teeth. The shifting yokes *E*—which span the threaded sleeves—are provided with cam lobes and form a face cam acting on the clutch lever. When the free end of the clutch lever rests on top of a cam lobe the clutch is released; when it rests in a depression between cam lobes the clutch is engaged, engagement, of course, being effected automatically by the clutch spring. The depressions between cam lobes correspond to the positions of full mesh of the different sets of gears. When the gears are in neutral the free end of the clutch lever is always on top of a cam lobe and the clutch is released.

The same sliding yoke which carries the cams for releasing the clutch also carries a cam—for applying the service brake.

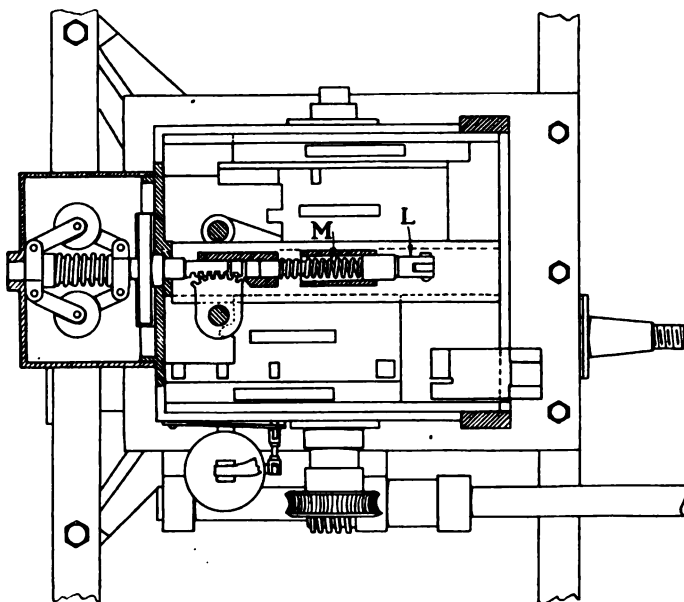
The action of the mechanism is as follows: When the engine is at rest the clutch is disengaged and the gears are in neutral position. By means of the throttle lever on the steering wheel, the gears may be set either for the low speed forward or for the reverse position. This setting is accomplished by the same movement of the lever which partly opens the throttle valve for starting the engine. The throttle lever moves over a semi-circular quadrant which is divided by a stop into two unequal parts. A knob on the lever has to be pulled in order to permit it to pass by this stop. If the lever is at the stop, the throttle valve is virtually closed and the gear is in neutral position. When the lever is moved to the right from the stop, where it has the greatest range of motion, the transmission will be set for first gear forward, and when it is moved to the left of the stop the transmission is set for reverse. The actual meshing of the gears is effected by engine power when the engine is started up.

Supposing the throttle lever to be moved in the direction corresponding to forward motion. As soon as the engine picks up, the low speed set of gears will be shifted into mesh, and as soon as they are fully enmeshed the clutch will be automatically engaged and the car will start off. If the driver wants to continue on first gear for a while, as may sometimes be the case in traffic, all he has to do is to so manipulate his throttle valve that the engine will not run beyond a certain moderate speed. Otherwise, he opens up his throttle and as the engine speeds up the gear shifts automatically to second and finally to third. If the car comes to a hill and the speed in consequence decreases, the gear automatically shifts back to second speed, and, if necessary in order to keep the engine running at a fair speed, to first gear.

On the other hand, if the driver wants to drive slowly on high gear, he will, of course, close his throttle valve. This causes the engine to slow down and the governor

balls tend to approach their axis of rotation and in consequence shift the gears from third to second and finally to first. To prevent this a foot button is provided which when pressed upon, through the intermediary of a linkage *L* and a spring *M*, exerts pressure on the governor sleeve opposite in direction to that of the regular governor spring, keeping the governor balls separated and the gear in high or in second as desired.

In describing this system we have only touched upon its principal features and not gone into all of the details. The system undoubtedly offers some important advantages, such as eliminating the need of manual gear shifting and preventing injury to gears by shifting while the clutch is still engaged. Whether these advantages are sufficient to warrant the complication which it involves cannot be decided offhand. At first one is likely to be prejudiced against any piece of complicated mechanism, but it must be remembered that when properly standardized and made in large numbers such mechanisms may not only be produced quite cheaply but at the same time may be very reliable. Undoubtedly a number of points would require further development, and one condition of operation that does not seem to have received sufficient consideration is when descending a long hill and using the engine as a brake, with a low gear in mesh, when in spite of heavy throttling, the engine might conceivably attain sufficient speed to change to second and third speed. This problem, however, could readily be solved.

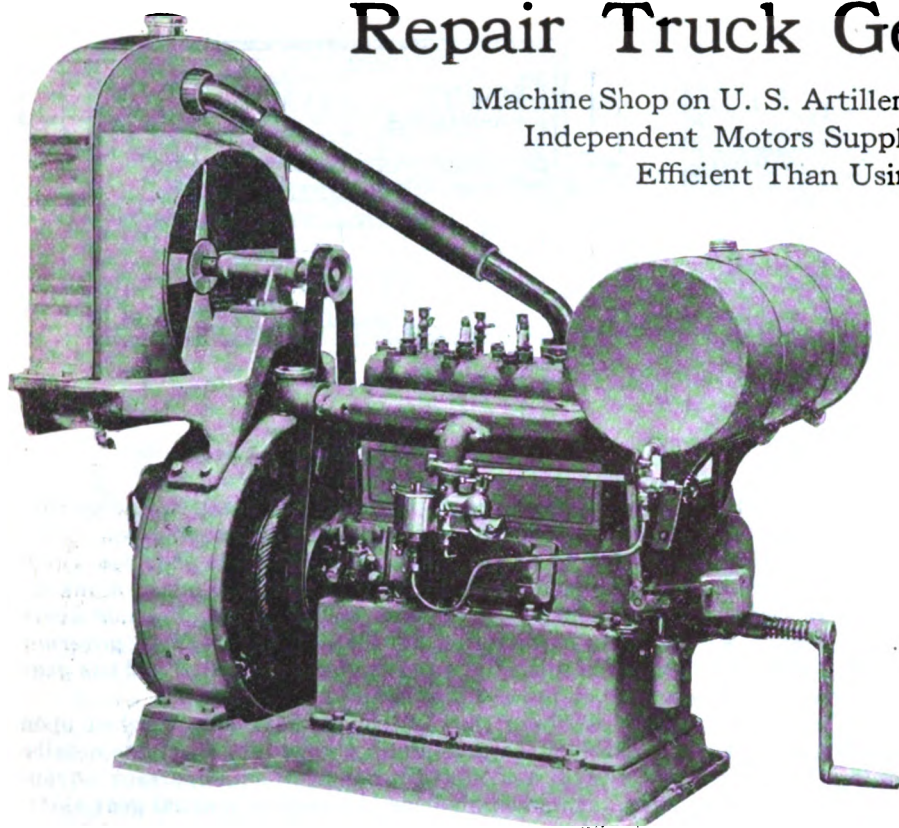


Showing governor and method of rendering it ineffective



# Repair Truck Generating Unit

Machine Shop on U. S. Artillery Repair Truck Operated by  
Independent Motors Supplied by Generator—More  
Efficient Than Using Truck Engine



**A**N interesting installation for generating electric power is used on the artillery repair trucks built for the Ordnance Department by the American Car & Foundry Co., in Berwick, Pa. The artillery repair truck is fitted with a lathe, drill press, air compressor set and a number of other machines, each operated by an independent electric motor. In order to supply the current for these independent motors there is a generator set operated by a four-cylinder four-cycle gasoline engine direct connected to a dynamo. This is made by the Universal Motor Co., Oshkosh, Wis.

A set of this kind is compact enough to be mounted upon the body of this repair truck and at the same time supplies sufficient electrical energy (4 kw.) to operate the machines and to give an adequate lighting system for the trucks. It is an easy step from the supplying of current for purposes of this kind to similar purposes on the farm or at any point where a central electric supply system can be utilized. The entire set is so compact that it takes up but a few square feet of floor space. The gasoline tank, radiator engine, and dynamo are so compactly mounted that they are readily carried upon one cast base, which could be placed on any firm foundation and supply current enough to take care of the average farm.

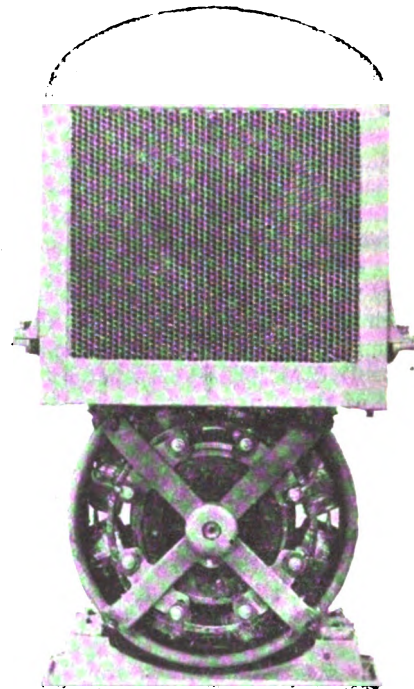
## Self-Contained Unit

The entire unit is self-contained and comprises an engine direct connected to a generator. The armature of the generator acts as the flywheel of the engine. In connection with these two main components there is a radiator and a 5 gal. gasoline tank with the necessary piping. There is also a switchboard which can be mounted at any convenient point.

Since the generator is direct connected, the speed of the armature is the same as that of the crankshaft and the engine governor acts as a regulator. This governor is a throttle type and can be set to any required speed. The normal speed of this particular engine is 1100 r.p.m., at which speed the engine develops 8 hp.

The engine is a four-cylinder unit with the cylinder block cast. It has a bore and stroke of 2½ by 4 in. The manifolds are cast integrally with the cylinders and the cylinder head is detachable. Gray iron pistons are used, with three piston rings, all of which are above the piston pins. The pistons

*Left side of engine-generator set, showing carburetor and connections, also mounting of radiator and oil pump*



*Radiator end of engine-generator set*

have a clearance of 0.003 in. and below the lowest ring are drilled to furnish an oil return passage for the lubricant scraped off the cylinder walls by the piston rings. The piston pin is hollow, hardened and ground. It operates within a bronze bushing contained in the upper end of the connecting-rod. The connecting-rod is a drop forging of I-beam section. At the lower end it contains a die cast babbitt bearing for the crank pin.

## Steel Drop-Forged Crankshaft

The crankshaft is a steel drop forging 1½ in. in diameter. It is direct connected at one end with the armature of the generator which acts as the flywheel, and at the other extremity it terminates in a squared end to take the starting crank engagement. The crankcase and engine bed are bolted together by flange connections and the bed is so shaped as to support the frame of the generator containing the stationary fields and to provide a substantial base within which the unit can be bolted to any firm foundation.

The radiator is an automobile type with a shield to secure the maximum draft of the fan. It is mounted on a frame bolted to the generator casing. The gasoline tank is supported on a bracket by the crankcase of the engine at the starting crank end.

The oiling system is automatic, oiling being taken care of by a removable plunger oil pump. The plunger is actuated by an eccentric on the camshaft. The suction pipe has a fine gauze cap to prevent dirt working up into the pump, and this is inspected by removing the oil pump. The oil is carried to a sight feed device located over the gear case, where the oil flows over the gears and down to the drip pan below the connecting-rod and then finally into the reservoir below. The splash from the connecting-rods lubricates the interior bear-

ings and a form of piston is used to prevent excessive oil from working into the combustion chamber. The surplus oil is scraped down by the lower ring, flowing back through the holes below the lower ring to the crankcase.

The oil sight feed device is composed of a large glass body so that the working of the oil can be seen at a distance from the units.

Cooling is by thermo-syphon, the flow being upward through the straight water pipe connection between the cylinder head and the top of the radiator.

Gasoline is fed by a gravity from the 5 gal. cylindrical tank mounted on the rear end of the engine. The carburetor is a float feed type, with an auxiliary air valve, and the entire gasoline system is readily accessible for cleaning, since the piping and the tank connections are all exposed.

Ignition is provided by a Bosch high tension magneto on the Government installation, although this ignition may be varied for commercial or industrial purposes. The generator is compound wound. It is of 4-kw. or 4000 watts capacity and operates at 110 volts. Regulation of the current output is secured by means of a governor which is of the centrifugal type mounted in an oil tight casing with an accessible cover. In this location it receives oil automatically from the gear case. The following is a list of the general specifications of the engine-generator set used on the artillery repair trucks:

Type of Engine, Four Cycle  
Number of Cylinders, Four  
Cylinder Diameter, bore, 2½ in.  
Stroke, 4 in.  
Brake hp., 8 at 1100 r.p.m.  
Cylinders Cast, in Block  
Cylinder Material, Gray Iron  
Piston Material, Gray Iron  
Piston Clearance, .003 in.  
Number of Piston Rings, 3 per piston.  
Connecting Rod, I-Beam Forging  
Piston Pin Bushing, Bronze  
Lower Rod Bearing, Die Cast Babbitt  
Crankshaft, Drop Forge Steel

Crankshaft Diameter, 1½ in.  
Crank Pin Diameter, 1½ in.  
Crank Pin Length, 1½ in.  
Cylinder Head, Detachable  
Ignition, Bosch Magneto  
Fuel Feed, Gravity  
Governor, Centrifugal Type  
Lubrication, Circulating Splash  
Cooling, Thermo Syphon  
Gasoline Tank Capacity, 5 gal.  
Generator, Multiple Pole Type  
Voltage, 110  
Winding, Compound  
Voltage, 110  
Capacity, 4 kw.  
Switch Board Size, 14 x 24 in.

## Wages and Hours of Labor

MUCH sound industrial philosophy is to be found in the report of the Railway Wage Commission which has just been printed in full in the monthly review of the Bureau of Labor Statistics. An unusual amount of space is devoted to abstract discussions of fundamentals in industrial relations. This is particularly true of the parts of the report devoted to hours of labor and rate of payment for overtime work. What is said there is of interest to all manufacturers.

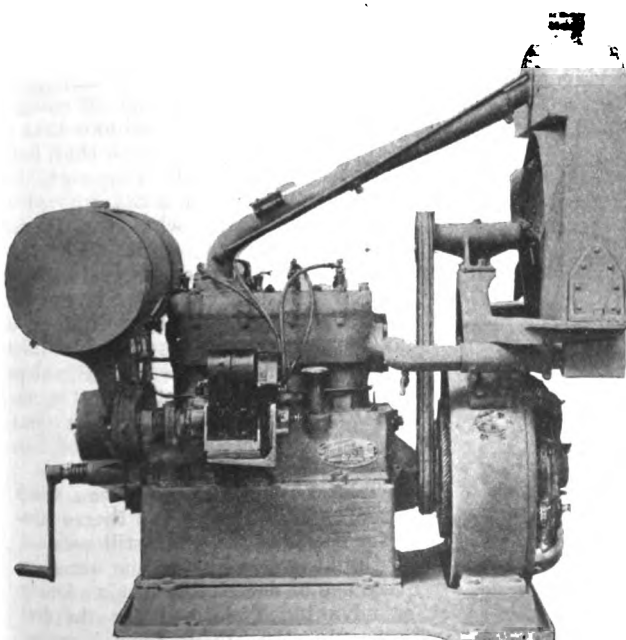
"The matter of hours of service," says the report, "is lodged deep in labor's mind. A standard day of reasonably limited length is as much a part of the measure of justice with the workingman as is his rate of wage."

"Slowly and steadily, by force of law somewhat, but also by the voluntary act of the employers, a shorter workday is being put into effect. This tendency will continue, and the shorter day will come to be regarded, not as a means of minimizing the returns which the worker gains, but as a conservator of the human material upon which industry rests. This matter of work time must be submitted to the pragmatic test. Society will come to see that there is a maximum which is beyond the Plimsoll mark of wisdom, and a minimum that makes society in many ways the sufferer. The line of moderation, the medial line, is one that must be proved by experience. The wise employer will look with sympathetic eye to find it, and the wise employee will attempt in good faith to make it manifest. It would be a splendid achievement if we could at this time crystallize the experience of the world into a conclusion concerning the length of the workday that would be of universal application. But this is not possible now for many reasons, not the least of which is an insufficiency of data touching so many and such diverse employments which call for such differing strains upon human nerves and muscles.

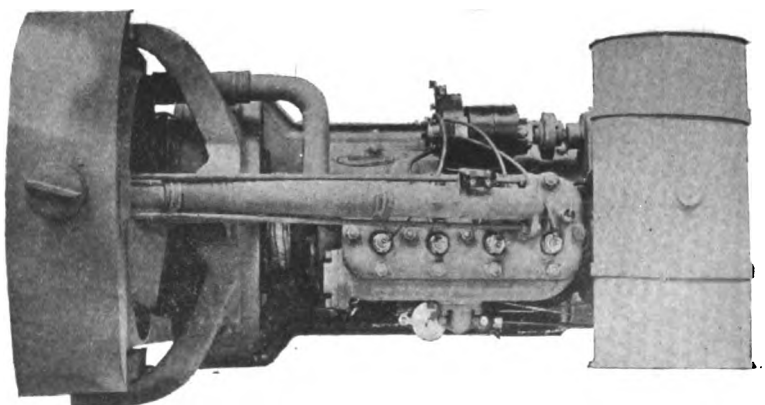
## Overtime Rates

"Closely allied to the matter of hours of service is that of extra pay for overtime. In fact, the whole theory of those who speak for labor is that extra pay for overtime is the logical way to force the standard day of reasonable hours, with no work thereafter. In that theory there may or may not be force; but, quite apart from such view, certain it is that in harmony with the broader idea that fair hours of rest and recreation are the laborer's right, the use of those hours in industry may well be obtained only at a wage much above the normal. With overtime as with hours of service, however, the commission believes that the existing rules and conditions of payment should not be disturbed during the period of the war. But at the time when the study of the matter of hours of service is made, that study must sympathetically cover also the broad and kindred field of compensation for the overtime which is necessary in certain classes of service."

UNTIL now the English Government has permitted the payment of fees due in enemy countries in connection with the grant, registration and renewal of patents, designs and trade-marks, and also the payment in Great Britain and allied territory, for the account of enemies, of similar fees. It has now been decided to revoke all licenses for the payment of such fees. The reason for this step is said to have been the general public disapproval of the practice of maintaining relations with the enemy.



View of engine-generator set on magneto side, showing water connections to radiator



Plan view of engine-generator set as used on ordnance artillery repair trucks

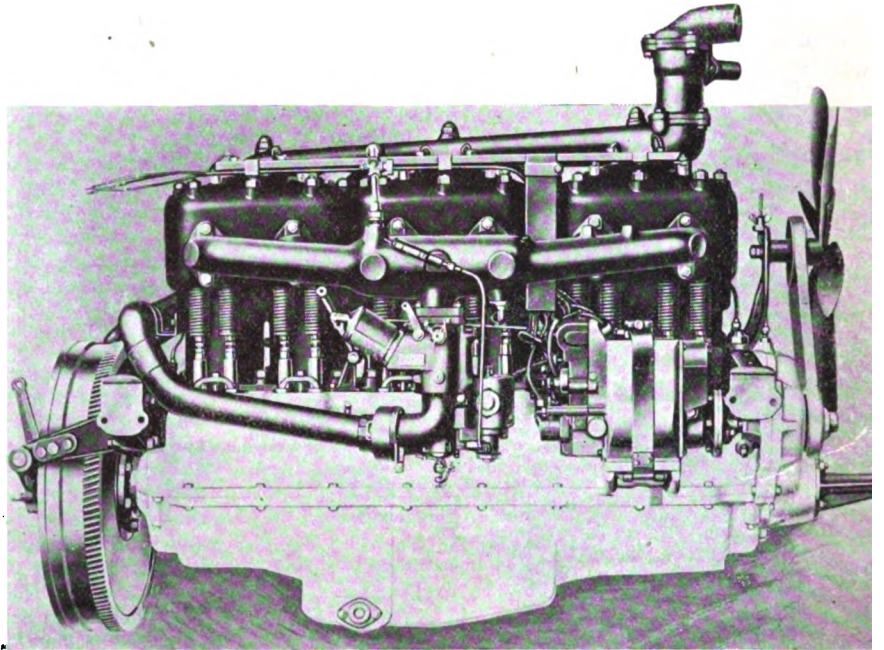


# Pierce-Arrow Adopts Dual Valves

In New Series Five Cars, T-Head Cylinders with Detachable Heads and Two Intake and Two Exhaust Valves Per Cylinder Are Used—Hill Climbing and Accelerating Ability Greatly Increased

IN engines having individual cylinders of considerable displacement, the provision of two inlet and two exhaust valves per cylinder tends to give increased output and flexibility of operation. In racing engines and aircraft engines dual valves have been used for many years. They have also come into use on stock passenger cars of the four-cylinder type, the chief object sought being to give these four cylinder cars the same range of high gear operation as six-cylinder machines. Now the Pierce-Arrow Motor Car Co., Buffalo, N. Y., has adopted the dual valve principle in its new six-cylinder model. Under the old system of terminology, the car would have been referred to as a 24-valve design, but the Pierce company prefers the more descriptive term "dual valve six."

In the experience of the Pierce company, the demand of the buying public to-day is for better high gear performance. To meet this demand in their 48 hp. model, the company built various types of six, eight and twelve-cylinder engines, and as a result of these experiments, they are now more than ever convinced that a six-cylinder engine is the preferable type for passenger vehicles. It was found that the greater power developed in some of the newly designed engines, especially at the higher speeds, was due almost entirely to the large size of the valves employed in proportion to the cylinder displacement volume, thus insuring a high volumetric efficiency. In order to obtain as great valve capacity in the

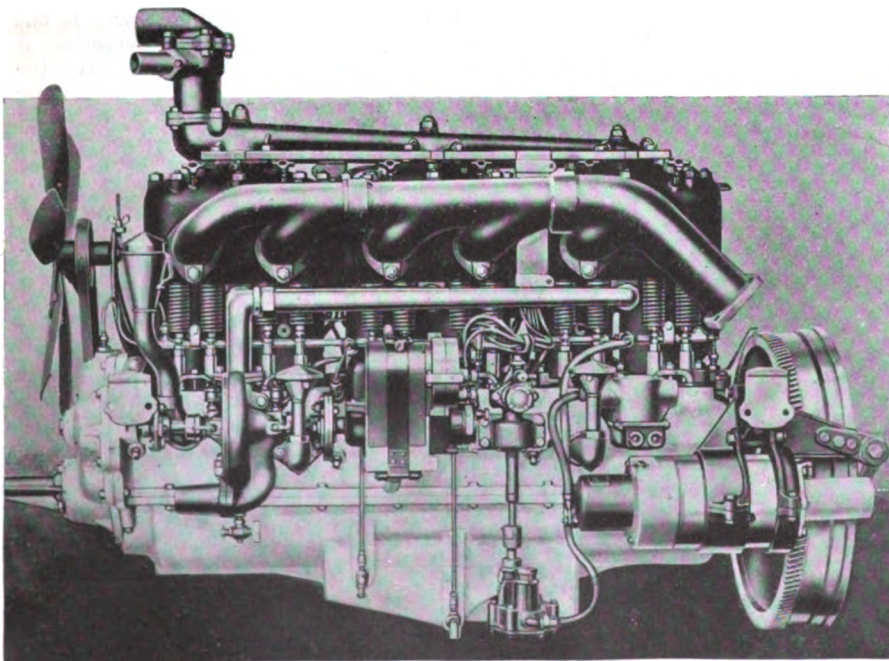


*Inlet side of Pierce-Arrow dual valve engine*

six-cylinder,  $4\frac{1}{2} \times 5\frac{1}{2}$  in. engine with which its 48 hp. model has been equipped, as found in some of these high speed engines, it would have been necessary to use 3 in. valves with  $\frac{3}{8}$  in. lift. With a greater lift, of course, a smaller diameter valve would have sufficed, but it was figured that  $\frac{3}{8}$  in. was the maximum lift which would permit of reasonably quiet valve action. This size of valve, however, is prohibitive

because of the noise due to the heavy springs required to close them promptly and also on account of the tendency of the valve heads to warp out of shape. In standard practice, it is seldom that the clear diameter of valve of more than half the cylinder bore is used. For a  $4\frac{1}{2}$  in. bore cylinder, this gives a  $2\frac{1}{4}$  in. valve which is substantially what the Pierce company has been using on its 48 hp. engine in the past. The conclusion was therefore reached that in order to get the maximum power out of the cylinders, it would be necessary to use double inlet and double exhaust valves. The valves used have a clear diameter of  $1\frac{1}{2}$  in. with a  $\frac{3}{8}$  in. lift, thus giving the same opening area as the single valve of 3 in. diameter with  $\frac{3}{8}$  in. lift.

The T-head cylinder construction, which has been championed by the Pierce company for so many years, is still retained but with dual valves it became necessary to make use of detachable heads. Among other advantages claimed for the dual valve construction, aside from increased output from the same size of cylinder, are very quiet valve action due to the use of light valve springs, increased fuel



*Exhaust side of Pierce-Arrow dual valve engine*



economy and less frequent need for regrinding the valves. There is also said to be a remarkable improvement in the acceleration of the car on opening the throttle, the difference being apparent to the driver familiar with the 48-B-4 model.

The modified three-point support, which has been used by the Pierce company for years, is retained. Camshaft drive is by helical spur gears. Water circulation is effected by a centrifugal pump and engine lubrication by the pressure system, through oil passages drilled in the crankshaft. The oil pump is of the gear type.

A carbureter of the Pierce company's own make is fitted and is of the automatic type. Fuel is fed to the carbureter by the pressure system. Ignition is by a Bosch high-tension magneto with a Westinghouse battery system as a reserve. The two systems are independent and connect to separate sets of spark plugs. The timing of the spark is hand-controlled. The starting and lighting system is of Westinghouse make, comprising a separate generator and starting motor, and working on the 6-volt system. All wiring is on the ground return principle. The battery ignition distributor is mounted on the generator. Engagement of the starter drive is effected magnetically. Exide and the Willard batteries are carried.

From the engine the power is transmitted through a cone clutch to the four-speed and reverse selective sliding gear transmission, which is located amidships. The final drive is by spiral bevel gears, these giving a reduction of 3.53:1. The driving thrust is taken on the springs and the torque reaction on a torque arm. The axle is of the semi-floating type and is of the Pierce company's own make.

Wood wheels are standard equipment and are fitted with Goodrich Silvertown cord tires, 35 x 5 in. all around. The front springs are half elliptic and the rear springs three-quarter elliptic. The car has right hand drive and right hand control. Ball bearings are used in the gearset, ball and roller bearings in the rear axle and roller bearings in the front wheels.

The regular equipment includes a speedometer, shock absorbers, demountable rims, one-man top, clock, curtains, power tire pump and windshield. A choice of about twenty different body types is offered the purchaser. The price of the three-passenger roadster is \$6,400 plus war tax, while the five-passenger and seven-passenger touring cars are priced at \$6,500 plus war tax. All models have a 142-in. wheelbase.

## Market for Gas Engines in Australia

**I**MPORT statistics for the Australian commonwealth show a rather steady demand for gas engines in spite of war conditions. Thus the imports under this heading were valued at \$850,825 in 1912, \$936,427 in 1913, \$897,314 in 1914-15 and \$755,709 in 1915-16. The majority of these engines no doubt were small farm engines.

Referring to these figures in a recent publication of the Department of Commerce, Juan Homs states that no other farm machine has been so consistently in demand in Australia since the war started.

Every implement house and many other firms engaged in the sale of machinery other than agricultural, handle gas engines. In spite of this it is felt that any American manufacturer making the type of engines demanded in Australia will find that country a most promising and profitable field, worthy of his best efforts, if he attempts to specialize in the sale of such machines. The sending of special representatives, and even the establishment of branch houses, can be recommended for his consideration, for along certain lines Australia offers an almost virgin field for the sale of gas engines. It is generally believed, for instance, that several thousand engines to run the internal mechanisms of stripper harvesters and binders could be sold in Australia if adequate efforts were made to acquaint the farmers with the many advantages of these machines for that work. Owing to the extremely varied demand, it would be desirable in that case that a complete line of engines should be represented, and several manufacturers under such circumstances might be able profitably to combine and join their efforts in promoting a business solely concerned in the sale of gas engines.

Vertical and horizontal engines in sizes ranging from 1½ to 15 horsepower are sold, the heaviest demand being for 4 and 6 horsepower machines. Almost every kind of engine manufactured is sold in Australia, and while there seems to be a preference for high-grade machines a good many cheap engines are also sold. In the large sheep stations, for instance, where sometimes dozens of engines are used for pumping purposes, the question of price is often a consideration of moment and in some cases the cheapest engines are imported for that trade, although as more experience is had with them a tendency toward a better product is observed. Engines such as are ordinarily sold to farmers in the United States are in great demand for farm work, and these, on the whole, may be classed as the intermediate type, being medium or moderate priced machines.

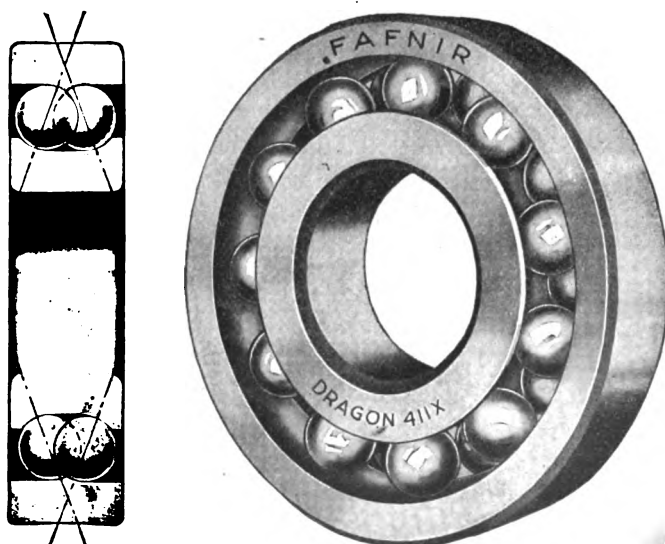
The fuels used in gas engines in Australia can be said to be equivalent to those used in the United States. The cost of these in the former country is normally about double that in the latter, while during the past three years it has been about three times higher. The fuels used range from low-test kerosene to high-test gasoline, there being but little crude oil used in Australia in connection with the operation of gas engines.

The large number of engines imported from the United Kingdom indicates that substantial, heavy and well-constructed engines are in great demand, for it is well known that thus far English manufacturers have not taken up the construction of engines to meet the demand for low-priced machines. The demand for some of the better American engines, however, is rapidly increasing, and on the whole it is felt that Australia may be regarded as a very promising field for the sale of American gas engines.

## Double Row Fafnir Bearing

**A** DOUBLE row bearing in standard single row widths has been placed on the market by the Fafnir Bearing Company, New Britain, Conn. It will carry nearly twice the radial load of a single row bearing of the same size and, having an angular contact, it will carry an unusual amount of thrust load in both directions. This new bearing is believed to specially meet present conditions, as it is economical of both stock and labor. No retainer is required, as the balls are in staggered relation to each other. The axis of contact makes an angle of 20° with the plane of the bearing.

We understand that the experts of the Fafnir company invented a bearing of this type some five years ago, and a patent on it was immediately applied for. An interference developed, however, as another application covering substantially the same features had been made two years earlier. The Fafnir Bearing Company has now secured an exclusive license under the Mossig and Sachs patent, issued in 1915. The bearing described and illustrated herewith is to be known under the name of the Dragon type bearing No. 411X.



# England Prepares for

Business To-Day Is in America  
Sellers—Demand for

BY SPECIAL

**J**OHANNESBURG, Aug. 4—In the export market, what have the past 4 years wrought and what is the outlook? Speaking for South Africa, it has seen a great increase in American and Japanese business and now a depletion of stocks that will mean millions to be spent immediately conditions permit. While Africa has been giving her sons to fight on the Western Front she has been reaping a material return such as she has never experienced before. Wealth has come to the Union in so large an amount that it has given the necessary impetus long needed to every industry. War conditions are rapidly building up local manufactures, the farming community has benefited as never before, and our coal and iron trade has now become of first importance; in fact, the whole industrial outlook is changed and must now be reckoned with in any survey of the export field.

TO-DAY THE WHOLE automobile business is in the hands of the American manufacturer, but lack of shipping has handicapped it exceedingly. Time was when men, looking at our limited white population, argued that the sale of cars was being overdone, but now it is admitted that we are but in the infancy of the industry. It is a country of vast distances. Our railways touch only a fraction of the population, the necessity for quick intercommunication has become urgent and so the demand steadily increases. With growing wealth has come the increased demand for the better class of cars, but owing to the lack of freight the demand cannot be met, and to-day there is not an unsold high-class automobile in the whole country. What this really means can best be gaged by the fact that the Hudson Super-six sells at \$3,750 and the Cadillac up to \$5,500.

THE PAST 4 YEARS have also seen many changes in the trade, competition has become keener, old methods have had to give place to new, the firms that formerly led are being rapidly out-distanced and the personnel is almost entirely changed. New men have brought to the selling a vision and outlook that were impossible to the old dealer. For the manufacturer to-day to place his agency without a knowledge of these and other changes and to do so simply on the ground of a firm's financial standing or its successful past is to ignore the factors of vital importance. Change is so constant a feature of life here that the reasons which decided the placing of an agency in the past may have given place to conditions prejudicial to the manufacturers' best interests.

SERVICE IS TO-DAY the watchword of all successful business and nowhere has it been more recognized than in the automobile business of America. It is even of more value to a car's reputation in the export field and frequently it receives but scant attention. Hence arises the necessity for more direct supervision because dealers are frequently averse to carrying the necessary stocks of parts because of the capital involved. In fact the problem is an acute one in a country like South Africa, where the distance of the dealer from his source of supply is so great and where the number of towns with facilities for repairs are so few. More cars have had their reputations ruined on this market through want of attention to this than from any other cause.

# South African Trade

## Hands—Our Trucks Are Poor Kerosene Farm Tractor

CORRESPONDENT

FOR THE FIRST time since the opening of the war British automobile manufacturers are making time to pay attention to this territory. Old connections are being restored or new ones sought and there is every evidence that, so soon as conditions permit, the export market will be cultivated as never before. So far there is no evidence of any real attempt being made to compete in the lower-priced car, but in what is your \$1,000 and upwards class the competition will be very keen indeed. The interest of dealers has been awakened and particularly so in cars such as the Crossley, the Arrol-Johnston and the Vauxhall. Previously neither of them could be said to have had anything but small sales, but now in the general opinion of the trade the first two are expected to pitch the note of British competition, especially the former. In the opinion of the writer, one of the first effects of this competition will be a decided reduction in the ratio of profits obtained by the dealer. Sentiment will undoubtedly play a considerable part in furthering their sale, but, on the other hand, many of the American cars will maintain their hold because of their flexibility, their quick response, their gasoline economy, together with the fact that our numerous hills can be negotiated without frequent change of gears.

ONE IMPORTANT and growing field has been left entirely to the British manufacturer, the light or baby car. It is a growing favorite in the towns as a runabout and, with the woman driver, it is much in demand, its extremely low gasoline consumption making it the most economical for short trips.

IT IS SINGULAR and one cannot account for it, but American motor trucks, above the light truck of 1 ton, have never had any appreciable sale in this country. This is all the more remarkable because, when war and our local rebellion broke out, the country was denuded of trucks by their being handed over to the military. Quite a number of American heavy trucks have been used in the German East African campaign and have given every satisfaction, but still our merchants and contractors seem to prefer to wait the advent of the British motor truck before again buying. In the light truck, of 1 or 1½ tons, there was the beginning of quite a considerable business, when shipping scarcity prevented their import. In this class the Maxwell especially has made a good showing and undoubtedly the future demand will be large.

GREAT INTEREST is being shown by agriculturists in the light kerosene farm tractor and a few samples have been imported, but the general verdict is that considerable improvements must be made before they are suitable for the work in South Africa. Our farmers look to them for the breaking of new ground, but so hard is the virgin soil here that, with one exception, none of them has come successfully through the test. Experts also seem to agree that the slow-revolution engine is better suited to our conditions and that the minimum of power must be about 30 hp. With our vast acreage still untilled, and with the increase in the number of our enlightened farmers, together with the high prices ruling for all farm products, few countries offer a better field for a suitable farm tractor.



# Some Outstanding Problems in Aeronautics\*

## Part II

### Engine Problems—Carbureters, Ignition and Lubrication—Variation of Power Output, Lift and Drift with Altitude

By Dr. W. F. Durand

WITH the problem of fuel, that of the prime mover, or engine, is closely related. Is the present type of engine to continue, or is it only a passing stage on the way to some more perfect form? This is a question, interesting indeed for speculation, but hardly to be considered in comparison with actual present moment problems. The present engine and its application to the propulsion of the aeroplane does, furthermore, present no lack of interesting and important problems, and among these a few of the more pressing may here be noted.

First, the problem of gross power. How much power can we put in an aeroplane or airship of no matter what type or form? This divides immediately into three subsidiary problems, as follows:

- (1) How much power from a single cylinder?
- (2) How many cylinders for a single engine?
- (3) How many engines for a single airship?

In the way of power per cylinder we are now reaching close about 40 hp. as a maximum.

In the way of cylinders per engine we have reached a stage of development where the 12-cylinder engine is quite a standard type and higher numbers such as 16 and 18 represent only questions of detail. It is not too much to say that the 600-hp. engine is quite within the reach of present practice and may be realized as called for. We have long since become accustomed to two and three engines on a single plane and are now seeing four engines in various recent designs. It is therefore clear that if a power plant of 2500 hp. on a single structure is wanted, it is quite within the scope of present practice to realize and provide such a plant.

And if four engines of 500 or 600 hp. each, there is no reason why the number may not be increased, at least to a point beyond the present apparent need for power on a single structure.

On the other hand, it must be admitted that, having in view the limitations of present practice, the most simple and in fact the only reliable way of extending power is by a multiplication of the number of cylinders rather than by an increase in the size of the latter. The fact that a 2000-hp. equipment would presumably require from 40 to 60 cylinders shows the formidable degree of multiplication of small elements required to realize such a result. The real problem of size or capacity of engine is therefore one of power in a single cylinder. What can be expected in this direction, and in what way shall search be directed?

#### Cooling the Limiting Factor

The present limitation arises largely as a matter of cooling, and it is in this direction that search may well be made for ways and means of effectively increasing the power capacity of a single cylinder in an engine of the aviation type. This is a problem which is distinctly outstanding and well worth our serious attention and study.

Another problem connected with the engine is that of the

carbureter. At the start of aeronautic engineering the carbureter naturally took its initial form and arrangement from the already fairly well developed automobile engine carbureter. This was but natural, since both engines are of the same type and both use the same general form of fuel. In respect of the conditions of operation, however, there is a marked and important difference. The automobile operates at or near a fixed level and hence in an atmospheric medium of sensibly fixed pressure and density. With the aeroplane the case is very different. The latter may change its level by thousands of feet in a few minutes or even seconds, as in vertical or nearly vertical dives, rapid spirals, etc. This difference in the conditions of operation introduces a factor of distinct significance and of great importance in the design and disposition of the carbureter. Experience in the air has clearly shown the importance of this new factor, and it is not too much to say that the problem of the entirely satisfactory carbureter, capable of automatically answering to the various atmospheric conditions under which it must work, is distinctly an outstanding problem. It is true that much progress has been made and as the result of laboratory research, checked by actual experience in the air, we now know much better than, say two years ago, the fundamental conditions which must be met by the carbureter for the aeronautic engine. The present solution can hardly be considered as final, however, and we may fairly admit that the whole problem of carburetion, including the manifold supply of the carbureted mixture to a multi-cylinder engine, should, as soon as may be, receive a thorough and fundamental re-study in the light of the information to be drawn from the experience of the past three or four years.

#### Ignition

Another problem which we should view as outstanding is that of ignition. It is true that ignition, as now realized with the best equipment, seems to be fairly reliable and effective. But the whole program is open to the objection of requiring an entire electric power plant of a highly specialized type, together with electric conductors and the spark plug for producing the spark between the discharge points within the cylinder. This ensemble, comprising electric generator or magneto, electric cable, distributor for sending the spark with proper timing to the various cylinders and spark plug with discharge points within the cylinder, represents a very complicated and highly specialized device for producing the initial ignition within the body of compressed fuel mixture. In its present state it is a marvel of scientific and technical development, and it does its work; but it is complicated and subject to many possible modes of derangement, and, as we all know, has been and is still the seat of some of the most serious of the engine difficulties to which the power plant as a whole is subject.

I have never been able to persuade myself that this exceedingly complicated and specialized auxiliary equipment was to be the final solution of the problem of producing ignition in an internal combustion engine. If we can anticipate

\*Sixth Wilbur Wright lecture read before the Aeronautical Society of Great Britain at London, June 25.

the explosion engine of the year 1968, assuming that our grandchildren are still dependent on hydrocarbure fuels at that date (and furthermore that they are still available) it would seem as though some more direct and simple mode of initiating the combustion in the cylinders would have been found. Still, otherwise, we may say that on the law of probability, the chances are overwhelmingly against our having at the present moment developed the very best method of ignition. The laws of physics and chemistry, by a probability which almost reaches certainty, contain some potential combination of factors which will permit of eliminating much of the complexity and delicacy of adjustment which is so characteristic a feature of the present mode.

It is perhaps proper to add here that studies in this direction have already been made, and with results which offer promise of interesting developments in the future. The path of perfection is likely to be not a short one, however, and we can see no prospect of any development in the tomorrow of progress likely to displace electric ignition. There must, however, be some better way, and if not to-morrow, then some other morrow should see it made available for use.

The problem of ignition is then one which is distinctly outstanding, one which by its importance merits the most careful study, and one which, at least, offers reasonable ground for hope of a successful and relatively simple substitute for the present mode.

#### Maintenance of Power at Altitude

We come now to a problem of the very highest present and future importance, that of maintaining the power of the engine at high altitude.

The situation as it develops in the case of an aeroplane mounting to higher and higher levels in the atmosphere is readily appreciated with a moment's thought.

The power of the engine arises from the combustion of vaporized hydrocarbon fuel. The power per cycle for a given cylinder will therefore, to a first approximation and assuming a sensibly constant efficiency of thermodynamic transformation, vary directly with the weight of the fuel which can be burned per cycle. But this in turn depends upon and is conditioned by the amount of oxygen which can be drawn into the cylinder per intake stroke of the cycle. But the oxygen is brought in as one of the constituents of the atmosphere and hence the amount of oxygen available per intake stroke will depend upon and be directly proportioned to the amount of air which can be drawn in. But in terms of volume, just a cylinder full or, more exactly, just the volume represented by the piston displacement in moving from one end of the stroke to the other, can be brought in. Hence we may at least depend on what we may term a cylinder volume of air no matter where we are. But just here arises the trouble. The actual weight of air depends conjointly on the volume and on the density, and unfortunately for the aeronautic engine, at least, the density of the atmosphere decreases steadily with altitude, so that at 15,000 feet, for example, the density is only about 60 per cent of the normal density at the earth's surface. It is clear then that an aeronautic engine, other things equal, will draw in, per intake stroke, only about 60 per cent of the weight of air at this altitude as compared with the indraft at the earth's surface. Hence, it will be able to burn only 60 per cent of the fuel and hence with equal efficiency will develop only 60 per cent of the power.

But here we must stop for a moment and inquire as to the effect of such reduction of power on the speed of the aeroplane. We know that, other things equal, the resistance of an aeroplane to propulsion through the air at uniform speed varies directly with the density of the medium. Hence, at the same speed as near the surface of the earth and with the same altitude or angle of attack, the aeroplane at 15,000 ft. elevation would experience only 60 per cent. of the resistance and would hence require only 60 per cent of the thrust, and hence at constant revolutions of the propeller would require only 60 per cent of the power from the engine. Hence, it appears at first sight as though we had lost nothing in speed by the reduction of the power of the engine. If the latter has been reduced to 60 per cent of its amount at low levels, so has the resistance and power required so that the speed realized should remain the same.

Such would, indeed, be the case if this were all of the story; but, unfortunately, other considerations enter and the simple relation of uniform speed at varying altitudes cannot, as a matter of fact, be realized without compensating features.

Thus, if at a constant speed and constant angle of attack for the wings, the resistance to propulsion is only 60 per cent as great at the altitude of 15,000 ft. as on the ground, it is, unfortunately, the same for the lifting force developed by the wings. This also is only 60 per cent as great while the weight of the machine remains sensibly constant at all altitudes. Let us pause long enough to grasp clearly this fact, that while, at constant speed and attitude of flight, the resistance, the lift and all other aerodynamic forces involved vary directly with the density of the air, and hence decrease with the altitude, the weight of the machine, and hence the lift necessary for support, remain sensibly unchanged. Hence, at the same attitude of flight the lifting force at altitude and under the same speed will no longer support the plane, and unless something is done, it would be unable to maintain horizontal flight at such altitude.

Two courses are then open for consideration as follows:

(1) We may seek to increase the speed until at such increased value the lift will equal the weight of the plane. Under the conditions assumed, this would involve an increase of speed of about 30 per cent, thus increasing the resistance to propulsion by nearly 70 per cent or bringing it back to its value at low altitude. But this resistance overcome at the increased speed would mean an increase in the required horsepower of 30 per cent as compared with that normally developed at low level, while with the actual indraft of air and even allowing for the increased speed, only some 78 per cent of this, or 60 per cent of the needful amount would be developed. Hence, no such speed could be realized and the support of the unvarying weight in the rarefied air cannot be realized in this manner, and must be sought otherwise.

(2) Instead of seeking for the necessary lift by increased speed we may seek it by changing the angle of attack; by changing the flying attitude of the plane so that at the same speed, for example, the lifting force will be greatly increased. In this manner the needful lifting force may indeed be realized. But unfortunately with the increase in lifting force will come also an increase in head resistance, not proportionally, but still a definite increase. This will mean that the actual resistance at, say, 15,000 ft. elevation will be greater than 60 per cent of that at low elevation and hence with 60 per cent of the power available per cycle, the original number of revolutions cannot be maintained and a reduction in speed will result. With this reduction in speed will come a further loss in lifting effect and need for a further change in the angle of attack with increased head resistance; until finally, at some reduced speed, a condition will be found where the needful support for the weight of plane may be realized and the resistance to propulsion can be met by the thrust or pull developed at the propeller. Under these conditions, horizontal flight again becomes possible, but at a speed somewhat below that corresponding to low altitude conditions.

#### Loss of Engine and Propeller Efficiency

But this is not all of the story. In addition we must reckon on a diminished efficiency of the engine with decreased power, and with the probability of a loss in propeller efficiency with the resultant change in speed. Thus, if an engine is primarily designed to work at its best efficiency and under its best conditions at or near full atmospheric pressure and density, it will not work with equally good efficiency at high altitudes in rarefied air and when developing only about one-half the power for which it is primarily designed.

All of this means, in brief, then that at an altitude of say 15,000 ft. the plane must fly at a less advantageous angle of attack and hence with more resistance, and that the engine will be able to burn only about 60 per cent as much fuel and will transform the resulting heat less effectively than when at low altitudes. Hence, the power developed will be less than 60 per cent, and hence, insufficient to maintain the same speed; and with diminishing speed there may be further loss of efficiency in the propeller and a further loss of speed until finally matters become adjusted at some value usually definitely and sometimes considerably less than that corresponding to low level conditions.

Hence, as an over-all practical result an aeroplane normally loses horizontal speed as it ascends to higher altitudes.

Confronted with this fundamental fact, what is to be done? Such loss of speed, especially in a military sense, is or may become very serious, and one of the large and definitely outstanding problems in aeronautic engineering at the present time, centers about the possible ways and means of meeting this condition.

The obvious proximate solution is to avoid, so far as may be, the decrease in the amount of air handled per intake stroke of the piston as the plane ascends to higher altitudes.

Broadly, two courses are open. First, we may definitely and frankly design the plane and engine for a certain desired performance at a given altitude, say 15,000 or 20,000 ft. This is a straightforward problem in aeronautic engineering. Given the desired schedule of operation and the altitude, we can determine the resistance to be overcome and the horsepower required, and can design the engine accordingly. In such case the volume of the cylinders will be suited to the rarefied air in which the engine is to work and all proportions and details will be worked out on this basis.

It will be obvious that such an engine will have much too large a piston displacement volume when at low altitude. That is, it will be over size and over powered relative to the plane. In fact, operation near or on the ground under the same adjustments as at altitude would be quite out of the question. Means must therefore be provided for reproducing, when on the ground or at low altitudes, substantially the operating conditions at high altitudes and low air density; that is, the conditions for which the engine was designed. This may be most conveniently done by throttling down the air intake so that while air at or near full sea level density may surround the engine, it will be reduced in pressure at the intake throttle to such a degree that the amount actually taken into the cylinder will only equal that which would normally enter, without throttling, at high altitude.

#### Super Induction

On the other hand, we may definitely design the engine for operation at or near sea level and with size of cylinders and all proportions and adjustments worked out accordingly, and then by a supplementary device endeavor to maintain or to nearly maintain such conditions within the engine itself even if it is at high altitude and surrounded by air of a lower density.

This solution calls for some supplementary form of compressor or equivalent device which shall operate on the rarefied air as a first stage and raise it from the low pressure, characteristic of the altitude, up to or nearly to normal low altitude pressure and density.

Each of these alternatives represents a perfectly solution. Each has its special advantages and disadvantages. Each has its advocates as a solution of this important problem.

The first solution is the simpler of the two, since it involves no special or additional device for compressing the air, however, it means extra weight in the engine which would reduce carrying capacity of the plane.

On the other hand, the compressing device of the second solution is not easy to realize satisfactorily and it involves extra weight, though presumably less than in the first solution. Again, its operation as a separate independent unit for realizing a preliminary compression of the air is less efficient than to do the whole compression by the engine itself and by the engine piston as in the first solution. Only extended and careful trial will presumably be finally decide which is on the whole the better solution.

The reserve necessary with regard to military aviation makes it unwise to attempt to give any account on this question of just where the matter stands with regard to this problem, but it will at least be safe to note that it is a problem which is attracting much attention and study on the part of the various allied Governments, and that much valuable information is being developed, and on which we must wait until some satisfactory solution may be based.

(To be continued)

### The Case Line of Trailers

A COMPLETE line of all-steel semi- and four-wheel trailers has been marketed by the J. M. Case Trailer Co., Racine, Wis. The line consists of models of 3, 4, 6 and 8 ton capacities, and extension pole trailers, and also includes something new in the way of a jacking device.

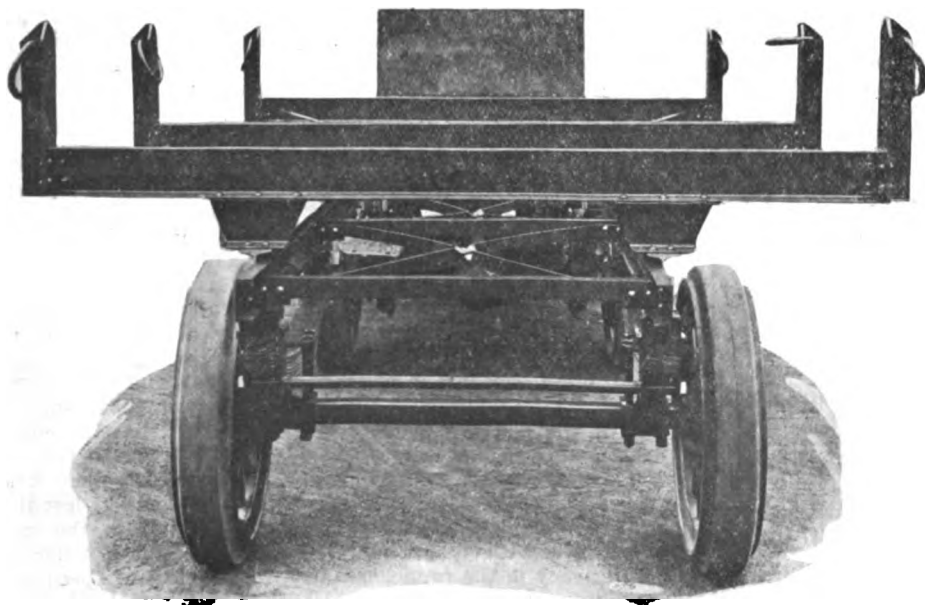
The pole trailers are built in three sizes, namely, 3, 4 and 6 ton. The latter two are of the extension type when telescoped they give a wheelbase of 9 ft., and when extended, a wheelbase of 16½ ft. For hauling lumber, poles and, in fact, any particularly long material, the pole trailer is the ideal equipment.

One important feature of this line of trailers is that all of the semi-trailers can be instantly converted into a wheel trailer by simply adding the Case front running gear. This front running gear unit is built in various sizes to correspond with the several semi-trailer capacities included in the line. This unit consists of axle, springs, tires, drawbar and steel turntable, upon which rests the front of the semi-trailer, the king pin of the semi-trailer being locked in the center of the turntable. The turntable is equipped with a spring absorber so that the shocks of starting and stopping are taken up.

The company is also furnishing trailer chassis equipped with its own steel dump bodies. These are built entirely of structural steel channels of generous size. The units include Timken roller bearings and Firestone tires, etc.

The new jacking device is of the double-post type and can be operated by one man from either side of the trailer. When not required it is swung up out of the way and is permanently attached to the trailer, it is always ready for use at a moment's notice.

J. M. Case, president, states that motor truck owners are fast realizing the importance of the trailer and that the demand over the country is increasing.



Case 6-ton pole trailer



# Topp-Stewart Four-Wheel Drive Tractor

Principle of Four-Wheel Drive Permits of Light Weight—Tractor Designed for Road Haulage and Road Grading as Well as for Farm Work  
—Engine a Four-Cylinder Waukesha

THE war has brought the four-wheel drive principle to the fore in motor trucks, and Clintonville, Wis., is one of the centers, if not the center, of four-wheel drive activity. Having proven successful in motor truck work, and even essential in the work of the Ordnance Department, it is little wonder that the principle has been applied also in tractor construction. The advantage of the four-wheel drive is that all of the weight of the tractor, as well as that of the driver, is available for traction purposes. The weight of the tractor being equally divided between the four wheels, the tractor will not pack the soil as hard as would one having the bulk of the weight on its two drives. Simpler and less wasteful traction devices can evidently be used than where only about two-thirds of the weight is available for traction.

Traction is secured by means of loose sliding lugs that grip the ground and automatically clean themselves and the wheel. These are put on without the use of bolts, screws or nuts.

## Designed for Road Grading

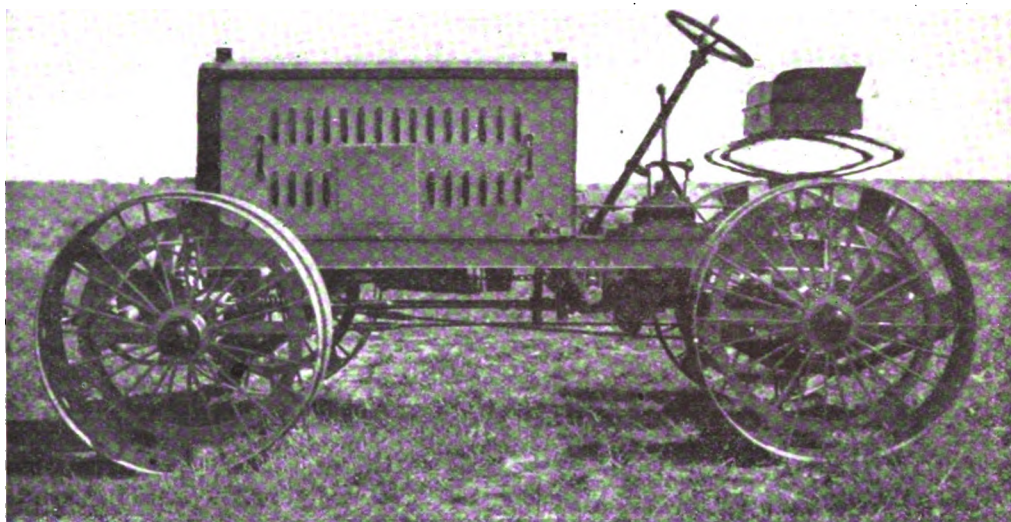
The engine of the Topp-Stewart is a Waukesha of 4¼ in. bore and 6¼ in. stroke, rated at 45 hp. It has a Kingston carbureter, an Eisemann magneto and a Perfex radiator. The change gear affords three forward speeds, viz. 1½, 2½ and 5 m.p.h. It appears that the tractor is intended for road work as well as for farm work, as mention is made of an instance where it pulled a heavy load up a steep grade when fitted with solid block tires. Road grading is one of the lines of work for which it is specially designed. The change gear is of the sliding pinion type and operates in oil.

The four-wheel drive naturally complicates the construction, but it is said to be applied here in the simplest possible form. Steering and control are arranged more nearly like on an automobile than on most other tractors.

## Four-Wheel Steer

Ordinarily the Topp-Stewart steers on all four wheels, but it can be quickly changed to steer on two wheels only. A brake is provided acting on the main shaft and therefore retards all four road wheels. A belt pulley is furnished only on tractors intended for farm work. The pulley is 14 in. in diameter by 8 in. width of face and is controlled by a friction clutch. A special design of drawbar is provided which acts as a cushion spring both in starting and stopping. The belt pulley is located directly over the rear axle, between the frame and the rear wheel, on the right hand side of the driver. This is said to make it easy to line the tractor up with the machine to be operated and to tighten the belt.

The Topp-Stewart tractor weighs 6500 lb. and develops a drawbar pull of 4500 lb. on low gear, 4200 lb. on intermediate and 2000 lb. on high gear. Power steer, a power winch and a canopy are extra equipment that can be furnished.



Side view of Topp-Stewart tractor with four-wheel drive

## The Lebbey Searchlight

LEBBY ENGINEERING CO. of Charleston, S. C., which specializes in lighting systems for motor yachts, has developed a new design of searchlight for automobiles. In starting to work on the problem it did not plan to evolve some scheme of lenses to modify the angle of light, but to construct an entirely new lamp to secure certain definite results. The conclusion was reached that the first requisite was to produce a lamp which would throw a uniform beam of light on to the roadbed and limit the amount of glare above the horizontal plane of the lamp.

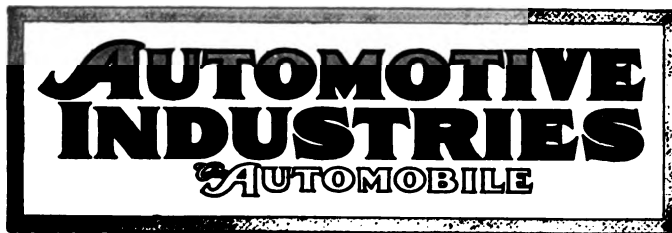
After a year's work a projecting lens was perfected which projected a uniform driving beam, well defined in outline. When this point was reached the company considered the no-glare problem solved. A test pair of the lamps was put in use, fitted with nitrogen bulbs having the front end frosted to cut off direct rays from the filament.

It was found, however, that there was insufficient light directly in front of the car. In order to secure this essential roadside illumination a plane or flat mirror is located close above the bulb, in a horizontal position, with its reflecting surface facing downward. This plane reflector reverses the angle of all the upwardly projected light from the bulb, turning it downward in a wide angle of distribution near the car. Thus an excellent driving light is secured, together with freedom from annoying glare.

We understand that arrangements are under way for the manufacture of this lamp in headlight and windshield floodlight styles.

## Data Sheets on Silent Chains

WE have received from the Morse Chain Co., Ithaca, N. Y., a copy of a booklet of data sheets containing useful information regarding silent chain drives. The data in the booklet cover such subjects as number of teeth and links, lubricating and venting, sprocket materials, chain widths, chain contacts, chain adjustments, etc.



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## The Time Element in Industrial Development

**A**UTOMOBILE development in this country began in 1895, and it took till about 1907 to develop a really practical, dependable vehicle. This statement may possibly be challenged, because conceptions of a "practical vehicle" differ. On the one hand the vehicles of 1895 carried their loads and ran in a fashion, and, on the other, those of 1907 were still far from the condition of faultlessness. But by 1907 the automobile had attained such a degree of practicability that manufacturers felt safe in investing enormous sums in equipment for its large scale production, and the general public, as distinguished from wealthy sportsmen, began to buy machines. The production curve in 1908 and 1909 showed a decided upward bend which reflects these developments.

From 1900 on, at least, development work was quite intensive. Large numbers of inventors and

engineers were active in the field, and capital was quite readily available for what appeared to be meritorious designs, and sometimes, alas, only too readily available for the exploitation of what proved to be absolute failures. On the whole, capital was quite ready to back any likely looking improvement, for the immense possibilities ahead of the automobile industry were apparent to all.

In spite of these favorable conditions it took a round dozen years until a really practical design was evolved. Large were the sums of money that were sunk in fruitless experiment in that period. One is tempted to say "wasted," yet many of the problems could be solved only by trial, and failures were inevitable.

The idea occurs that if development had been spread over a longer period—if the outcome of one experiment had been awaited before another was started upon, the same results could have been achieved at much less cost.

But delay in engineering progress is not tolerated in this strenuous age. As soon as a market develops for any engineering product, competition sets in, and those who lead the way in improvement reap the greatest rewards. In this connection it is interesting to note that the development period of the steam engine was incomparably longer than that of the automobile. In turn the development of aircraft is being forced as no engineering enterprise has ever been forced before. The absolute necessity of quick results fully warrants this procedure, but costly mistakes are an unavoidable accompaniment of such hot-house development.

## Why the Unsprung Weight Should Be Minimized

**T**HE rule that the unsprung weight of an automobile should be reduced to the lowest possible figure is generally recognized. It is, of course, violated by the practice of placing the transmission gear on the rear axle, but we remember that one of the earlier prominent champions of this practice did not deny the sound reasoning behind the rule but justified his construction by the statement that his axle with transmission weighed less than other axles of similar cars without the transmission.

The advantage of small unsprung weight, or, in other words, of a light axle, is that the wheels will "keep the road" better; that is, they will not lose contact with the ground as much as the wheels on a heavy axle. This may not be readily apparent, as the heavier axle would seem to press the tire harder to the ground. However, the tire will leave the ground only when the vehicle is proceeding at considerable speed, and in passing over rigid obstacles a blow will be imparted to the wheels and the axle which is directly proportional to the weight thereof.

The force tending to make the wheels adhere to the road, or follow unevennesses in the road bed, is that due to the weight on the wheel, and the greater the total weight on the wheel in proportion to the unsprung weight, the better the wheel will adhere to the road. The effect is much the same as in a valve

operating cam mechanism. In order to make the cam follower follow the contour of the cam even at high speed, we must make the valve and pushrod light and the spring strong.

In a valve mechanism it is very desirable to keep the follower in contact with the cam because that is the condition of noiseless operation. The chief reason for wanting to keep the drive wheels of an automobile in contact with the ground is that this preserves the tires. When the tires alternately are pressed very hard against the ground and leave the ground entirely, considerable slippage between tire and ground surface is inevitable, and such slippage is, of course, very injurious to the tire.

Aside from large unsprung weight causing abnormal tire wear, it also affects the riding qualities of a car detrimentally. As explained in the foregoing, the upward thrust on the wheel when striking an obstruction is proportional to the unsprung weight. A part of this thrust is transmitted to the car body through the springs, and makes itself felt in the form of an unpleasant jolt. The greater the unsprung weight, the severer the jolt.

## Specialized Manufacture of Tractor Axles

THE tractor front axle offers an excellent opportunity for a firm in the drop forging business to establish itself in the tractor parts industry. It is hardly necessary to say that this budding industry has a very promising future, and those who enter it early have a chance to secure a firm footing without much competition.

The front axle is one of the few parts of a tractor that are really ripe for specialized production. It should be made in a drop forging, and very few firms producing tractors have sufficient financial backing to enable them to install the relatively expensive equipment required to make such heavy forgings. In fact, the output of the great majority of plants is not sufficient to warrant the installation of the heavy drop hammers, trimming presses, etc.

While there are great differences in the present designs of tractor front axles, that is mainly due to the fact that the different designers had no acknowledged standard to guide them. A great majority of the present tractors have Ackerman steering, with the axle pivoted to the frame at the center. If an axle is offered the tractor designer that has provisions for a swivel support at the center and for fastening radius rods close to the axle heads, he can easily arrange his frame to fit it.

Only a few—probably not more than three—sizes of axles would be required to meet the whole range of tractor requirements. Of course, the three-plow tractor affords by far the best chances for the parts manufacturer, as it is that intermediate size which suits the requirements of a large number of farms and will be concentrated on by a majority of manufacturers or assemblers. An axle for this size of tractor, therefore, would be the best to start out with.

With what eagerness the manufacturers of tractors go in for parts of specialized manufacture that are of sound design and construction is shown by the heavy demands on engine, clutch and transmission manufacturers from the tractor industry. Moreover, the tractor industry is an essential industry—so recognized by the Government—and any effective work toward the improvement of tractors counts toward the winning of the war.

## Heels

WERE we gifted with a poetic pen we should write an ode or some other accepted form of verse to the wearer of bloomer overalls and French-heeled shoes. We should ask her not to do it. We should appeal to her on aesthetic grounds. We should tell her that dressed in such a combination she is not so handsome as she might be. We should tell her to wear her French heels, if she will, when she dresses herself in petticoats, but not when she slips on bloomers.

Under the circumstances, however, we shall have to say our say in prose and trust that it may be made effective by adding an appeal to reason.

Besides being something horrible to look upon, the French-heel-bloomer-overall combination is only a half measure from the point of view of accident prevention, and therefore needs further consideration on the ground of safety. This fact is recognized by the New York State Industrial Commission, which has prescribed that women operatives in industrial plants shall wear, besides other things, "shoes with low heels."

It is bad enough to have a large part of our women-folk go tottering through social life on semi-stilts at all angles of inclination, but when we permit these potential accident breeders to become an added industrial hazard we are doing something in which there is no reason.

Encourage the woman operative to wear good square heels, and with her bloomers she will not only retain the attractiveness which is her right, but she will also become a better risk for industrial accident insurance.

## England's Dope Scandal

A SITUATION similar to that in our aircraft industry has been revealed in England by an investigation of the dope industry. There were no manufacturers of cellulose acetate in England at the outbreak of the war, and in view of the urgency of the demand the Government was induced to grant a virtual monopoly to a firm started by a foreign capitalist, and to make terms with it which proved exceedingly onerous later on.

The investigation showed that the business was being conducted wastefully and inefficiently. It is now proposed to place the concern under direct Government control, besides which the creation of new sources of dope supply is considered.



# Owners' Conception of Tractor Instruction Book

**Automotive Industries' Editorial Representative Visits Farmers in Illinois  
and Secures Their Impressions**

**T**HE final test of tractor efficiency must take place upon the farm. The farmer himself must be the ultimate judge. The tractor must meet the individual needs of the farmer who buys it else it is a failure so far as he is concerned. For this reason what the farmer thinks about what the tractor manufacturer and the tractor dealer should do is important to the tractor manufacturer. Here we have the farmer's point of view.

"I think every tractor manufacturer should get out a plain, easily read and comprehensible book about his tractor," says D. W. Rice, who is one of the prominent farmers near Champaign, Ill., and who is a tractor owner. "This book should give complete information about the construction of the tractor and also should have full instructions about its operation. You see, we farmers have to teach ourselves a whole lot about the operation of our machines because we cannot be running to the dealer every time some little thing goes wrong. We haven't the time and we can't afford it. We ought to be able to make the ordinary repairs and adjustments ourselves that may be necessary, and this most of us could do if we knew the 'innards' of our machines, how to get at them and what to do to them when they get out of order. If we could have a book, full of pictures, telling us where every little thing belongs and what it is for and how to fix it when it gets out of kilter, then we would be much better fixed than most of us now are to look after our tractors in the right way."

## **Tractor Manuals Needed**

There are at present no more than two tractor manuals which measure up to the requirements as set forth by Mr. Rice. These both are admirable publications and have contributed materially to the satisfaction the tractors they describe have given. No matter how thorough the instruction may be which the dealer gives to his customer, at the very best it must be elementary and cannot cover all the emergencies which are certain to come up in tractor operation. No matter how perfect a piece of mechanism a tractor may be or to what extent operative troubles have been guarded against by the manufacturer, no one escapes from occasional trouble. For the most part these troubles are trivial, as has been proven by countless responses to calls for assistance, and most of them easily could have been corrected by the farmer himself had he only known how to go about it. This the right kind of a tractor manual would teach him.

To remedy serious troubles, such as breakages and the like, the tractor owner must, of course, look to the dealer. This, however, comes in another branch of service which it devolves upon manufacturer and dealer mutually to provide. But the really annoying things about tractor operation are the inevitable things of a trivial kind which the farmer encounters and which are serious only to the extent that his own ignorance of his machine and of its operation makes them so. Supplied with a manual which is copiously illustrated and which indicates the remedy to be applied in case of common

troubles the farmer is far more likely to derive satisfaction from the use of his tractor than he is when he must interrupt his work and wait for a service man to drive out from town.

How the farmer regards such interruptions is expressed by Charles Rhodes, an Illinois tractor owner, who says: "The farmer uses his tractor for necessary work and its value to him lies in its ability to do that work when it ought to be done. When the tractor is out of commission for any cause, the work must stop and the tractor operator is idle. It isn't the same as having something happen to a horse. A farmer nearly always can change teams and go ahead. But when his tractor balks he is helpless. There's nothing to take its place.

## **Dealer Should Carry Repair Parts**

"Then, too, nothing ever happens when it is standing still and doing nothing. It's only when it's needed and it's in use that things go wrong. It means something then for the farmer to be near a dealer who is prepared to give him prompt service when he needs it, and, above all, a dealer who carries at all times a complete stock of repairs. If something breaks in the midst of the plowing season, for instance, and the farmer must wait and delay his plowing until a spare piece can reach him from the factory the delay may rob him of all the advantage his tractor would otherwise be to him. Every tractor dealer, I think, should carry a stock of repairs sufficient to meet all the probable needs of his customers. If the farmer cannot get repairs for his tractor quickly when he needs them then he would better stick to his horses and be done with it."

This brings out clearly the nature and extent of the service obligation the tractor manufacturer and the tractor dealer jointly owe the farmer when the latter buys a tractor. With tractors becoming more and more numerous on the farms of the country this matter of accessibility to an adequate stock of spares is one of increasing importance. Indeed, it is more than important, it is imperatively necessary. When tractors in actual use were fewer in number it was feasible for the manufacturer, either from the factory itself or from branch houses or centrally located distributing agencies, to meet the service needs for a relatively large territory. With hundreds of tractors now in the place of scores, and with thousands in the place of hundreds, this centralized service system no longer is adequate or even possible.

## **Every Agency a Service Unit**

The obvious solution is to make every dealer agency also a service agency for the territory covered by the dealer. This necessitates not only knowledge of what to do in an emergency on the part of the dealer but the possession of the necessary equipment for giving service, including an adequate stock of spares. Many tractor manufacturers already are making it a condition of their agency contracts that the dealer at all times

shall carry a supply of parts sufficient to meet all the probable requirements of his customers. Obviously the size of the repair stock must bear a certain definite ratio to the number of tractors the dealer has sold or may sell in his territory.

It is not only a matter of good business policy to do this. It is as well meeting one of the recognized demands of the trade. The farmer who buys a tractor expects it, and he has a right to expect it. What Mr. Rhodes says is not alone an individual opinion but may be regarded as typical of the views held by farmers on this service question. How much importance the farmer attaches to the dealer giving this kind of service is shown in a further statement by Mr. Rice, already quoted. He says: "If I were favorably disposed to buy a certain tractor, and would buy it in preference to any other, and the dealer who handled it did not carry repair parts for it, I would forget my preference for the tractor and the dealer and would even buy a tractor regarding which I knew little or nothing from some other dealer, provided the second dealer carried spare parts. I think this is one of the most important things a farmer should consider when he buys a tractor."

### Maker Should Have Farmer's Viewpoint

This brings out clearly the necessity which faces the tractor manufacturer of taking the farmer viewpoint into consideration and making the tractor dealer conform to it. There is nothing theoretical about the needs of the farmer. They are actual and concrete. From the motive which in the first place induces him to buy a tractor at all to the last application he makes of it as a power unit on his farm the practical rules. There are certain things to be done. There are certain ways in which they should be done. There are certain times when they must be done. The farmer does not buy a tractor to make experiments with nor because he hopes it will do his work better than he has been able to do it in the past. He buys a tractor because he believes it will be a help and an economy to him and that it actually will do his work better.

It is up to the manufacturer and to the dealer to see that it does what it should do. In the first place it is incumbent upon both to see that the tractor which a farmer buys is adapted to the needs of that particular farmer, after which every facility should be at hand for keeping that tractor in a constant state of efficiency. This is what the farmer expects, and this measures the extent of the service the manufacturer and the dealer must give. As the man to whom the farmer will look directly for service in the future is the dealer from whom he buys, the manufacturer cannot afford to tolerate a single dealer who fails in the ability, the equipment and the disposition to render service.

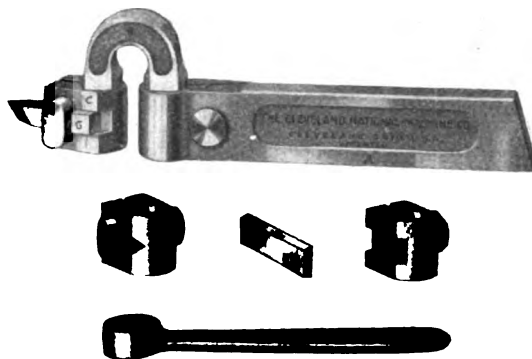
### Preventing Piston Slap

AN interesting method of preventing side slap of pistons has been devised by A. C. Mason of the Chevrolet Motor Co. Instead of turning the piston cylindrical, as is customary, Mr. Mason turns the skirt of elliptical form. The minor axis of the elliptical cross-section is in line with that of the piston pin, and the major axis is perpendicular thereto. The ring groove flanges and the piston heads are substantially circular in cross-section, and the diameter of this part of the piston is slightly less than the length of the minor axis of the skirt section. The diameters of the ring groove flanges are gradually reduced from the flange nearest the skirt to the head of the piston. It has been found that the skirt of a piston having a major axis equal to 3.685 in. should have a minor axis 0.003 in. to 0.005 in. less in length than the major axis. A very efficient construction is said to be obtained by making the radius of the minor axis 0.002 in. less

in length than the radius of the major axis. A British patent on this construction has been issued to Mr. Mason.

### Cleveland National Spring Head Tool Holder

A NEW tool holder for finishing work has been placed on the market by the Cleveland National Machine Co., Cleveland, Ohio. The holder has been in use at the plant of the manufacturers for over a year, and it is said to have proven absolutely satisfactory. Its principal object is to relieve chatter and give a smooth cut. The tool can be adjusted either way to an angle up to 90 deg. Three tool clamps are provided,



Spring head tool holder

viz., flat  $\frac{1}{8}$  x  $\frac{7}{16}$  in., round  $\frac{3}{16}$  to  $\frac{5}{16}$  in. and square  $\frac{5}{16}$  in. All of the tool clamps are interchangeable, and they can also be inverted so as to throw the tool on either side of the holder. Bits can be used down to  $\frac{1}{8}$  in. in length, and parting tools as thin as 0.014 in. can be used.

The construction of the tool holder with its spring head is obvious from the illustration. The spring has sufficient strength to stand up to all finishing work that would ordinarily be done on a lathe taking a  $\frac{1}{2}$  x 1  $\frac{1}{16}$  in. shank.

### Correction on Traction Hitch Article

MOMENTS were incorrectly taken around the center of the rear axle in the article on tractor hitches which appeared in AUTOMOTIVE INDUSTRIES for June 27 on page 1257. The last paragraph on page 1257 and the first two on page 1258, as well as Fig. 1, are incorrect as the moments should have been taken about the point of contact of the wheel and the ground. The paragraphs in question should read as follows:

Taking moments about the point of contact of the rear wheel and the ground we find, referring to Fig. 1, that the drawbar exerts an unbalanced moment of 1800 ft.-lb. in a clockwise direction. The weight moments through the center of gravity and the front wheels cancel out, leaving a lifting moment of 1800 ft.-lb. on the front wheels counteracted by a weight moment on the front wheels of 4800 ft.-lb.

The total moment tending to keep the front wheels on the ground is thus only 3000 ft.-lb. instead of 4800 and gives a virtual backward shift to the center of gravity of 10.8 in., lessening the load on the front axle by that amount.

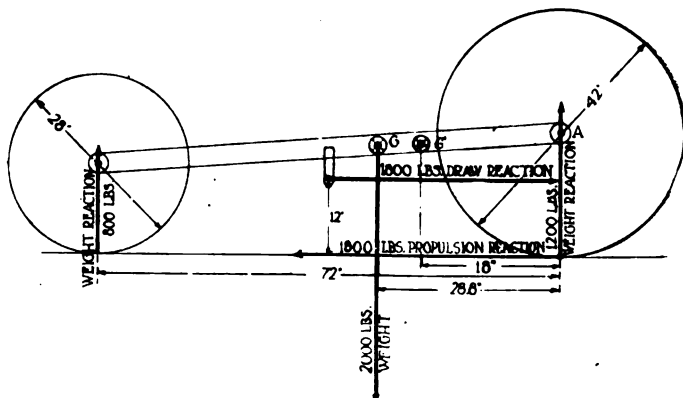


Fig. 1—Corrected diagram showing reactions and backward shift of center of gravity from G to G'

# □ Latest News of the

## Abandon National Shows During War

**National Automobile Chamber of Commerce Unanimously Votes to Eliminate New York and Chicago Exhibitions—  
New York May Have Truck Exhibit—Local Show Situation Unsettled**

NEW YORK, Sept. 5—The National Automobile Chamber yesterday voted unanimously to abandon the National Automobile Shows during the period of the war. The action was taken at the monthly meeting of the Board of Directors and the reason ascribed is to "further co-operate with the governmental authorities in conserving labor, fuel and transportation."

Thus, for the first time in 18 years, the great national exhibitions of passenger cars and accessories which have drawn the public by tens of thousands to Grand Central Palace in New York and to the Coliseum and the First Regiment Armory in Chicago will not be held.

There is a possibility, however, that New York may see an exhibition of commercial vehicles. For some time the Motor Truck Club of America has been carrying on negotiations for a lease of Madison Square Garden in which to stage a motor truck show. Arrangements have been carried to the point where it is expected that the contract will be signed this week, provided sentiment favors such an exhibition in view of the action of the N. A. C. C. in abandoning passenger car shows for patriotic reasons.

Just what effect the abandonment of the National shows will have on the dealer shows such, for example, as Boston, Kansas City, Minneapolis, etc., is not known and it is a little early to predict. The National Association of Show Managers, representing practically every important local automobile show says:

### Local Shows Unsettled

"It is not possible at this time to state exactly what will happen in regard to the dealer shows although the probability is that there will not be the number held in previous years. Passenger car exhibits are, of course, hardly to be considered; however, there are so many other automotive activities in certain sections, especially in the large agricultural centers that the exhibition situation of next winter can hardly be foretold. One thing is assured, and that is that there will be no shows unless they have the full approval of those who are running the country's industrial war machine."

Local shows have yearly assumed greater importance. The annual Boston show which always has been the great

gathering place for dealers, not alone from New England, but from all over the East, last year drew an attendance of 225,000; last year both Kansas City and Minneapolis staged exhibitions that were easily the most important events of the kind that were held during the year in their respective territories. The Minneapolis show was the greatest automotive exhibition that has ever been held and was larger, both in area and in the number of exhibits than both the New York and Chicago shows together.

The situation with regard to the annual Importers' Salon which is held in the Hotel Astor, New York, is chaotic. It is not unlikely that this, too, will be abandoned.

The action of the N. A. C. C. was not altogether unexpected. Last year the trade wondered whether in view of the war the shows should be put on. This year sentiment against the shows has been augmented by the difficulty of obtaining a place in which to hold the New York exhibit. It has been rumored that Grand Central Palace has been taken over by the government and will be converted into a mammoth hospital. The rumor cannot be confirmed but there seems more than a grain of truth in it.

### First Show in 1900

America's first automobile show was held in Madison Square Garden during the week of Nov. 3, 1900, and was almost immediately followed by the first annual show in Chicago. Surrounding the arena on the main floor of the Garden was an oval track where cars were demonstrated to prove to the skeptical public that they really would run. Rising high above the roof of the Garden was built a plank incline with steep gradient on which the hill-climbing ability of the little steamers of that period was demonstrated. Steam vehicles predominated at that show and for several years thereafter with electric cars occupying second place and gasoline vehicles a bad third. A dozen or more companies whose cars have since become known all over the world were represented at the first show. It was during this first show that the National Association of Automobile Manufacturers was formed.

The second New York show was also held in the Garden in November, 1901,

and held a total of 93 exhibitors—nearly twice as many as the first—and the demonstrating track was omitted. At the 1903 show there were 154 exhibitors, 185 in 1904 and 250 in 1905. This number has grown each year until at the last exhibition, which several years ago outgrew Madison Square Garden, and has been housed in Grand Central Palace, there was a total of 335 exhibitors. Chicago has fully kept pace with the New York show and in the number of exhibits has often excelled it. Its central location has resulted in an enormous attendance of dealers and other representatives of the industry, more than 3000 dealers having attended last year.

Like the New York show, the Chicago show several years outgrew the Coliseum and during the last few years has required this building and the first Regiment Armory as well.

### Statement of the N. A. C. C.

Following is the statement of the National Automobile Chamber of Commerce:

With a view to further co-operating with the governmental authorities in conserving labor, fuel and transportation, the Directors of the National Automobile Chamber of Commerce at their meeting yesterday, unanimously voted voluntarily to recommend to the members the abandonment during the period of the war, of the automobile shows held annually for 18 years in New York and Chicago.

The makers present felt that the holding of automobile shows would be inconsistent with the patriotic obligations of the industry.

At its previous meeting the N. A. C. C. working with the War Industries Board, voluntarily agreed to curtail production of passenger cars to 50 per cent of the production of 1917, and recommended that all automobile companies take on war work as rapidly as it is obtainable.

### Stutz Profits Decrease \$221,912

INDIANAPOLIS, Sept. 4 — Gross profits of the Stutz Motor Car Co. decreased \$221,912 during the 6 months ending June 30, 1918. The total profits were \$424,253 which is equal to \$7.30 a share on 75,000 shares outstanding. This compares with \$8.29 a share for the corresponding period of 1917. Following is the income account as of June 30:

	1918	1917	Decrease
Net Sales.....	\$1,935,957	\$2,489,622	\$553,665
Cost of sales....	1,511,704	1,843,457	331,753
Gross profits....	\$424,253	\$646,165	\$221,912
Selling, administrative and gen. expen.	35,374	50,317	14,943
Balance .....	\$388,879	\$595,848	\$206,969
Int. & dis. earned	9,187	25,927	16,740
Net profit 6 mos	\$398,066	\$621,775	\$223,709



# Automotive Industries □

## Treble Tax on Cars; Double Trucks

### New Revenue Bill Also Taxes Accessories Including Tires— Owner's Horsepower Levy

WASHINGTON, Sept. 4—The manufacturer's tax on passenger cars is more than trebled and the tax on motor trucks nearly doubled in the draft of the new War Revenue Bill which has been presented to the House of Representatives by Chairman Claude Kitchin of the Ways and Means Committee. In addition, there is a provision to tax owners of passenger cars on a horsepower basis and a tax of 2 cents a gallon is placed on gasoline.

Under the terms of the new measure, passenger cars are placed in a so-called "luxury list," and, along with such products as candy, cosmetics, chewing gum, etc., are to be taxed 10 per cent on the selling price instead of the 3 per cent which now is assessed. Motor trucks, on the other hand, are to be taxed only 5 per cent. For the first time, a tax has been placed on automobile accessories, including tires and tubes, the amount being 10 per cent. Motorcycles are to be taxed 10 per cent.

It is estimated that these taxes will produce \$123,750,000 and that the horsepower tax to be paid by passenger car owners will produce an additional \$72,920,000. The horsepower tax will be based on the standard method of calculating horsepower by the S.A.E. formula.

Following are the provisions of the new measure which apply particularly to the automobile industry:

#### Accessories Taxed 10 Per Cent

SEC. 900. That there shall be levied, assessed, collected, and paid, in lieu of the taxes imposed by section 600 of the Revenue Act of 1917, upon the following articles sold or leased by the manufacturer, producer or importer, a tax equivalent to the following percentages of the prices for which so sold or leased—

(1) Automobile trucks, automobile wagons, automobile trailers or tractors (including tires, inner tubes, parts, and accessories therefor sold on or in connection therewith or with the sale thereof), 5 per centum;

(2) Other automobiles or motorcycles (including tires, inner tubes, parts, and accessories therefor sold on or in connection therewith or with the sale thereof), 10 per centum;

(3) Tires, inner tubes, parts or accessories, for any of the articles enumerated in subdivision (1) or (2), sold to any person other than a manufacturer or producer of any of the articles enumerated in subdivision (1) or (2), 10 per centum;

SEC. 902. That there shall be levied, as-

essed, collected, and paid upon all gasoline, naphtha, and other similar petroleum products, having a flash point below 100 degrees Fahrenheit, as tested by the Taglibue open cup tester, and suitable for motor power, sold by the manufacturer, refiner, or importer, a tax of 2 cents a wine gallon.

#### Owner's Automobile Tax

SEC. 1006. That sixty days after the passage of this act, and thereafter on July 1 in each year, and also at the time of the purchase of a new or used automobile or motorcycle by a user, if on any other date than July 1, there shall be levied, assessed, collected and paid, upon the use of automobiles and motorcycles, a special excise tax at the rates as follows: Motorcycles, \$5; automobiles (other than electric) of 23 horsepower or less, \$10; more than 23 horsepower and not more than 30 horsepower, \$20; more than 30 horsepower and not more than 40 horsepower, \$30; and more than 40 horsepower, \$50; electric automobiles, \$5 per horse power and 50 cents for each 100 pounds of weight.

In the case of a tax imposed at the time of the purchase of an automobile or motorcycle or any other date than July 1, and in the case of the tax taking effect sixty days after the passage of this act the amount to be paid shall be the same number of twelfths of the amount of the tax as the number of calendar months (including the month of sale or the month in which is included the sixty-first day after the passage of this act, as the case may be) remaining prior to the following July 1.

For the purposes of this section the horsepower of all automobiles other than steam or electric shall be computed as follows: Square the diameter of the cylinder in inches, multiply by the number of cylinders, and divide by two and one-half. In the case of steam or electric automobiles the horsepower for the purposes of this section shall be the horsepower rating fixed and advertised by the manufacturer or importer thereof at the time when sold by him.

#### Canada Takes Control of Steel

MONTREAL, Sept. 5—The Canadian government has taken over the control of steel products in Canada through its War Trade Board. The board will have full authority to direct the extent and character of the steel produced by the various companies but will have nothing whatever to do with the financial or general management of the concerns. The object of the measure is to co-ordinate producing power and insure maximum production.

#### Enlarge "Essential Industry" Group

WASHINGTON, Sept. 5—The 64 original industrial groups which the War Industries Board classed as being essential have been enlarged to 69 groups. It is expected that the list will be completed and ready for publication early next week. The original plan is to be modified so that non-essential industries will be given a place on the preferential list while engaged in war work.

## Gasoline Saving Was 100,000 Barrels

### Fuel Administration Takes Census of Cars Running— Illinois Leads the List

NEW YORK, Sept. 5—It is estimated that between 100,000 and 150,000 bbls. of gasoline were saved in the states east of the Mississippi River by the first motorless Sunday. This is as close as the Fuel Administration can come to the actual figures. These figures were compiled at the instigation of the National Petroleum War Service Committee and reveal that Illinois leads the conservation list through a saving of 95 per cent of the quantity normally used.

In order to obtain the data, a census was taken of all cars passing certain key points between 2 and 4 p. m. on Saturday, Aug. 31, and during the same time on Sunday in the 25 states west of the Mississippi. The difference in the count of cars is taken to represent a fairly accurate figure on the number of cars in use.

It is estimated that the quantity of gasoline that will be saved next Sunday will be still greater when motorists become more familiar with the request of the Fuel Administration and have had a little more time to rearrange their schedule.

Following is the result of the test:

	Sat., Aug. 31	Sun., Sept. 1	P. C. of Reduction	No. of Cars Registered*
Illinois .....	19,997	1,006	95	340,292
Ohio .....	28,774	1,952	93	425,789
Wisconsin .....	2,181	183	90	182,700
Dist. of Columbia .....	7,939	774	90	36,969
Kentucky .....	3,596	891	90	57,543
West Virginia .....	826	107	87	36,400
Louisiana .....	3,269	429	87	38,000
Tennessee .....	10,115	1,265	87	54,000
Indiana .....	2,165	334	85	209,346
Maryland .....	6,400	989	84	63,827
Florida .....	2,282	361	84	43,746
Maine .....	906	149	83	39,538
Massachusetts .....	1,947	354	81	166,384
Alabama .....	3,589	668	81	44,859
Pennsylvania .....	46,923	8,765	81	344,877
Connecticut .....	8,592	1,721	80	75,900
Rhode Island .....	3,396	625	80	26,399
New Jersey .....	14,663	2,805	80	137,322
Georgia .....	4,750	906	80	89,876
New York .....	17,627	4,617	74	422,853
Mississippi .....	2,016	583	71	37,500
North Carolina .....	906	282	68	62,071
South Carolina .....	680	230	66	48,350
Michigan .....	6,378	2,245	65	242,712
Virginia .....	1,499	549	63	65,000

\*Automotive Industries census.

## General Staff Holds Truck Control

### Reorganization Order Places Motor Transport Corps Under Army Supervision

WASHINGTON, Aug. 31—That the Motor Transport Corps of the U. S. Army, recently formed as told in a past issue of *AUTOMOTIVE INDUSTRIES*, will remain directly under the supervision and direction of the General Staff is shown by the reorganization of the General Staff with an Operations Division which will contain a Motor Transport Branch to supervise the Motor Transport Corps. This branch will consequently be the supreme body governing purchase, procurement and design of the motor vehicles of the army. The General Staff is the division of the army that plans, develops and executes the army program directly under Secretary of War Newton D. Baker.

This new reorganization apparently means that the Motor Transport Board, comprising officers of the various army corps and bureaus and which is the consulting board working with the Chief of the Motor Transport Corps, will hereafter operate under the direction of the General Staff Branch.

The three directing officers of the Motor Transport Corps are members of the General Staff and since the announcement of the order of reorganization specifically states that no change of personnel is affected, it is expected these officers will form a part of the Motor Transport Branch of the General Staff.

The order which is known as General Order No. 80 also states that the object of the reorganization is to prevent duplication and to correlate the motor activities of the various army bureaus.

It is further stated that in aircraft production, aircraft operations and tank activities will operate directly under the supervision of the Chief of the General Staff in so far as military affairs are concerned.

### Barley Figuring on War Work

KALAMAZOO, Aug. 28—The Barley Motor Car Co. is actively engaged in working out plans to adjust the plant to war work. The company is now figuring on a good portion of Government work. The three-story factory buildings cover 11 acres of ground and have 350,000 sq. ft. of floorspace. The plant is equipped to assemble trucks that do not require unduly large machine tool capacity.

### Signal Corps Loses Aircraft Supplies

WASHINGTON, Aug. 30—The transfer of all aviation and aircraft property now carried by the Signal Corps to the Division of Military Aeronautics and the Bureau of Aircraft Production is ordered by War Department General Orders No. 1. The order authorizes the transfer

of all aircraft supplies consisting of those necessary for the production of airplanes, airplane engines, aircraft equipment, unfinished, unattached or unassembled airplanes, airplane engines or aircraft equipment. These supplies will automatically transfer and become aviation supplies on their delivery to the Department of Military Aeronautics by the Bureau of Aircraft Production.

### Standardize Oil Specifications

WASHINGTON, D. C., Aug. 31—The Specifications Commission of the Allies has arrived in Washington to discuss the standardization of specifications for petroleum products for use by the American Government and the Allies. President Wilson recently announced in a proclamation that standard specifications would be drawn up and appointed an American committee, as was announced in a past issue of *AUTOMOTIVE INDUSTRIES*.

The Specifications Commission from London comprises: W. Fraser, chairman; H. R. J. Conacher, secretary; Engineer Commander A. E. Hyne, Royal Navy; Captain W. E. Guttentag, British Air Ministry; Captain E. C. Paix, French Army; Captain L. Noyer, French Army; Major Galileo, Italian Navy.

The commission met in conference to-day with the American Committee on Standardization of Petroleum Products, composed of the following members: M. L. Regua, general director oil division, U. S. Fuel Administration, chairman; J. W. Williams, secretary; Col. George E. Warren, appointed by Secretary of War; Admiral R. S. Griffin, appointed by Secretary of the Navy; H. L. Doherty, appointed by chairman of Shipping Board; C. B. Young, appointed by Director General of Railroads; C. H. Beal, appointed by Director of Bureau of Mines; Dr. C. W. Waidner, appointed by Director of Bureau of Standards. Further conferences will be held from day to day.

### Tractor Demonstration for Pennsylvania

HARRISBURG, Sept. 3—The State of Pennsylvania will conduct state farm tractor demonstrations on Sept. 19, 20 and 21, when 250 acres for winter wheat will be plowed and cultivated. Plowing is to be done on Sept. 20, when 7 hr. will be given over for this work, from 9 to 12 in the forenoon and 1 to 5 in the afternoon. On the third day, Sept. 21, the tractors will disk, pulverize and sow the wheat. The first day will be very largely given over to getting ready for the work. In these tractor demonstrations it is planned to keep a very complete record of the performance of each tractor, with regard to fuel used, oil required, plowing speed, depth, number of stops, delays, etc.

### Fordsons at Ohio Fair

COLUMBUS, Aug. 31—One of the biggest attractions at the Ohio State Fair, which closed to-day, was an exhibit of 55 Fordson tractors under the charge of E. H. Bryant, distributor for Ohio.

## Purchasing Agents Convene Sept. 23

### Expected That More Than 100 Will Attend 3-Day Meeting—The Program

DETROIT, Aug. 28—Vigorous plans are on foot for the entertainment of the convention of the National Association of Purchasing Agents, which will be held in this city Sept. 23, 24 and 25. It is expected that more than 1000 purchasing agents from all lines of industry will attend this convention, and a big step toward the consolidation of the buying interests of the country will be made on this occasion. The association has already made considerable progress toward the standardization of catalog sizes and is rapidly obtaining the recognition of the largest business interests. During the past year the membership has tripled and is expected to be augmented by the addition of several new branches during the coming fall. The convention headquarters will be the Hotel Pontchartrain. The program of the convention will be as follows:

#### Sept. 23:

- 9.30 A. M.—Meeting of Board of Directors.
- 10.30 A. M.—Convention called to order by E. L. McGrew, President.
- 2.00 P. M.—"How the Purchasing Agent may serve the nation in his work," by C. A. Woodruff, Saxon Motor Car Co., Detroit, Mich.
- "Standardization of printed matter—present and prospective developments," W. L. Chandler, of Dodge Sales and Engineering Corp., Mishawaka, Ind.
- "Trade acceptance from the buyer's viewpoint," H. E. Cass, of Merrell-Soule Co., Syracuse, N. Y.
- 6.30 P. M.—Smoker and entertainment. Dinner and theater party for lady visitors.

#### Sept. 24:

- 9.30 A. M.—"Commercial Bribery—Cause, effect and remedy," W. P. Ogden, of Scovill Manufacturing Co., Waterbury, Conn.
- "Should the stores department be under the Purchasing Agent's control?" Wm. Guggenheim, of Bauer Brothers Co., Springfield, Ohio.
- "Buying substitutes," F. J. Solon, of Owens Bottle Machine Co., Toledo, Ohio.
- 2.00 P. M.—Automobile tour of Detroit followed by visits to manufacturing plants.
- 7.00 P. M.—Annual banquet.
- Sept. 25:
- 10.00 A. M.—Business session. Election and installation of officers. Deciding place of next convention.

### To Speed Up Brass Production

WASHINGTON, Aug. 30—Brass manufacturers met here to-day with the War Industries Board to discuss plans to speed up rolled brass mills production. Plans suggested were:

1—Each mill to take its full share of Government business.

2—Each mill to take work best suited to its equipment.

3—Each mill to cut off all non-essential uses of the products in which there is a shortage.

4—Each manufacturer to get out his product in the face of obstacles to work up to full capacity.

There is a shortage of rolled brass for shells, cartridges, condenser tubes, etc. Labor has been a serious obstacle in the way of increased production. It was stated that with 9600 additional unskilled workers the mills could increase their output 33 1/3 per cent. The gross production of rolled brass now is 2,910,000 lb. per day. Gross demands, according to the listed figures, are 4,685,000 lb. per day. A number of plants are installing additional facilities and will soon increase their output.

#### Would Aid Mineral Production

WASHINGTON, Aug. 31—Stimulation in the production of such metals and minerals as antimony, cobalt, manganese, platinum, tin tungsten and vanadium is provided for in a bill just introduced by Senator Henderson of Nevada, and referred to the Mines Committee. Under its provisions the President would be authorized to requisition and take over any undeveloped or insufficiently developed deposit, mine, smelter or part thereof and to operate under government direction either under a lease or any other agreement. The bill, however, does not affect gold, silver, copper, lead or zinc production or smelters used in their production.

The bill also creates a revolving fund of \$50,000,000 to carry out the purposes of the act. If in the President's judgment such action is necessary, one or more corporations can be established for the purpose of encouraging the production or controlling the distribution of metals. By this provision, Senator Henderson explained, it would be possible for the President to organize a corporation, with the Secretary of the Interior at the head, for the purpose of developing production in western states and another of chairman of War Industries Board as head, which would be in charge of distribution. The bill is a war measure and the powers conferred by it would terminate two years after peace is declared.

#### War Industries Board Creates New Section

WASHINGTON, Aug. 31—The War Industries Board has created a new section to be known as the Facilities Division, which will determine new or additional facilities in any line of production necessary to the conduct of the war, the possibilities of expanding existing facilities, and the best means of creating and locating new facilities. Samuel P. Bush is at the head of the new division and associated with him is D. R. McLennon of Chicago. The Facilities Division will work co-operatively with the Resources and Conversion Section.

## May Pay Over 25% of Government Cost

### President Nullifies Law Limiting Production Payments—Correct Estimating Hard

WASHINGTON, Aug. 31—The President to-day nullified by an executive proclamation the recent action of Congress providing that the Government should not pay an excess of 25 per cent over the cost of production to any manufacturer of raw materials.

An amendment to the army appropriation bill carried the provision which the President has set aside. Congressmen charged that contractors were making excessive profits, but the President states that, "in view of the practical impossibility under existing conditions of making the estimates necessary to comply fully and adequately with said provisions, it appears that the situation is such as to justify a waiver of said provisions," thereby expressing his opinion that it is not possible to forecast in advance of a contract just what the cost will be. The President's proclamation is as follows:

"Whereas, By the Act of Congress, approved July 8, 1918, Public No. 189, 65th Congress, it is provided

"That except as expressly otherwise authorized herein no part of the sums appropriated by this Act shall be expended in the purchase from private manufacturers of any material at a price in excess of 25 per centum more than the cost of manufacturing such material by the Government, or, where such material is not or has not been manufactured by the Government, at a price in excess of 25 per centum more than the estimated cost of manufacture by the Government; provided, that whenever in the opinion of the President the situation is such as to justify such action he may waive the limitations contained in this section:

"And whereas, in view of the practical impossibility under existing conditions of making the estimates necessary to comply fully and adequately with said provisions, it appears that the situation is such as to justify a waiver of said provisions,

"It is hereby ordered that during the present national emergency the limitations contained in the above section be and the same are hereby waived.

"WOODROW WILSON.

"The White House, Aug. 29, 1918."

#### Special Italian Export License

WASHINGTON, Aug. 31—Exports to Italy are hereafter forbidden unless an import license is secured from the Italian Government, according to an announcement made to-day by the War Trade Board.

Applications for licenses to import into Italy any commodity of foreign origin must be filed by the Italian purchasers with the Giunta Tecnica Interministeriale, Rome, before the placing of orders abroad.

After licenses to import have been granted by the above body, the orders may be placed abroad. The prospective

importers should advise the prospective exporters in the United States the numbers of such import licenses, in order that the latter may designate such numbers in their applications for licenses to export from the United States.

Import licenses issued by the Giunta Tecnica Interministeriale are valid for only one shipment, even though such shipment covers only part of the commodities originally licensed for import into Italy.

The Giunta Tecnica Interministeriale will cable to the Italian High Commission in Washington the numbers of the import licenses granted, so that such Commission may approve the corresponding applications for export licenses when filed with the War Trade Board.

#### Ford to Turn War Profits to Government

DETROIT, Aug. 31—Henry Ford will turn back to the Government his entire share of profits gained on war work contracted by the Ford Motor Co. This means that hundreds of thousands of dollars will be returned to the Government. Ford does not hold any of the war contracts personally, but the Ford Motor Co. in which he owns over one-half of the capital stock received the Government business and it is only the disposition of his own shares that Ford has reference to. It is not stated whether the other stockholders will follow suit and return their profits also.

The company is working on Liberty engine cylinders, Liberty engines, caissons for Ordnance Department, helmets, tanks, the naval boats known as Eagles, and other work.

None of the contracts having been completed, no profits as yet have been paid. Various contracts are progressing and the Government is paying the bills for costs, as they are rendered from time to time. Profits will be figured at the completion of the work. At that time Ford will turn his portion of such profit into the United States treasury.

These various contracts were taken at the solicitation of the Government at prices fixed by it and which prices include a profit of about 10 per cent more than cost. The price on Liberty engines was fixed by the Government, but the Ford Motor Co. later voluntarily reduced the price something like 18 or 20 per cent and filed supplementary contracts with the Government on the revised figure.

Ford personally was willing to do all of this work without profit, but he was advised that this could not be done without violating the duty of the officers to stockholders, and besides the Government officials preferred that the contracts should carry with them the same terms as those which had already been made with other contractors for the same kind of work.

#### Ford Has 5000 Service Stars

DETROIT, Aug. 31—There are now 5000 stars in the service flag of the Ford Motor Co. Among those who are represented in the flag are 400 repairmen serving in France as a unit.



## Exports to Norway Restricted

### Requests for Licenses to Export Tires and Oil Now Require Definite Guarantee

WASHINGTON, Aug. 31—Applications for licenses to export automobile and motorcycle tires and tubes and oils to Norway which are not controlled by a Norwegian import association, states the War Trade Board, will not be considered unless the prospective importer has given a guarantee certified by the Norwegian Finance Department and further certified by an American consul in Norway who will furnish the importer an identification number.

It is no longer necessary to have a code word with the identification number. The number should be forwarded by the importer to the prospective exporter in the United States and specify on supplemental information sheet X-106, which should be attached to the application for an export license.

Applications for licenses to export automobile and motorcycle tires and tubes and oils which are controlled by a Norwegian import association must be accompanied by a certificate secured by the importer from the association. This certificate must be either issued or confirmed subsequent to May 10, 1918. The identification number of the certificate should be forwarded by the importer in Norway to the exporter in this country and specified on the supplemental information sheet X-106, which must be properly executed and annexed to the application for export license.

In filing an application for a license to ship these commodities the shipment must be consigned to the association which has issued the certificate, and the exporter must state the name of the person or firm in whose favor the imports certificate was issued, as for example:

Consignee	{ Royal Norwegian Automobile Club
Purchaser Abroad	{ (Here state person or firm to whom certificate was issued)
	{ Address of such person or firm

The War Trade Board states that the following import associations in Christiania will accept consignments of the following articles on behalf of the Norwegian importer actually interested:

Royal Norwegian Automobile Club—Automobile tires and tubes, motorcycle tires and tubes.

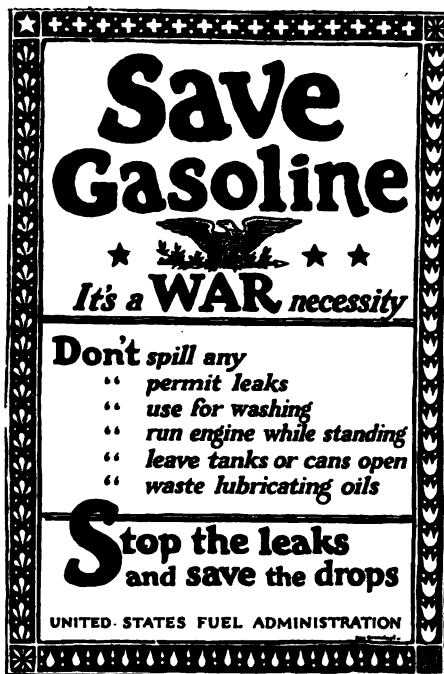
Norwegian Cycle Tire Importer's Association—Bicycle tires.

Lubricating Oil Merchants' Association—Lubricating oils, lubricating greases.

#### Air Mail Service Successful

WASHINGTON, Sept. 3—The air mail service between Washington, Philadelphia and New York operated during August without any serious delay or

miss. There were 27 flying days during which 108 legs of the journey were made and during this time but two forced landings were made, one with the delay of 7 min. and the other less than 10 min. One forced landing was made within 4 miles of Belmont Park, the end of the



*This is the poster which the Fuel Administration has prepared and which will be distributed all over the country in the gasoline-saving campaign.*

journey, and was caused by a break of the magneto shaft. The other forced landing was caused by a compass fault, obliging the pilot to land to pick up his course when the instrument failed to operate. The total possible miles of flight were 11,961, of which 11,957 were completed.

During the first 10 days of the month army fliers operated the planes and during the last 20 days the routes were handled by civilian fliers of the Post Office Department, following the taking over of the air mail service from the War Department by the Post Office Department. A total of 5879 lb. of mail was carried. A rigid mechanical maintenance service has been inaugurated, and during the last month not one of the 15 planes in the service was laid up for repairs.

#### Big Drop in British Imports

LONDON, ENGLAND, Aug. 15—In the fiscal year ending March 31, 1917, there were imported into Great Britain 440 complete motor cars as compared with 5740 the previous year. There were imported 105 chassis as compared with 330 in the previous year; and 655 complete motorcycles as compared with 750. This at 33 1/3 per cent duty which is imposed on automobiles, motorcycles, accessories and components brings the revenue to \$1,068,645.

## No More Priorities for Refineries

### Present Refining Capacity Considered Ample—Necessary Enlargements Allowed

WASHINGTON, Aug. 31—Priorities for materials to be used in the construction of new oil refineries will not be approved, according to an announcement made to-day by the Fuel Administration. The present refining capacity in the mid-continent oil fields is considered ample. Priorities will be approved for materials to maintain existing facilities and for such additions thereto as are necessary in the national interest.

Reasonable use of gasoline-driven vehicles as a means of necessary transportation where no other means are available is not prohibited by the Sunday driving ban, says the Fuel Administration. The intention is that all mere pleasure riding be eliminated, but that necessary use of the automobile should not be interfered with. The individual is expected to determine conscientiously the difference between "pleasure riding" and "necessary use." The Fuel Administration will not attempt to tabulate Sunday automobile traffic.

That the measure is regarded as a temporary one, likely to be enforced only for a few Sundays, is shown by the following statement by M. L. Requa, Director of the Oil Division of the U. S. Fuel Administration:

"Motorists are requested," said Mr. Requa, "to initiate every means of conservation possible in the handling and use of gasoline and lubricating oils. The useless operation of engines when the car is not in motion must be discontinued. Extreme care must be exercised that gasoline and oil are not spilled; that leaks are not tolerated and evaporation not permitted. The gasoline and lubricating oil user must realize that there is not an inexhaustible supply of crude oil, and he must appreciate the fact that the need for it now exceeds that of any previous time.

"War needs must be first supplied. By conserving through the non-use of motor-driven vehicles for a few Sundays and the exercise of care in the use of gasoline and oil during other days, there probably will be no necessity for more severe control.

"If this program is followed to the extent that the Fuel Administration believes it will be, a few Sundays will effect the desired conservation."

#### Test Chicago-New York Air Mail Service

WASHINGTON, Sept. 3—Air mail service between New York and Chicago will be tested Thursday, Sept. 5, by the Post Office Department, when a Curtiss and a Standard airplane, each carrying mail, will leave Belmont Park at New York at 6 a. m. to arrive at Chicago at 4 p. m. If successful, this will be the first time that a machine has flown between the two cities in 1 day. The route will be called the Woodrow Wilson Air Way. Stops will be made at Lock Haven at 8.30 a. m., Cleveland at noon, and Bryan, Ohio, at 1.30 p. m., for gasoline

and oil. The schedule calls for a speed of 80 m.p.h., which can be easily maintained unless diverse head winds are encountered. The pilots will chart the course for distinguishing landmarks, safe landing places and to discover the mountains and ravines which create air currents.

The return trip will be made on Saturday, Sept. 7, starting from Grant Park, Chicago, at 6 a. m. The total distance is 745 miles. The postage rate will be the same as on the New York-Washington route, 16 cents for the first ounce and 6 cents for every ounce thereafter. If the service is successful it is expected the Post Office Department will install night air travel between the 2 cities next spring when the planes will leave New York City at 9 p. m. with the heavy afternoon mail and arrive in Chicago for the first morning delivery.

The New York-Chicago route, if established, will be the last air route installed by the Post Office Department until the end of the war.

#### Warns Against Use of Agents to Secure Priority Certificates

WASHINGTON, Aug. 31—Manufacturers and the public generally are advised of the uselessness and inadvisability of employing agents to obtain priority certificates or preferential treatment from the War Industries Board in an open letter by Edwin B. Parker, Priority Commissioner of the Board. The letter follows:

#### TO THE PUBLIC:

"The attention of the Priorities Division of the War Industries Board has been called to the fact that certain individuals are offering their services and soliciting employment to present priority applications and procure the issuance of priority certificates, and also to use their alleged influence in having industries accorded preferential treatment.

"The rules and regulations of the Priorities Division are clear, simple, can be readily followed and will be furnished to anyone applying therefor. The employment of agents not only burdens the applicant for priority with a wholly unnecessary expense, but an attempt on the part of such agents to exert personal influence—which it is needless to say they do not possess—may have a tendency to prejudice the applicant's cause.

"EDWIN B. PARKER,  
"Priorities Commissioner."

#### Milwaukee Dealer Convention Sept. 11

MILWAUKEE, Sept. 2—The Milwaukee Automobile Dealers' Association has taken the initiative in the organization of a state association of dealers and garagemen by calling a mass meeting at Milwaukee on Wednesday, Sept. 11, during State Fair week. Invitations have been issued to approximately 1700 members of the trade in Wisconsin to attend a dinner at the Milwaukee Athletic Club, to be followed by an organization session, at which it is hoped to present F. W. Vesper, St. Louis, president of the National Automobile Dealers' Association, and E. E. Peake, Kansas City, executive secretary of the N. A. D. A., as the principal speakers.

## Michigan Now Short 10,000 Men

### Employment Office Unable to Supply This Number—Machinists Most Needed

DETROIT, Aug. 30—The Michigan district of the United States Employment Service estimates the present shortage of labor in this state to be over 10,000 men. The office arrives at this figure by taking into consideration the number of men demanded by the industries and which the office is unable to secure to meet requirements.

The office receives requisitions from industries every week for 10,000 more men than it is possible to supply. Half of this demand is for highly skilled men and the other half is for common labor; there is only a slight shortage of semi-skilled workers. Of skilled workers, 90 per cent of the demand is for all around machinists; the remaining 10 per cent is for tool makers.

The recent announcement of a shortage of 30,000 men prevailing here was rather misleading, according to an official of the government office. The estimate, he believes, was based on an anticipated demand due to the increasing volume of war work rather than on an actual count of present requirements. Owing to the adjustments made in the various industries the actual labor shortage has not developed to such great proportions as anticipated.

#### Detroit Places 4000 Men

The Detroit offices placed a total of 4000 men last week, of which 65 per cent were semi-skilled men and the balance was evenly divided between common and skilled workers. The week previous a total of 3200 men were placed.

When Provost Marshal-General Crowder's recent "work or fight" order was put into effect an increase of 5 to 10 per cent in the number of applications coming in was noted, but this order is not credited for the stimulation, as a steady increase is manifested from month to month. The number of men placed each month is always greater than that of the preceding month. The office is at a loss to know where all the men come from. Of course, a small percentage of this number are "come-backs."

It is believed that the general conditions are having an influence on men, causing them to seek more essential work. The men early foresaw the present situation and voluntarily set about to seek places of employment where they would be less liable to be disturbed by the Government.

For the 6-month period—Jan. 1 to June 30, 1918—the Detroit office placed a total of 12,874 men. Between the months of April and May a very marked jump in the number of applications is recorded. Twenty per cent more business was done during this period than any time previous or since. With the exception of

this period the percentage of increase has been almost uniformly 5 per cent.

#### Steel Inventories Asked

WASHINGTON, Sept. 3—A nationwide inventory of stocks of steel on hand is being made by the War Industries Board in co-operation with the Department of Commerce to ascertain the supply of steel. The deficiency of production of steel for direct and indirect war needs is the cause of the inventory. More than 40,000 manufacturers have been asked by questionnaires to report the stocks of steel. The present estimated total production of steel is 17,000,000 tons and war demands total over 23,000,000 tons and are constantly increasing.

A number of industries, says the statement issued by the War Industries Board, such as the automobile industry, have been called upon to report stocks of steel on hand so that the War Industries Board could be guided in making an intelligent administration of the steel stocks, but the Board decided that it was necessary to gather complete information from all steel-using industries determined on a general inventory from all manufacturers.

#### Aircraft Bureau Needs Men

WASHINGTON, Sept. 3—An urgent need for accountants and manufacturing cost clerks who have had either office or factory experience, is made public by the Bureau of Aircraft Production. A limited number of voluntary inductions of men registered under the present draft will be allowed. Induction is open only to men in class 1-A who are classified for limited service or who are in the remediable group, and to men placed in deferred classes on account of dependents. The work will not only be of great service to the Government in the production of airplanes, states the Bureau of Aircraft Production, but it will prove beneficial to the individuals because of the training they will receive. Applicants should communicate with the Personnel Officer, Finance Division, Bureau of Aircraft Production, 119 D Street, N. E., Washington, D. C.

#### Wisconsin Registration Total \$2,049,680

MILWAUKEE, Sept. 2—Wisconsin motorists paid the sum of \$2,049,680 into the coffers of the State of Wisconsin in registration and license fees during the fiscal year ended June 30, 1918, according to the report of the Secretary of State. For the previous period the income was \$834,142. The large gain is due both to the doubling of fees in Jan. 1, 1918, and the vast gain in the number of cars registered. Since the beginning of the present year owners pay an annual fee of \$10, instead of \$5; dealers pay \$25, instead of \$10, and trucks pay a graduated fee according to weight, ranging from \$15 to \$25, instead of the flat fee of \$5 formerly in effect.

**To Produce New Milling Machine**

MILWAUKEE, Sept. 2—Frank M. Davis, formerly president and general manager, and John T. Thompson, formerly vice-president and works manager of the Davis Mfg. Co., Milwaukee, now the gas engine division of the Avery company, Peoria, Ill., have perfected a new type of milling machine in the manufacture of which they will engage at once. Experimental work has been completed and arrangements made for quantity production under contract with the Smith Engineering Works, Milwaukee, until it is found practicable to build and equip a new plant in West Allis, on a site already acquired. The machine will be known as the Davis-Thompson continuous miller. The principal feature of this design, which is entirely new, is that it has two sets of milling cutters and a round table, enabling one machine to do both the rough and finish cutting without removing the work from the table. It is claimed the machine does the work of six ordinary millers. Patents have been granted to Davis and Thompson, who will conduct the business under the name of Davis-Thompson Co.

**Madison Motors Merges With Bull Tractor**

INDIANAPOLIS, Aug. 31—The Madison Motors Corp., which was formed in 1915, has merged with the Bull Tractor Co., Minneapolis. The capital is \$1,500,000 preferred and \$1,200,000 common stock. Cecil Gibson, formerly president and general manager of the Madison Corp., is president of the new company, L. A. Brown is treasurer and John F. Green and Frederick N. Judson, formerly controllers of the Bull Co., are on the board of directors. Mr. Green has just succeeded ex-President Taft on the War Labor Board. The factory of the new company is located at Anderson, Ind. Homer McKee will handle the advertising.

**Reed Foundry on 75 Per Cent War Basis**

KALAMAZOO, Aug. 28—The Reed Foundry & Machine Co., which manufactures the "One Man" tractor, is making steel castings for different branches of the war department, for tanks, ships, hydraulic parts used for piercing shells, iron working lathes to be used in machining and finishing shells. Castings for ditching and dredging machinery are made, and these are sent abroad for trench work. Castings are also made for winches and cranes used in powder plants. Over 75 per cent of the Reed company's foundry work is for Government account.

**Automobile Men in Go-Cart Co.**

STURGIS, MICH., Aug. 31—Several prominent Detroit manufacturers and business men have interested themselves in the newly reorganized Sturgis Steel Go-Cart Co., among whom is Norval A. Hawkins, general sales manager of the Ford Motor Co., who is the directing

**Current News of  
Factories***Notes of New Plants—Old  
Ones Enlarged*

spirit of the new enterprise. The company will continue to make the product for which it was designed with certain allied lines which may be taken on later. The new company will be composed of the following officers and directors: President, Charles B. Tuttle, president of the Tuttle & Clark Co., automobile accessories dealer; vice-president, F. L. Burdick of Sturgis, associated with the go-cart company since its inception; secretary and treasurer, D. L. Seymour of Detroit, stocks and bonds. In addition to the officers the directorate is composed of Norval A. Hawkins and John R. Bodde, vice-president of the Peoples' State Bank, Detroit. Among the stockholders is A. L. McMeans, secretary of Dodge Brothers, Detroit.

**Aluminum Castings Expands for War Work**

CLEVELAND, Aug. 29—For the purpose of expediting war work the Aluminum Castings Co. is greatly enlarging its plant. Work is just being completed on one building, 120 by 260, and two more buildings will be constructed on the adjoining land. One of these buildings, which will be used as a core room, is 140 by 260, and costing \$100,000. The company is also erecting sand bins, 32 ft. high, in a building 150 by 460, at a cost of \$150,000. When the two buildings are completed the Aluminum Castings Co. will have six buildings in a group.

**National Tractor Gets New Plant**

CEDAR RAPIDS, Aug. 31—The National Tractor Co. has just finished a large reinforced concrete, brick and steel addition more than doubling the capacity of the plant. This company is building tractors under the Denning patents. The Chicago offices of the company were recently moved to Cedar Rapids, and an Eastern and export sales office has been opened at 151 Fifth Avenue, New York.

**Victor Screw Works Increases Capital**

The Victor Screw Works, Detroit, has increased its capital stock from \$250,000 to \$500,000.

**Dividends Declared**

At a recent meeting of the directors of the Sewell Cushion Wheel Co., Detroit, a 7 per cent cash dividend was declared on both common and preferred stock, which was paid in July to stockholders of record June 15.

The Jordan Motor Car Co., Cleveland, on Aug. 1 paid an 8.6 per cent dividend to stockholders of the original preferred.

**Stegeman Becomes Parker Motor Truck**

MILWAUKEE, Aug. 31—The Stegeman Motor Car Co., which produces the Stegeman truck, has changed its name to Parker Motor Truck Co. The company states: "The name was changed only after careful consideration. The founder of the company has practically no connection with the present organization at all. It was a name of German origin and we believe that as our soldiers return and tell us of what Germany has stood for the prejudice against everything of German origin will be many times greater than it is now."

**Limousine Top Seeking War Work**

KALAMAZOO, Aug. 29—The Limousine Top Co., which manufactures demountable limousine tops, closed bodies and truck cabs and bodies, is seeking to turn its factory over to government production and is bidding on eight or ten items, such as mess tables, packing cases, ambulance bodies, field hospital equipment, etc. The company recently built a three-story addition to its plant, covering a plot 164 by 66.

**Lane 50 Per Cent on Government Work**

KALAMAZOO, MICH., Aug. 31—The Lane Motor Truck Co. is making fifty complete trucks a month for the Government, and the output will be increased to 100 per month within 60 days. The company expects within that time to be devoting itself 75 per cent to Government work. The trucks are of 1½ tons, 2 tons and 3½ tons capacity.

**More Room for Falls**

MILWAUKEE, WIS., Sept. 2—The Falls Motors Corp., Sheboygan Falls, Wis., has broken ground for another factory addition, 60 x 176 ft., of brick and steel, to provide the additional facilities required to handle its Government contracts for vehicle and aircraft engines.

**Galesburg Plant For Dependable**

GALESBURG, ILL., Aug. 31—The plans have been approved for the factory of the Dependable Truck & Tractor Co. The structure is to be 100 ft. in width and 300 in depth and will be completed about Dec. 1. In the meantime, trucks will be manufactured in the temporary quarters secured here.

**Fire Visits Inner Shoe**

GRAND RAPIDS, MICH., Aug. 31—The plant of the Inner Shoe & Tire Co. was destroyed by fire, the damage being estimated at \$30,000, of which \$7,000 is on the building and \$23,000 on the contents. A new factory will be erected on the same site.

**Capital Increases**

The Van Dorn Electric Tool Co., Cleveland, has taken out a permit for a two-story machinshop addition, 37 by 31.

The Dayton Castings Co., Dayton, Ohio, has increased its capital stock from \$15,000 to \$50,000.



**Owston Made Major**

C. W. Owston, formerly purchasing agent of the McCord Mfg. Co., Detroit, has been promoted from captain in the Ordnance Officers' Reserve Corps to major.

George R. Cullen has been added to the staff of the Bearley-Hamilton Co., advertising agent, Grand Rapids, Mich. He was formerly publicity manager of the Hudson Motor Car Co. and editor of the Triangle and the Hudson Super-Six News-Pictorial.

Glenn A. Sanford, who has been associated with the Jackson Steel Products Co., Jackson, Mich., for some time, has been appointed sales manager of the rim division of that company.

Dwight Davis, for some years assistant to the general manager of the Hyatt Roller Bearing Co., Newark, N. J., assumed the position of assistant to the general manager of the Ever Tight Piston Ring Co., St. Louis, on Sept. 1.

T. P. C. Forbes, for some time a partner of John N. Willys, has been appointed assistant sales manager of the Fulton Motor Truck Co. For the past ten months Mr. Forbes has been general traveling representative with the Fulton Co.

V. Hughes has resigned from the Overland Motor Co. to enter Government service as aeronautical engineer, Aviation Section, Signal Corps, and is assigned to McCook Field, Dayton, Ohio.

W. G. Bell has been appointed Canadian sales manager of the Cleveland Tractor Co., Cleveland. For the past four years he has been assistant sales manager in the Dominion of Canada for the Studebaker Corp.

Thomas A. DeVilbiss, president of the Toledo War Industries Commission, has been appointed sub-regional chairman for the Toledo district.

H. B. Garman has been appointed plant manager of the Detroit plant of the Steel Products Co. He has been associated with the company for a number of years as superintendent of the Detroit factory.

George A. Robson, for 3 years office manager and first assistant to the officials and advertising manager of the Chalmers Motor Co., has resigned. He has formed no other connection, but expects to do so shortly.

Clem Jackson has been promoted from the position of assistant chief engineer to chief engineer of the Erd Motor Co., Saginaw. He was formerly with the Mitchell Motor Co., Racine, and at one time was assistant chief engineer of the Haynes Automobile Co., Kokomo.

E. C. Newcombe has been made a director of the Four-Drive Tractor Co., Big Rapids, Mich., and also vice-president. Two resignations from the directorate are those of George A. Wright

## Men of the Industry

### Changes in Personnel and Position

and Harley Frederick, the latter of whom is expected to remain as manager.

C. B. Meyers has been appointed manager of the sales promotion department of the United States Motor Truck Co., Covington, Ky.

L. F. Miller, formerly of the Mitchell Motors Co., Racine, Wis., has accepted a position with the Anderson Forge & Machine Co., Detroit, as metallurgist.

**Franklin Prices Increased \$450-\$600**

SYRACUSE, Aug. 31—The Franklin Automobile Co. has increased the prices of its cars from \$450 to \$600, effective at once. The new prices follow:

Model	New Price	Old Price
4 and 5 pass. tour.....	\$2,900	\$2,450
2 pass roadster.....	2,850	2,450
Sedan .....	3,350	2,950
Brougham .....	3,300	3,300
Town car .....	4,050	3,450
Limousine .....	4,050	3,450

**Congress of National Safety Council to Deal With Accident Prevention**

CHICAGO, Aug. 31—The seventh annual congress of the National Safety Council, which will convene at the Hotel Statler, St. Louis, from Sept. 16 to 20, will be devoted to all aspects of accident prevention and allied topics in relation to war conditions. A message emphasizing the pressing need for conserving man power will be received from President Wilson, the Hon. Franklin K. Lane will deliver an address on "Safety as an Asset in Winning the War," and Charles M. Schwab, director of the Emergency Fleet Corporation, will speak on "The Democratization of Industry." Other addresses on allied subjects of importance will be given by men of recognized authority.

**Representatives of Parts Manufacturers Co-operate With Dauch**

SANDUSKY, OHIO, Aug. 31—The Dauch Manufacturing Co., builder of the Sandusky tractor, has arranged with the various companies manufacturing standard parts used in the construction of the tractor to co-operate to the limit of their various capacities in speeding up production and insuring a more efficient tractor. Accordingly, one executive from each company has been selected to become a member of the Dauch executive board, where he will give the company the benefit of his specialized experience, and thus help in the development of co-operative manufacture.

**Kettering to Address Detroit Section**

DETROIT, Aug. 31—C. F. Kettering, president of the Dayton Engineering Laboratories Co. and president of the Society of Automotive Engineers, will address the Detroit Section on the subject of the future of the airplane industry after the war. The meeting will be held on Sept. 20 at the Hotel Pontchartrain, Detroit, at 8 p. m. It is expected that a number of out-of-town people from the airplane industry will be present to hear Mr. Kettering's address.

**Tractor Rally for Milwaukee**

MILWAUKEE, Sept. 4—Final plans for a state-wide tractor rally to be held in Milwaukee during State Fair week, Sept. 9 to 14, were made by the Wisconsin Power Farming Association at a meeting on Tuesday evening, Sept. 3. The association met on Aug. 27 to discuss plans and postponed action for one week in anticipation of a full attendance of members, each of whom is a sales manager, branch manager or distributor of farm tractors in Wisconsin.

The purpose of the rally will be to bring to Milwaukee all dealers and owners of tractors so that they may be informed concerning the service plan being evolved by the association.

**Machine Shop Men Organize for War Work**

DETROIT, Aug. 31—Another step in the organization in the individual industries of District No. 1 of the Michigan war resources committee of the War Industries Board was taken recently, when the machine shop owners of Wayne, Oakland and Monroe counties met in the Detroit Board of Commerce. The purpose of the meeting was to organize machine shop men so that a survey of their facilities can be made. Similar meetings of the stamping and forging and casting manufacturers have been held and it is planned by the district head to organize all individual industries in the same manner with a sub-chairman in charge of each.

**Some Statistics from Ford**

DETROIT, Aug. 31—Slightly more than 3000 workers from the Ford Motor Co. plant have been transferred to the Ford shipbuilding plant to work on the Eagles within the last 3 months. Between 15 and 30 young men are leaving the plant daily to take their places in the ranks of the navy or the army. Very nearly 6000 have left the factory for national service during the past year.

**Oil Storage in France**

WASHINGTON, Aug. 31—Four oil tanks of 55,000-barrel capacity each have been secured by the Quartermaster Corps for shipment to France, where they will be erected for the use of the American Expeditionary Forces. These tanks will give storage for 11,000,000 gal. of oil or gasoline, approximately the requirements for a 2-month period.

# Industrial Review of the Week

## A Summary of Major Developments in Other Fields

### Pig Iron Production Falls— Washington Conference

As was expected, August pig-iron production fell below that of July. It was at a less rate also than the outputs of April, May and June, but was higher than that of any other month since May, 1917. The total was 3,389,585 gross tons, or 109,341 tons a day, against 3,420,988 tons in July, or 110,354 tons a day—a falling off in the daily rate of about 1000 tons.

The meeting of iron and steel manufacturers in New York on Aug. 28 was occupied solely with the labor question and the matter of possible price changes for the last quarter of the year was not touched. Leaders in the industry realize that even the present insufficient rate of production cannot be maintained unless special measures are taken in connection with the new draft. More important still is the maintenance of existing hours and the safeguarding of the industry for the period of the war against such restrictions of output as have commonly accompanied union control. Some of the recent Washington decisions of labor issues have evidently not taken into account the grave consequences to the war program which would result from a wide enforcement of such findings in the steel and metal-working trades.

The conference on iron and steel prices between the general steel committee and the War Industries Board is appointed for Sept. 18 at Washington. An all-day meeting of the committee in New York, Sept. 3, will be followed by others at which the requests of various groups of manufacturers for higher prices will be considered.

Representatives of the malleable castings industry at a meeting in New York Aug. 30 adopted prices, making a number of revisions in the existing schedule, and these will be recommended to the War Industries Board.

The threatened inventory of the country's stocks of finished steel has been ordered by the War Industries Board. Manufacturing consumers of rolled iron and steel must report what they have down to the smallest holdings. Commandeering of surplus stocks for war purposes is a probable next step.—*Iron Age*.

### Edge May Re-enter British Trade

LONDON, ENGLAND, Aug. 20—S. F. Edge, who was one of the pioneer automobile dealers in England, and who had the sole selling rights of the Napier, will, in all probability re-enter the automobile field. When he sold the Napier for \$1,000,000 one of the conditions was that he should not engage in the automobile industry directly or indirectly for a period of 10 years. That period will soon expire and it is expected that Mr. Edge

and several other manufacturers will develop a line of low-priced automobiles. Nothing is definitely announced yet as to the type of car that will be built.

### California Oil Production Decreases

SAN FRANCISCO, Sept. 5—The production of crude oil in California fields decreased 1037 barrels a day during July as compared with June. During July the total production was 87,737,629 barrels, which averages 281,859 barrels a day. There were 54 wells completed in July with an initial output of 12,022 barrels daily, compared with 46 wells finished in June with an initial daily output of 5492 barrels. Stocks of crude on hand Aug. 1 were about 200,000 barrels in excess of the quantity on hand July 1.

### England Has 3780 Fordsons

LONDON, ENG., Aug. 13—According to a report made in the House of Commons last week there are 3780 Fordson tractors at the disposal of the Food Production Department. There are also 1700 heavier tractors of the following types at the disposal of government departments as follows: Titan, Mogul, Saunderson, Overtime and Clayton. In all some 3780 Fordson tractors are proposed to be used for the department's own tractor scheme, as a large number, if not the majority of these tractors, have been transferred to Henry Ford & Sons for distribution through regular trade channels.

### To Curb Rent Profiteering

WASHINGTON, Sept. 4—To curb rent profiteering in war manufacturing localities the Department of Labor has introduced a bill in Congress, allowing the President to requisition houses and apartments where the rent is excessive for the duration of the war. In event the landlord is not satisfied with the compensation set by the Government, he is entitled under the terms of the bill to sue the Government.

### 1200 Military Tractors a Month

WASHINGTON, Sept. 4—Production of military tractors is now averaging 1200 per month, according to a statement made here this week by the Acting Secretary of War. He stated further that this production is "not nearly what it should be."

### Shuler Axle Expanding for War Work

DETROIT, Aug. 31—The Shuler Axle Mfg. Co. has increased its capital stock from \$150,000 to \$200,000 to allow for further expansion of its plant to meet government requirements. The company is already on a 95 per cent war basis, indirectly, furnishing axles to manufacturers who have received government orders.

### Bituminous Production Better—A Car Shortage

During the week ended Aug. 24 the production of bituminous coal showed the first improvement in five weeks, due to a slight betterment in the car supply. The output for that week totaled 12,603,000 net tons, and would have been much greater if the car allotment had been regular and the loaded cars had been speeded away from the mines. In fact, the erratic car supply during the month of August was at once the despair of the Federal Fuel Administration—which sees the demand for coal growing larger and larger—and a stumbling block to the operator—who wishes to keep his laboring forces intact and instead finds his men leaving for industries that promise more steady employment.

Anthracite production is not only keeping up, but shows an increase in output for the week ended Aug. 24 with the shipment from the mines of 2,134,000 net tons. The total production of anthracite for the coal year to date is estimated at 41,768,000 net tons, an increase over 1917 of 869,000 net tons.

The Lake trade is active. Under governmental stimulus a larger tonnage is being moved from Ohio and West Virginia to the lower lake ports. Shipments are still behind pre-season estimates, however, and in order to enable the Pittsburgh region to meet its quota coal is being withheld from all nonessential industries in that district, while plants on the preference list which had been receiving only 50 per cent of their requirements are to be still further reduced. There is strong basis for the feeling that the Northwest will be supplied before the close of navigation.—*Coal Age*.

### Reorganization of Motor Transport Corps

WASHINGTON, Sept. 4—The article telling of the organization of the Motor Transport Corps in AUTOMOTIVE INDUSTRIES of Aug. 22 was not the official Government statement. The official publicity telling of the organization of this Corps was not given out until one week following the publication of this fact in AUTOMOTIVE INDUSTRIES. The article published in AUTOMOTIVE INDUSTRIES comprised opinions and information gathered here combined with the history of past military truck activities known publicly prior to this reorganization, and which had been told previously in these columns. Copy of the order organizing the Motor Transport Corps which was reproduced was secured from the office of the Adjutant General. These statements are made at the request of War Department officials who are desirous having the public understand that this article was not the official one.

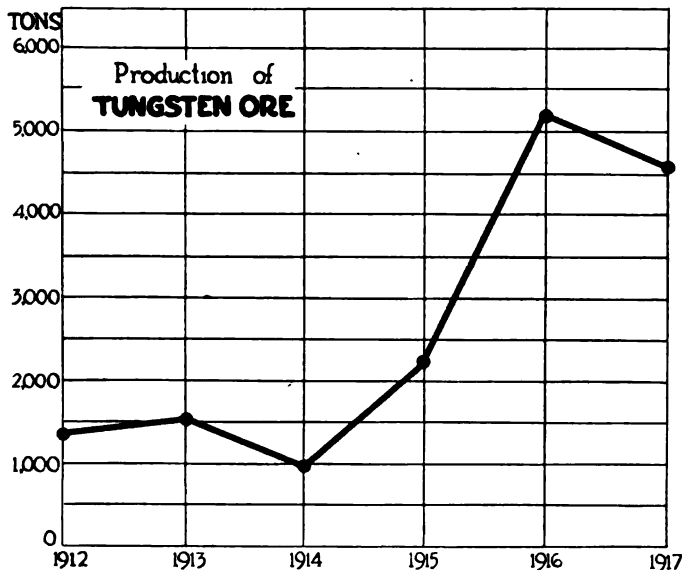
## AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>		<b>Fabric, Tire (17½ oz.):</b>	
Muriatic, lb. ....	.02-.03	Sea Is., combed, lb. 1.65-1.70	
Phosphoric, ct. ....	.35-.39	Egypt, combed, lb. 1.25-1.35	
Sulphuric (60), lb. ....	.009	Egypt, carded, lb. 1.20-1.30	
<b>Aluminum:</b>		Peelers, combed, lb. 1.05-1.20	
Ingot, lb. ....	.33	Peelers, carded, lb. .95-1.05	
Sheets (18 gage or more), lb. ....	.40	Fibre (¼ in. sheet base), lb. ....	.50
Antimony, lb. ....	.13½-.14½	<b>Graphite:</b>	
<b>Burlap:</b>		Ceylon, lb. ....	.07½-.25
8 oz., yd. ....	.18	Madagascar, lb. ....	.10-.15
10 oz., yd. ....	.23	Mexican, lb. ....	.03½
<b>Copper:</b>		Lead, lb. ....	.08-.09
Elec., lb. ....	.26	<b>Leather:</b>	
Lake, lb. ....	.26	Hides, lb. ....	.18-.35½

<b>Nickel, lb. ....</b>	.40-.43
<b>Oil:</b>	
Gasoline:	
Auto., gal. ....	.24½
68 to 70 gal. ....	.30½
<b>Lard:</b>	
Prime City, gal. ....	2.30
Ex. No. 1, gal. ....	1.60
Linseed, gal. ....	1.90
Menhaden (Brown) gal. ....	1.30-1.31
Petroleum (crude), Kansas, bbl. ....	2.25
Pennsylvania, bbl. ....	4.00
<b>Rubber:</b>	
Ceylon:	
First latex pale crepe, lb. ....	.63
Brown, crepe, thin, clear, lb. ....	.60

<b>Smoked, ribbed sheets, lb. ....</b>	.62
<b>Para:</b>	
Up River, fine, lb. ....	.68
Up River, coarse, lb. ....	.40
Island, fine, lb. ....	.59
Island, coarse, lb. ....	.27
<b>Shellac (orange), gal. ....</b>	.70-.76
<b>Spelter ....</b>	.09½-.09¾
<b>Steel:</b>	
Angle beams and channels, lb. ....	.03
Automobile sheet (see sp. table).	
Cold rolled, lb. ....	.06½
Hot rolled, lb. ....	.03½
<b>Tin ....</b>	.80-.81
<b>Tungsten, lb. ....</b>	2.40
<b>Waste (cotton), lb. ....</b>	.12½-.17



The effect of the war is shown in the largely increased production of Tungsten ore since 1914. Last year showed a slight falling off compared to 1916, but nevertheless the value of the 1917 production was \$5,100,000

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping....	6.20	6.10
Automobile body stock, extra deep stamping .....	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping .....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
Black Sheet Extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Automotive Securities Quotations on the New York Exchange

	Bid	Asked	Net Ch'ge		Bid	Asked	Net Ch'ge
Ajax Rubber Co. ....	62	64	..	Kelly-Springfield Tire Co., 1st pfd. ....	81	87	+1
J. I. Case T. M. Co., pfd. ....	78	83½	-2	Lee Rubber & Tire Corp. ....	19¼	20¼	+ ¼
Chalmers Motor Co., com. ....	4½	5½	..	Maxwell Motor Co., Inc., com. ....	26¼	27¼	+ ¼
Chalmers Motor Co., pfd. ....	20	30	..	Maxwell Motor Co., Inc., 1st pfd. ....	56¼	57½	+ ¼
Chandler Motor Car Co. ....	86	88	-1½	Maxwell Motor Co., Inc., 2nd pfd. ....	20	21	- ¼
Chevrolet Motor Co. ....	127	130	-12	Miller Rubber Co., com. ....	106	108	+1
Fisher Body Corp., com. ....	35	37	-1	Miller Rubber Co., pfd. ....	95	96	..
Fisher Body Corp., pfd. ....	85	..	-4	Packard Motor Car Co., com. ....	..	120	..
Fisk Rubber Co., com. ....	60	62	..	Packard Motor Car Co., pfd. ....	94	97	..
Fisk Rubber Co., 1st pfd. ....	98	103	..	Paige-Detroit Motor Car Co. ....	17	18	..
Fisk Rubber Co., 2nd pfd. ....	78	83	..	Peerless Truck & Motor Corp. ....	15	17	..
Firestone Tire & Rubber Co., com. ....	105	107	+1	Portage Rubber Co. ....	105	109	+1
Firestone Tire & Rubber Co., pfd. ....	94	96	..	Reo Motor Car Co. ....	14½	15½	..
General Motors Co., com. ....	132	137	-30	*Saxon Motor Car Corp. ....	6	7	+ ¾
General Motors Co., pfd. ....	78½	80	-3½	Standard Motor Construction Co. ....	12¼	13	- ¼
B. F. Goodrich Co., com. ....	44¼	45¼	+ ¼	Standard Parts .....	59	61	-1¼
B. F. Goodrich Co., pfd. ....	99	100½	+ ½	*Stewart-Warner Speed. Corp. ....	56	57	- ½
Goodyear Tire & Rubber Co., com. ....	150	155	..	*Studebaker Corp., com. ....	43	44	- ½
Goodyear Tire & Rubber Co., pfd. ....	97½	98½	..	*Studebaker Corp., pfd. ....	84	90	+2½
Grant Motor Car Corp. ....	2¼	3	..	Swinehart Tire & Rubber Co. ....	50	60	+5
Hupp Motor Car Corp., com. ....	2½	3½	..	United Motors Corp. ....	32½	33	- ¼
Hupp Motor Car Corp., pfd. ....	78	82	..	*U. S. Rubber Co., com. ....	62¼	63¼	..
International Motor Cor., com. ....	28	32	+1	*U. S. Rubber Co., pfd. ....	103¼	104¼	- ½
International Motor Co., 2nd pfd. ....	35	40	-1	*White Motor Co. ....	45¼	46¼	+ ¼
International Motor Co., 2nd pfd. ....	35	40	-1	*Willys-Overland Co., com. ....	19¼	19¼	- ¼
Kelly-Springfield Tire Co., com. ....	47½	48	- ½				

\*At close Aug. 3. Listed N. Y. Stock Exchange.



## Aircraft Production Purchases

WASHINGTON, Aug. 31—Following is a list of contracts placed by the Bureau of Aircraft Production recently:

Wright-Martin Aircraft Corp., New Brunswick, N. J., spares for 150-horsepower type A Hispano-Suiza engine.

Curtiss Aeroplane & Motor Corp., Buffalo, hexagon-head bolts with castellated nuts. Cherry Lumber Co., Cincinnati, 60,000 ft. walnut lumber.

Brown & Harris Lumber Co., Holmesville, Ohio, 50,000 ft. walnut lumber.

West Virginia Aircraft Corp., Wheeling, spares for 500 JN4D training planes: Engine-bed bearers, elevators, rudders, wings, landing gears, etc.

John A. Roebling's Sons Co., Trenton, 240,000 ft. balloon cable.

Pyrene Co., care of H. B. Vandergrift, Continental Hotel, Washington, D. C., 5000 Pyrene fire extinguishers.

Liberty Iron Works, Sacramento, spares for 100 JN4D planes: Elevators, vertical fins, landing gears, rudders, wings, etc.

International Register Co., Chicago, 3500 mechanical interrupter gears.

Dayton-Wright Airplane Co., Dayton, spares for D.H.4 planes: wings, stabilizer braces, front direct-wire fitting with tie rods.

Dayton-Wright Airplane Co., Dayton, parts for D.H.4 planes: wings, right and left ailerons, elevators, rudder, landing gears, etc.

Wright-Martin Aircraft Corp., New Brunswick, spares for Hispano-Suiza motors: Speedometer shaft and bushing assembly, cotter pins, air pump parts, gaskets, nuts, etc.

N. C. L. Engineering Corp., Providence, 50 N. C. L. windlasses, complete.

James Cunningham Son & Co., Rochester, 25 Caquot windlasses.

McKeen Motor Car Co., Omaha, Neb., 25 Burton windlasses.

Cleveland Tractor Co., Cleveland, 10 standard model H Cleveland tractors.

Livingston Radiator & Mfg. Co., New York, 541 Handley-Page type radiators.

Whittaker-Glessner Co., Portsmouth, Ohio, 700 steel drums, 110-gallon capacity.

Chase Metal Works, Waterbury, Conn., seamless copper tubing.

Sheffield By-Products Co., New York, N. Y., 40,000 pounds casein.

N. C. L. Engineering Corps, New York, N. Y., 1 N. C. L. kite balloon windlass.

Gilbert & Barker Mfg. Co., Springfield, 10 tanks of 10,200 gallons' capacity each.

Dobbie Foundry & Machine Co., Niagara Falls, 100 No. 21 single-drum hand-power hoists.

Henry Cheney Hammer Corp., Little Falls, N. Y., 14,400 hammers.

Henry Cheney Hammer Corp., Little Falls, 13,150 hammers.

Collier Supply & Equipment Co., Philadelphia, 43 electrical engineers' chests.

Blaw-Knox Co., Pittsburgh, furnishing and fabricating necessary structural steel and accessory structural material for the construction of 70 hangars.

Belmont Iron Works, Philadelphia, furnishing and fabricating 576 columns (approximately 1500 pounds each).

Whittaker-Glessner Co., Portsmouth, Ohio, 1000 steel drums, 110 gallons' capacity.

## Contracts

Ayer & McKinney, Philadelphia, 30,000 pounds casein.

Standard Aero Corp. of New York, Elizabeth, 30 E-1 advanced planes constructed to mount Gnome motors.

Standard Aero Corp. of New York, Elizabeth, 6 E-1 advanced planes constructed to take LeRhone motors.

Fedders Mfg. Co. (Inc.), Buffalo, 109 radiators complete, with inlet and outlet connections.

Hartsell Walnut Propeller Co., Piqua, 1000 wooden air fans.

Hardman, Peck & Co., New York, N. Y., 500 sets of laminations for Handley-Page propellers.

Parsons Pulp & Lumber Co., Philadelphia, 4,800,000 ft. spruce.

Light Mfg. & Foundry Co., Pittstown, spares for OX5 engine, upper and lower crankcase bearing caps.

Lamb, Finlay & Co., New York City, for services in connection with the handling, paying of duties, and shipping of airplane linens, tapes and balloon cloths, which are being imported from Great Britain for the Bureau of Aircraft Production.

Louisiana Oxygen Co., New Orleans, 500,000 cubic ft. hydrogen gas.

Isaac McLean Sons Co., Dorchester, Boston, 10,000 ft. African mahogany and 25,000 ft. Mexican or Central American mahogany.

Ericsson Mfg. Co., Buffalo, parts for Berling, type D81 magneto (99 items).

Link Tool & Machine Corp., New York, miscellaneous thread gages to be furnished from time to time.

Paul Whitin Mfg. Co., Northbridge, Mass., 25,000 yards cotton airplane fabric.

Wright-Martin Aircraft Corp., New Brunswick, spares for type 3 engine (43 items).

Wright-Martin Aircraft Corp., New Brunswick, spares for type 3 engine (43 items).

Universal Grinding Machine Co., Pittsburgh, 1 No. 2 grinder with C equipment.

Stewart-Hartshorn Co., New York, N. Y., 2000 sets complete streamline tie rods for D.H.4 machines.

Witherow Steel Co., Pittsburgh, 2000 sets complete streamline tie rods for D.H.4 machines.

Eastman Kodak Co., Rochester, 5000 United States Army unit sights.

J. V. Stimson & Co., Owensboro, Ky., 50,000 ft. walnut lumber.

Hoosier Veneer Co., Indianapolis, 500,000 ft. walnut lumber.

Canadian Aeroplane (Ltd.), Toronto, Canada, 12 wings for JN4D Canadian planes.

Disco Mfg. Co., Detroit, 3000 C. C. gun synchronizing generators.

Wireless Improvement Co., New York City, 1,500 S. C. R., 65 sets.

Arthur F. Smith Co., New York, N. Y., labor and material required to change 315 sets of curtains.

Electro Metallurgical Sales Corp., New York City, 1000 tons ferro-silicon.

Electro Metallurgical Sales Corp., New York City, 200 tons ferro-silicon.

Novo Engine Co., Lansing, air compressor outfits.

Wright-Martin Aircraft Corp., New Brunswick, crankcase.

Wright-Martin Aircraft Corp., New Brunswick, engine spares.

Wright-Martin Aircraft Corp., New Brunswick, engine spares.

Wright-Martin Aircraft Corp., New Brunswick, engine spares.

Positipe Co., Cleveland, paper film.

American Optical Co., Southbridge, Mass., 10,000 negative lenses.

Gleason Works, Rochester, generators.

Canadian Aeroplanes (Ltd.), Toronto, spares for JN4D planes.

English & Mersick Co., New Haven, radiators.

Dayton-Wright Airplane Co., Dayton, stabilizer braces.

Dayton-Wright Airplane Co., Dayton, stabilizer braces.

Dayton-Wright Airplane Co., Dayton, connections for gasoline rubber joints.

Dayton-Wright Airplane Co., Dayton, control cables.

Dayton-Wright Airplane Co., Dayton, control cables.

Dayton-Wright Airplane Co., Dayton, control cables.

Dayton-Wright Airplane Co., Dayton, stabilizer braces.

Wright-Martin Aircraft Corp., New Brunswick, engine spares.

Wright-Martin Aircraft Corp., New Brunswick, engine spares.

American Steel & Wire Co., 30 Church Street, New York, wire.

Columbia Steel & Shafting Co., 1145-1146 Munsey Building, Washington, D. C., cold-rolled steel.

Western Block Co., Lockport, N. Y., tackle blocks.

Curtiss Aeroplane & Motor Corp., Buffalo, spares for planes.

John A. Roebling's Sons Co., Trenton, N. J., cable.

Buffalo Aeroplane Corp., Buffalo, propellers.

Springfield Aircraft Corp., Springfield, Mass., spares for planes.

Willis-Overland Co., Toledo, Ohio, engines.

Splitdorf Electrical Co., 98 Warren Street, Newark, magneto parts.

Union Switch & Signal Co., Swissvale, Pa., engines.

Winton Motor Car Co., Cleveland, engines and spares.

Union Switch & Signal Co., Swissvale, Pa., engines.

Eastman Kodak Co., Rochester, cameras.

Aero Supplies Co., 864 East Thirty-ninth Street, Brooklyn, N. Y., goggles.

Dayton-Wright Airplane Co., Dayton, Ohio, spares for planes.

Wright-Martin Aircraft Corp., New Brunswick, N. J., engine spares.

C. L. Willey Co., 2558 South Robey Street, Chicago, Ill., lumber.

Firestone Tire & Rubber Co., 312 Colorado Building, Washington, D. C., balloons.

Thomas Morse Aircraft Corp., Ithaca, spares for planes.

Walden-Worcester (Inc.), Worcester, parts for planes.

Walden-Worcester (Inc.), Worcester, parts for planes.

Lionel Mfg. Co., 48 East Twenty-first Street, New York City, flame-proof keys.

Connecticut Aircraft Co., New Haven, Conn., balloons.

Bosch Magneto Co., 223-225 West Forty-fifth Street, New York City, magnetos and switches.

## Calendar

## ENGINEERING

Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

## ASSOCIATIONS

Oct. 7-12—Milwaukee. American Foundrymen's Assn. and 5 allied organizations. Milwaukee Auditorium.

## SHOWS

Sept. 2-6 — Hartford, Conn. Tractor demonstration (State Fair). Will F. Landon, Secy.

Sept. 2-7—Indianapolis, Indiana. State Fair. Indianapolis Automobile Trade Assn.

Sept. 5—Medina, Orleans Co. Tractor demonstration (State Fair) Food Commission. Calvin J. Huson, Director.

Sept. 8-20—Greely, Weld Co., Colo. Tractor Show. Central Community Fair.

Sept. 9-14—Milwaukee. Milwaukee Automobile Dealers, Inc. Fourth Annual Wisconsin State Fair. Hart J. Ruddle, Mgr.

Sept. 9-14 — Syracuse, N. Y. Tractor demonstration (State Fair). J. Ian Ackerman, Secy.

Sept. 9-15—Madison, Wis. Tractor demonstration (State Fair). O. E. Remy, State Fair Secretary.

Sept. 12-13—Marion, O. Tractor demonstrations, Farm Bureau Associations. M. C. Thomas, County Agricultural Agent.

Sept. 14-21—Chicago. Automotive and Accessories War Exposition. Municipal Pier.

Oct. 14-27—Dallas, Tex., Seventh Annual Texas Automobile Show. Texas State Fair.

Sept. 17-20—Riverhead, L. I. Tractor demonstration (County Fair). Harry Lee, Secy.

Sept. 30-Oct. 4—Trenton, N. J. Tractor demonstration (Trenton Fair). Harry B. Salter, Supt.

Oct. 16-18—Ottawa, Ont., International Plowing Match. Tractor and Farm Machinery Demonstration. Experimental Farm.

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration. State Fair.

Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.

## RACING

Sept. 7 — Chicago. Chicago Speedway.  
Sept. 21—Sheepshead Bay.  
Oct. 5 — Cincinnati. Cincinnati Speedway.

SEP 16 1918

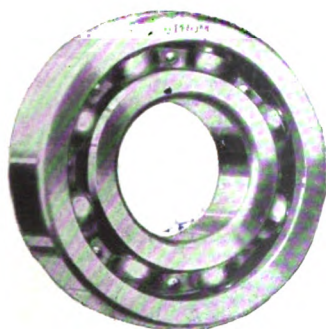
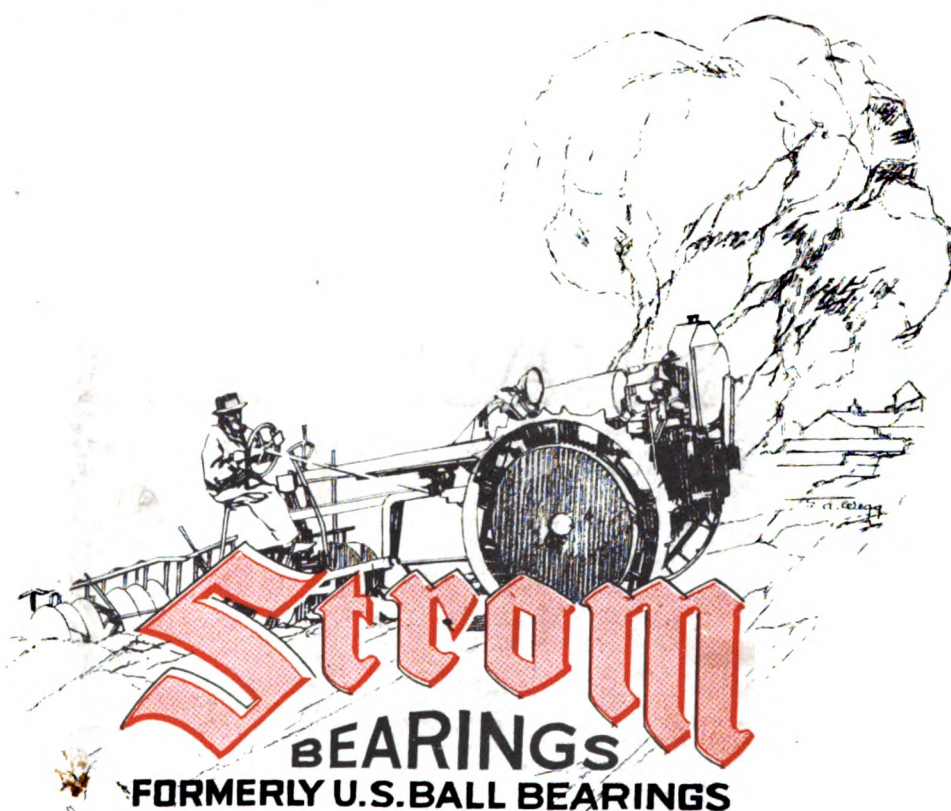
UNIV. OF MICH.

# AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

Engineering  
LibraryVol. XXXIX  
No. 11

NEW YORK, SEPTEMBER 12, 1918

Fifteen cents  
Three dollars

U. S. BALL BEARING MFG. CO., (Conrad Patent Licensee) CHICAGO, ILL., U. S. A.





Back view showing mirror, included at no extra cost.

**\$5.00**  
Complete with bracket and electric cord

# Stewart V-RAY SEARCHLIGHT

*A Real Searchlight—Not a "Spotlight"*

When you have occasion to use a searchlight, you want a *real* searchlight—not a "spotlight" with its small restricted "spot" of light.

You want a strong, powerful, all-revealing searchlight beam. That is what you have in the Stewart V-Ray Searchlight. Its penetrating shaft of light shoots 'way down the road, revealing even the most distant objects.

The exterior design is particularly noteworthy. See how it stands apart—a thing of beauty. Observe how symmetrical it is. Note the design of the body; also the back.

It is beautifully finished with many coats of jet black enamel, baked on. And there is just a touch of nickel here and there to make the "tailor-made" appearance complete.

The Stewart V-Ray Searchlight harmonizes with the design of the modern automobile. Adds to its appearance. Looks like a built-in part of the car—not like a misplaced, re-vamped headlight.

It is scientifically designed. Made with a perfect parabolic reflector, which is silver-plated—not polished tin. Has a full six inch curved lens, instead of plain window glass.

A 3¼ inch reducing mirror, included at no extra cost, is located in the center of the back. It is not necessary to twist the light at an unsightly angle to use mirror. The switch is located conveniently so the hand finds it instantly in the dark.

The back is so formed that the hand grasps the light naturally, without cramping—and turns the light in any direction—up, down, right, left, front, or back—with ease. The case is absolutely dust and moisture-proof. A focusing device permits the use of any size bulb.

The bracket—an exclusive Stewart feature—not only permits turning the light in any direction, but also fits any windshield.

Both its handsome appearance and complete utility recommends it. It has high quality and finish all the way through. Its low price \$5.00—is not an indication of quality, but a tribute to the Stewart Organization, which makes quality accessories at popular prices possible through large quantity production.

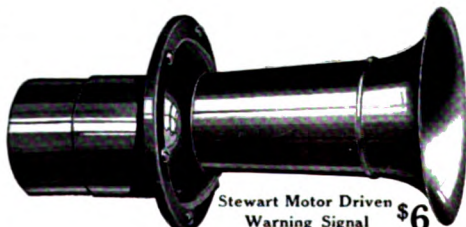
And so it is with all Stewart Automobile Accessories. Each, because of sheer merit and high quality, deserves a place in the equipment of every automobile.

Stewart Accessories are sold by leading accessory dealers, jobbers and garages everywhere.

**Stewart-Warner Speedometer Corporation**  
CHICAGO, U. S. A.

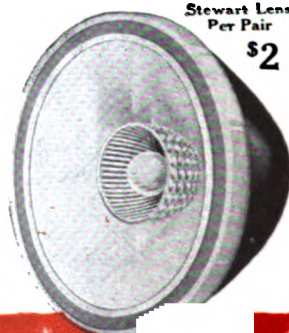


Stewart  
Speedometer  
**\$25**



Stewart Motor Driven  
Warning Signal  
Hand Operated Type **\$3.50**

Stewart  
Vacuum System  
**\$10**



Stewart Lens  
Per Pair  
**\$2**



# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

VOL. XXXIX

NEW YORK, THURSDAY, SEPTEMBER 12, 1918—CHICAGO

NO. 11

## Offered Aid of Allies Not Accepted by Aircraft Authorities

Foreign Missions Sent to America to Give Advice  
and Assist in Work Are Not Consulted

### SUGGESTED SUBJECTS FOR A REAL AIRCRAFT INVESTIGATION

By Allen Sinsheimer

**W**ASHINGTON, Sept. 10—Although airplane matters have been very quiet since the Labor Day holiday, the recent cancellation of the Caproni contract for manufacturing bombing planes and other steps in the selection of types of planes to build have added to the confusion of the situation and force many to ask why an investigation should not answer some of the questions with regard to types of planes that have not been touched upon in the Senate Committee report.

The Foreign Aviation Missions now in this country to assist in the airplane program are amazed and quite at sea because of many things that have recently happened in connection with the work and they see very little if any use for remaining in this country when their recommendations are given so little consideration.

It is gossiped in Washington circles that an investigation which shows something will be worth while and very desirable. There are many subjects that might be answered, in fact, that should be answered, whether an investigation is necessary to secure these answers or not. There should be answers forthcoming which would explain the reasons for some of the following:

1—The 8 months' delay and indecision on the Nieuport 15-metre scout.

2—The selection of the Bristol scout discarded long ago by Great Britain.

3—The large orders for the 80 hp. Rhone engines.

4—The selection of the SE5, long since discarded by England.

5—The refusal by this country of thousands of SE 5's offered by England.

6—The complete cancellation of the Caproni program.

7—The bewilderment and discouragement of our Allied air experts in this country.

8—The apparent lack of regard for the opinions of the Allied aviation missions by our aeronautical divisions.

9—The reports that numerous engineers are given carte blanche to improve their inventions while discrediting all other suggestions.

10—The frequent charges that there are too many engineers with individual preference, too many authorities and too little decision.

Eight months ago following a conference between American and foreign heads of the air divisions, decision was made to adopt the Nieuport 15-metre scout for training pursuit pilots in this country. It was to be equipped with the 80 hp. Le Rhone engine.

After 8 months of absolute inactivity, it has been announced that the Nieuport program is abandoned and that the British Bristol scout has been adopted in its place. The Bristol scout is 3 years behind in the British program. It has been discarded for a new Bristol far superior. The Bristol scout has a speed of 80 m.p.h. and a ceiling of 10,000 ft., while the Nieuport has a speed of 106 m.p.h. and a ceiling of 17,000 ft. equipped with the same engine.

British experts join in the declaration that of the two machines the Nieuport is far superior.

French officials are dumfounded at the substitution of the Bristol for the Nieuport. They are at a loss to understand it. It is reported here that the chief reason for using any such machine as the Bristol is the large order placed some time ago for the 80 h.p. Le Rhone engines. The authorities do not know what to do with the quantities of these engines, it is said, and are therefore taking on the Bristol scout.

### England Discarded the SE 5

Recently, announcement was made that the SE 5 was officially adopted for the American airplane program. As soon as this announcement reached England, a very high British official cabled that England had long discarded this plane and had 5000 or 6000 on hand which would be sold to this country reasonably. Our officials replied refusing the offer, stating that we will build them in great quantities and have no use for the several thousand on hand in England. With no explanation, this reply leaves the British confused.

The SE 5, as was told before in these columns, has not only been discarded by England as long ago as September, 1917, but was discarded for the SE 5 A, which had a higher speed and all around better performance and which in turn was superseded by the Sopwith Camel, discarded for the Sopwith Dolphin, replaced by the Sopwith Snipe. Each of these machines in turn has been regarded as superior to the preceding one by the British experts. We have selected a machine in the SE 5 which has been replaced four times over and which was called obsolete 1 year ago.

### Reasons for Caproni Cancellation

Politics and business influences are rumored to be the cause of the Caproni program cancellation. Although it is conceded by everyone that bombing planes in great quantities will certainly hurry the end of the war; although Caproni planes tested with Liberty engines have been proven even better than the Caproni equipped with the Fiat engine; although Italian experts from the Caproni plant have been in this country for months, there has been only delay and indecision and now, finally, we have complete cancellation of the plans for Caproni plane construction. And the Italian authorities appeared to be as much at a loss to understand the cancellation as the average citizen.

The British, French and Italian air missions are, of course, delicately situated and unable freely to express opinions, but it is an open secret that they are alarmed and discouraged with American air

activities. Many valuable men, needed in their own countries, sent here to give us the benefit of their experiences, sit in their offices, unable to gain hearings with the American officials, wasting their time O.King blueprints that are never used and rejecting others embodying numerous foolish practices. When they can be induced to talk they tell of the many engineers who will approve only their own ideas, of the lack of definite authority, of the inability to make a decision and stand by it.

### Allies Approve Liberty Engine

The Allied experts all approve our Liberty engine. They will take all they can get of them. They are amazed at our great production which is steadily climbing toward the peak. But witnessing this remarkable performance on one hand, thoroughly converted to our standardization and plans for few models, they are unable to connect the efficiency shown here with the confusion that exists as regards all of the other operations.

They are unable to understand the speedy engineering and production of the Liberty engine and the principles of standardization, with our delay and procrastination in plane production and our present plans which point toward a program of many types of planes.

One engineer sent to this country was at first an ardent believer in quality as against quantity. He has changed his ideas. After witnessing the hampered production here, due to the constant improvements suggested to their inventions by our engineers who have been given carte blanche, he has turned to the German plan of producing few types in great quantities. His investigations over here, his contact with our officials and his experiences have led him to make suggestions which he cannot personally offer in his official capacity.

### Suggests a Business Head

He suggests the appointment of a thoroughly capable business man, "one who has had to do with automobile production," to the head of all aircraft work with absolute power.

This man should then call together the British, French and Italian airplane engineers for conference with the American engineers to decide on three types of machines or as many as they decided necessary. He believes in the use of three types:

- a—Pursuit machines (single seaters).
- b—Artillery and reconnaissance machines (2-seaters).
- c—Long distance bombing machines (double engine, 4 or 6 seaters).

In collaboration with these experts, he further recommends the fixing of a schedule of performance necessary for the machines of each type before they can be adopted. For example:

A pursuit machine before adoption and production must exceed certain speeds at certain heights, climb to specified heights in a certain number of minutes and display certain endurance powers.

After the schedules of performance have been decided upon they should be duplicated and copies sent to each airplane firm in the country. The firms

themselves could then design their own machines to meet or exceed the performance.

In consequence of this plan there would be different firms in all sections of the country striving to produce the best possible machines, some building pursuit planes, some bombing planes and others reconnaissance planes. When the machines are finished the firms would notify the aircraft headquarters which, in turn, would order them sent to a central testing ground.

The result would be a large number of all the necessary types of planes awaiting the tests. The best of each type would be selected after thorough trials, the machine exceeding the schedule over all its competitors being the one selected. This one in each type would be universally adopted as the standard plane and put into production.

A plan of this sort would eliminate design of all planes by a few men as is now the case. It would prevent the constant tinkering and attempts at improvement which hinder production. It would insure a machine equal or better than the requirements set by the original conference, and while this plane is in production and in service further improvements which would not hamper production or newer and better designs of planes could be studied for the later program.

Whether these suggestions are adopted or not,

there must be some radical changes. Recently the chief official of the military air section testified before Congressmen that the SE 5 is a two-passenger machine, when as a matter of fact it is a single-seater. He compared it to the Spad, although it is completely different in performance, appearance and horsepower.

With the airplane program vitally important in the successful prosecution of the war, it is most urgent that we have men at the head of this work who thoroughly understand it and that we have some definite policy under the control of such an executive.

A secretary of Aircraft with full power to act, versed in internal combustion engines, broad enough to appreciate the value of the foreign experts, combined with some such plan and organization as is suggested, will probably insure speedy and successful fulfillment of the airplane program. Certainly it could not allow for the existing confusion and delay.

Without doubt many other apparently unreasonable activities like those and equally bewildering and confusing will be found. The men responsible must be removed. The proper organization and plan must be determined. Thoroughly trained competent men must direct the work. In this way only can we achieve the success that is expected:

## Keeping Track of Labor Turnover

In Plants Where Semi-Skilled Men Must Be Trained to Meet Labor Needs, a Careful Compilation and Analysis of Turnover Records Is Worth Many Times the Expense Involved

By E. H. Fish\*

**M**UCH has been said in the past few years regarding the high cost of a high labor turnover. There has been a tendency to attack that high cost blindly, with the idea that a reduction by whatever means must be an economy. There are, however, many cases in which the employer is much better off to be rid of an employee, and many cases in which the employer ought to wish a departing subordinate Godspeed and good luck.

No single figure, no matter what the definition of labor turnover may be, will give the general manager a true idea of what is going on in the shop or office. An analysis will.

It is probable that most concerns will find that certain departments hold their men and others do not. They will usually find that married men stay longer, on the whole, than unmarried. If the work is seasonal they sometimes find that married men shun their places. They find that men who have a deep-rooted feeling that they wish to live in that particular city stay better than men who have been in the habit of roving.

There are then two principal things which determine the analysis: the department, and the cause of leaving; or, more important yet, the reason for staying. The

division by departments should be fine enough to reach the foremen, whose influence is most felt by the workmen. This is different in different shops. In some the department head is in close enough contact with the men so that any difficulty with the straw boss comes immediately to his attention. In other cases the straw boss or working foreman is the man who really determines the status of his subordinates.

Whichever it may be, we need to know definitely how well men stay under certain personalities. A great many foremen take the ground that with the dilution of labor going on all around us they cannot be blamed for the rate at which subordinates leave them. They cannot be held responsible for the whole turnover in their departments, but they themselves ought to wish to know how their departments compare with those under other foremen.

### Three Classes of New Men

It is also interesting to keep watch of the new men, dividing them into three classes: those new to the shop, those who have worked there in the past and are rehired, and those who are transferred from one department to another. We are interested in these items because the number of men rehired is a very good indication of the

\*Employment Manager, The Norton Co.



esteem in which the shop is held, and the number transferred is a good indication of the attempt to steady employment. No shop is quite so well able to get a high-grade of help as the shop which has a reputation for taking care of its men.

Most of us are children in business, as otherwise we would probably not be good mechanics, and we crave a certain degree of paternal treatment. To get this information it is well to classify the transfers as promotions, demotions on account of health, and those which are merely for departmental fluctuations. It is also our practice to classify the new men and those rehired as skilled, learners, and laborers. This classification, in these times, is especially desirable to show to the general manager what a large proportion of his new men must be trained in some way. Knowing the number, he may see more clearly whether it will probably pay to establish a vestibule school, or a school for training foremen to teach.

Many foremen take the unfortunate ground that once a man leaves them he has burned his bridges behind, and cannot return. The analysis shows who they are. A great help in rehiring is to have the man rated when he leaves, so that a glance at his folder, if records are kept that way, will show whether he left in such a way that he should be considered for immediate re-hiring, or whether he should be warned that he could not get back easily unless he gave a reasonable notice. This, however, depends on other conditions in the shop. There are many places where men do not give notice when they intend leaving, for the simple reason that they know from the past experience of others that they are liable to be told to "get to h— out right now."

There are other places where, if a man gives notice, he can get all his money the day he quits, which is productive of a high turnover, because every time a man feels that he would like a little more money than he ordinarily gets he gives his notice, and goes to work for our competitor the next Monday. If these things are going on in the shop unknown to the general manager, a few statistics will set him on their track.

#### Analysis of Reasons for Leaving

The most important thing, however, is an analysis, by departments, of the reasons for leaving. If the management knows why men leave, and in what numbers, he can tell with fair certainty how much money he can spend to cure the trouble. It is not easy to find out why men leave. Usually, it is a combination of reasons. The last one, the straw that broke the camel's back, may be the one that is given, while one that is not uppermost in the man's mind may be the fundamental one. No system of tabulation is of any value unless the management is confident that the interviewer who sees the workman has gotten to the bottom of the causes; and quite often, when he has reached the bottom, and can begin to build up on a solid foundation, he is able to retain the services of the man.

These times, the first reason we expect to see advanced is low wages. Probably half the men who leave will allege that they can get more money somewhere else. Many times they can. None of us like to knock our neighbors, especially if we both belong to the same employment managers' association. We may be very certain that this particular man cannot earn what he claims, or, if he can do it in a competitor's shop he can do it in ours, too, just as well as to move over there.

The proportion of the turnover which is found after careful inquiry to be due to the ability of our employees to get better-paying jobs, compared with the number of men returning to us after having been away to try another place, is what should determine when it is best to

raise wages. This proportion will, of course, be different for every different shop and for varying conditions in the one shop, depending on whether the policy of the company is to pay for the pick of the available workmen, or whether it prefers to keep its payroll low and depend on excellence of foremanship to produce results.

Working conditions are the next thing to tabulate. By this we mean whether the work is dusty, dirty, heavy, wet, dangerous, or otherwise disagreeable and unsafe. A high proportion of labor turnover may justify the expenditure of considerable sums of money for improvement, while a low rate may prove that employees do not object to the prevailing conditions so much as the superintendent might.

One of the elusive things is the leaving due to the coolness of the social atmosphere. An office man is apt to think of this attitude as his prerogative, and not to grant the shop men the sensitiveness to notice it. It is usually one of the last straws that determines whether a man will put up with other things. It is just this one straw, however, that if removed might help keep men on the job. Other divisions under which leaving should be tabulated are housing, transportation, commissary, preference for another line of industry, living nearer home, and, naturally, now, entering Government service.

#### Recording Reasons for Discharges

Discharges should also be classified. If a certain department shows a large number of men discharged as "trouble breeders," the foreman may be suspected of having caused the trouble, or possibly he may be using it as a cloak to his desire to get rid of men on personal grounds. We do not tabulate the latter, as we feel that it should not be allowed. If a foreman does not like red-headed men he should say so when he sends in his requisitions.

The turnover due to unavoidable causes, such as death, protracted illness, marriage of female employees, etc., is so small as to be hardly worth recording except for the sake of completing the record; but it is also so small as to make the recording a trivial expense.

This brings us to a vital question: How much can a firm afford to pay for keeping vital statistics like these? The answer is, "It depends." If the works are run entirely by unskilled laborers, if the supply is ample, then there is little good to be obtained. If the plant is operated almost wholly by skilled men, who come already well trained, and the supply is ample, there is no great object; but if the plant is in the condition that almost every shop in the country is in to-day, where the work is being done by semi-skilled men who are being trained on the job at great expense, or in separate vestibule schools at less expense, then the saving to the shop of even a few men who would otherwise have to be replaced at anywhere from fifty dollars each up, then the profit is so great that the expense sinks out of sight. Our experience is that a good man on the job in a plant with four thousand men can save his salary and the expense of this office about ten times over.

#### New Duplex Instruments

IN its new catalogue on Instruments and Relays, just published, the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces two new duplex instruments for battery charging, marine, dental, telegraph, telephone, farm lighting, and other compact instrument panels where direct-current is involved.

These duplex instruments consist of any two standard Westinghouse type AW or type FW instruments desired, mounted in an attractive dull-black metal case. The type AW instruments have round open faces, 8 in. in diameter, with glass cover and rear mounting studs; the type FW have 5-in. faces.

# Process Refining Systems Would Increase Gasoline Production

Cost of Installing Such Apparatus Would Be Returned in 80 Days—Present] Need Is for Increased Output Rather Than Curtailed Use

**F**IGURES on gasoline production and consumption given out by the Fuel Administrator to-day showing that since April 1, 1918, there has been a decrease in gasoline reserves of 4,119,000 barrels (barrel contains 42 gal.) must be interpreted somewhat differently from what these figures would indicate, in that gasoline is a seasonable product with a maximum consumption taking place during the period of April to September, inclusive, and with the peak load of consumption coming in June, July and August.

To understand the gasoline situation it must be remembered that the high point of storage of gasoline generally comes in April and that this storage stock gradually falls off until October, when it starts building up again to the following April.

The gasoline stock in storage during three periods of the present year bear out these figures:

	Barrels
January 1 (in storage).....	9,902,000
April 1 (in storage).....	15,787,000
August 1 (in storage).....	8,648,000

According to the Fuel Administrator, the daily deficit or loss in stocks approximates 11,000 bbl. of 42 gal. each. The deficit in the territory east of California is 3000 bbl. per day and in the California territory 8000 bbl. per day.

These figures, given out by Fuel Administrator Garfield, were in reply to the Lodge resolution asking that figures be furnished to show the supply on hand. The complete figures for the territory east of California and also for the California territory are given herewith as presented by the Fuel Administrator.

These fuel figures are doubtless responsible for the recent requests for automobilists practically to discontinue the use of motor cars on Sundays. There is scarcely a motorist in the

country who does not wish to conserve as may be necessary, but there are other viewpoints on the fuel situation which we believe the Fuel Administration should take recognition of and attempt to supply the necessary gasoline, not all by curtailment, but rather by increased production.

This can be accomplished by the use of a process system of manufacture, which systems are familiarly known as pressure systems and in which a pressure ranging from 75 to 110 lb. per sq. in. is used in the stills and where the temperature varies from 700° to 750° Fahr., a temperature high enough to crack the crude into gasoline and thereby greatly increase the production of gasoline from crude.

There are 30 or 40 of these process systems of gasoline refining, several of which are very practical and valuable. With three or perhaps more of these processes it is possible to double the output of gasoline from a given quantity of crude. With what is known as the skimming method, a gallon of crude oil will yield approximately  $\frac{1}{4}$  gallon of gasoline, but with the process system, refining this same gallon of crude will yield approximately  $\frac{1}{2}$  gallon of gasoline.

At present, scarcely 20 per cent of gasoline is produced by the process system, which means that on 80 per cent of the crude used we are literally securing but 50 per cent of the gasoline from it that we should be securing. The Standard Oil Co. has been a leader in developing the process system, this particular system being the Burton, developed by Dr. W. M. Burton, chief chemist of the Standard Oil Co. of Indiana, whose refinery is at Whiting, a short distance out of Chicago. This company began manufacturing under the Burton process 7 or 8 years ago and has since licensed practically all of the other Standard Oil companies.

The majority of the other big refinery interests have not  
(Continued on page 483)

## Production and Consumption of Gasoline in the East

### TERRITORY EAST OF CALIFORNIA

Gasoline and naphtha stocks, 1918—		Barrels
Jan. 1 .....		8,400,000
April 1 (high point).....		11,000,000
Aug. 1 .....		7,800,000
Decline in stocks .....		3,200,000
Estimated daily production and consumption:		
Approximate daily consumption—		Barrels
Domestic .....		160,000
Export .....		34,000
Total daily consumption .....		194,000
Approximate daily production.....		191,000
Average daily deficit .....		3,000
(Probable result for year ending Dec. 31, 1918.)		
Records for the months of April, May, and June, combined, show the following: (July and August are not yet entirely complete.)		
Approximate daily average consumption—		Barrels
Domestic .....		199,000
Export .....		37,000
Total .....		236,000
Approximate daily average production.....		216,000
Daily deficit, April, May, June.....		20,000

### CALIFORNIA TERRITORY

Gasoline and naphtha stocks—		Barrels
Stocks on hand, Jan. 1, 1918.....		1,502,000
Stocks on hand March 1, 1918.....		4,787,000
Stocks on hand Aug. 1, 1918.....		848,000
Total decrease from high point.....		919,000
Daily production, consumption and export, first half of 1918:		
Approximate daily consumption:		
Domestic .....		29,000
Export .....		2,000
Total .....		31,000
Approximate daily production .....		28,000
Daily deficit .....		.000
April, May, and June, 1918, approximate daily consumption:		
Domestic .....		33,000
Export .....		2,000
Total .....		35,000
Approximate daily production .....		27,000
Daily deficit .....		8,000

# The Bennett Centrifugal Air Washer

Combines the Centrifugal Principle of Separating Dust from Air with the Water-Washing Principle

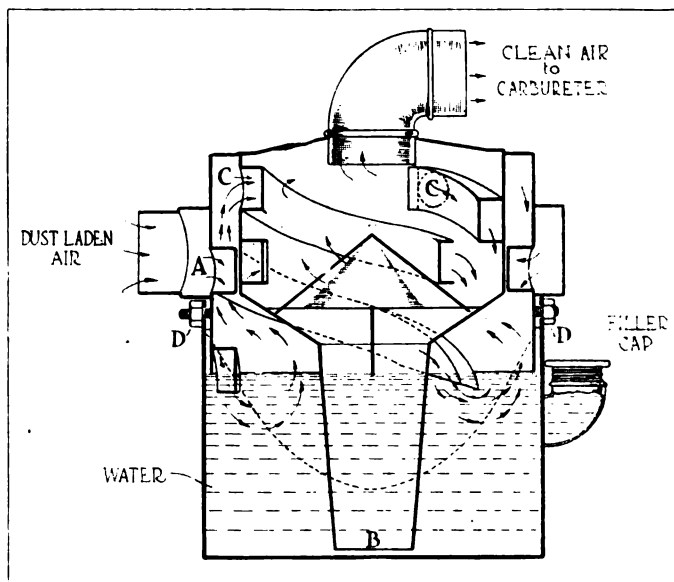
**T**HE Bennett centrifugal air washer, a new product of the Wilcox-Bennett Carburetor Co., Minneapolis, Minn., consists essentially of a Bennett air cleaner suspended within a cylindrical casing containing a quantity of water. This water is made to revolve within the container by the whirling action of the air drawn into it from the suction of the carburetor. The water rotates because the air is drawn into it tangentially through two spiral tubes in the inner circumference of the casing.

Referring to the sectional view of the air washer, the dust laden air enters as shown and passes into the water compartment through openings in the spirals at A. The rapidly whirling air causes the whole mass of water to revolve so that it piles up against the sides in approximately the position shown by the dotted line. This completely submerges the lower ends of the spirals so that all the air must pass through the water before escaping upward into the openings C of the inner air cleaner.

The air cleaner has three spirals on its inner circumference through which the air and entrained moisture pass. The centrifugal action set up in the inner cleaner completes the cleaning of the air and also throws down any drops of water that have been picked up in the air. These water drops are thrown downward and back into the water container through the open end of tube B. This reduces the humidity of the washed air and also prevents excessive water consumption. The clean air, after passing out of the spirals in the inner cleaner, escapes upward and out through the elbow at the top of the carburetor air intake.

As long as there is any water in the container the whirling of the water keeps the end of tube B (which is very close to the bottom of the container) sufficiently open for the downwardly projected water to re-enter the reservoir. However, if the water supply is allowed to totally evaporate, enough mud and dirt will settle under the open end of B to seal it, so that even if the container runs dry, the inner air cleaner will collect the dust as a dry air cleaner. Of course, if the water container is dry and also clean, no such cleaning action is possible unless opening B is closed.

The water compartment is filled to the top of the filler cap.



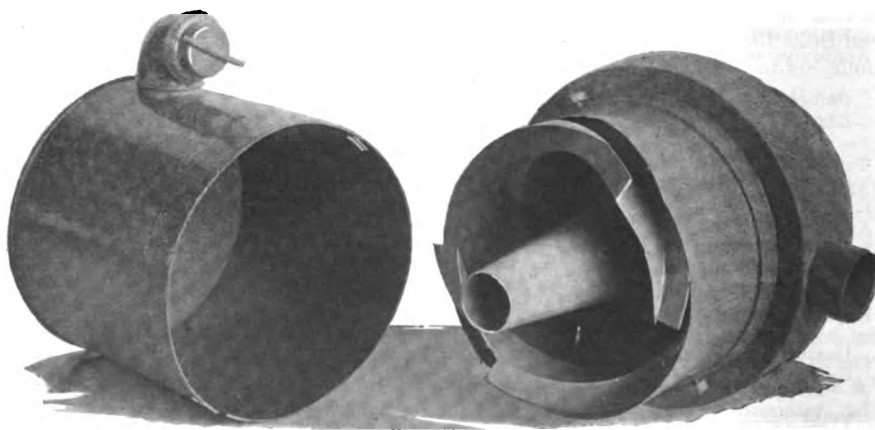
Section through air washer

At normal summer temperatures one filling should last a full day with a tractor in the field.

To clean the accumulated mud or dirt from the air washer, nuts D are loosened, the water reservoir is turned to free it from the catches on the studs, and is then removed and cleaned thoroughly and frequently. It is then replaced and refilled with water. The air washer when used where there is much dust, should be cleaned every day.

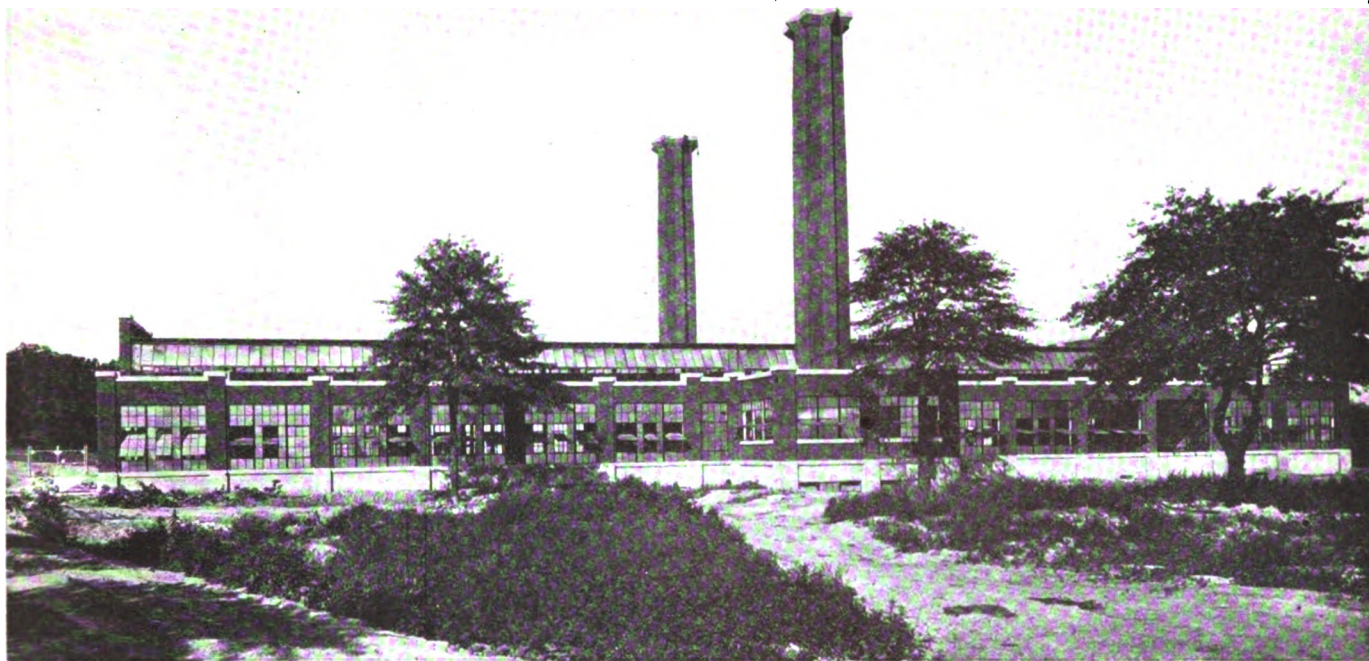
## Cadmium as Substitute for Tin

**T**HE possibility of using cadmium as a substitute for tin in solder appears promising. Among others the composition containing 80 per cent lead, 10 per cent cadmium and 10 per cent tin has shown particular promise. No difficulty is anticipated in connection with the production of cadmium on a commercial basis at a price considerably less than that of tin as soon as it has been demonstrated that its use for this purpose can be generally extended.



Bennett air washer complete and in parts





*New engine test house of the Duesenberg Motors Corp.*

## A 900-Hp. Dynamometer Installation

New Test House of the Duesenberg Motors Corp. Has Several Features of Novelty Relating to Water Cooling, Exhaust Disposal and Dynamometer Tests of Mammoth Engines

**A**IRCRAFT engine testing confronts the engineer with problems which differ from those of automobile engine testing chiefly because of the enormous powers involved. While the 1000-hp. mark has not yet been reached in aircraft engines, its attainment is already in sight. The majority of the engines now being produced in this country for aircraft work range over 400 hp. on the brake, which is more than ten times as much as the average automobile engine. This comparison is here made because in the past standard testing equipment has been largely designed for automobile engine tests.

Obviously, engines for aircraft must be more rigidly tested than those for any other purpose, and the departments letting the contracts issue detailed specifications of the tests each engine must pass before it will be accepted. In addition to routine tests of its regular stock product, an engine factory carrying on development work must also conduct tests on experimental engines, and these latter call for somewhat different equipment than the routine tests.

In regular routine tests it is desirable that the conditions of actual use be duplicated as nearly as possible. Formerly it was customary to test aircraft engines with plain clubs which are really a form of fan dynamometer. By plain club is meant a beam of square or rectangular cross section which is secured to the engine crankshaft in the same manner as the propeller. Now, however, clubs with their ends given a form resembling propeller blades are used, to produce the identical condition of end thrust

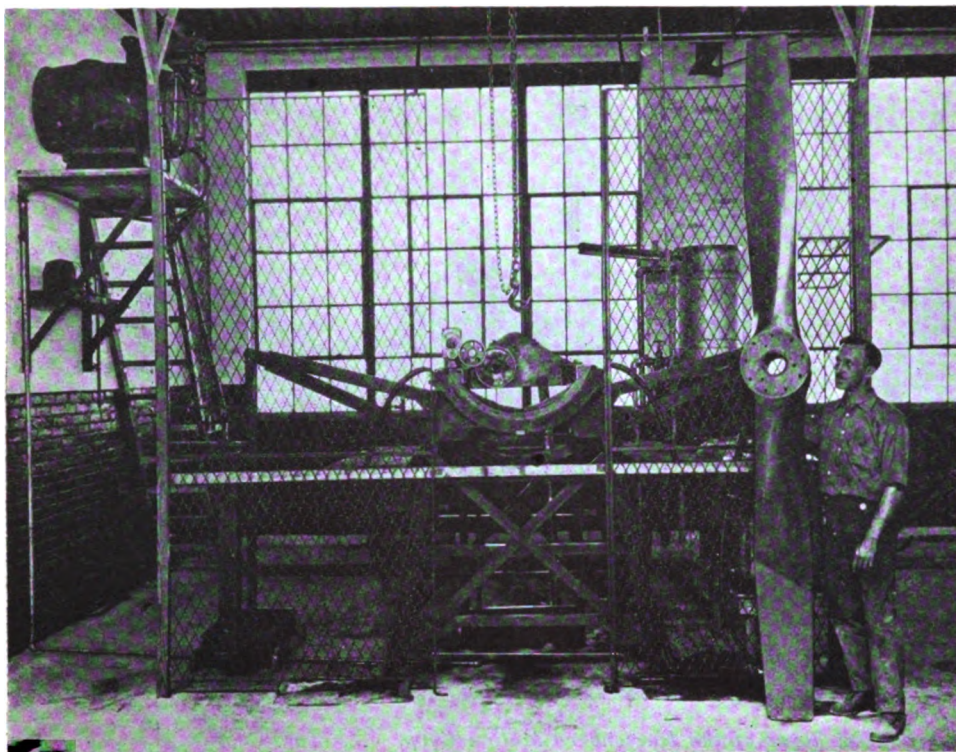
on the engine bearings to which they are subject in flying.

One of the most modern airplane engine testing departments in the country has just been completed by the Duesenberg Motors Corp. at Elizabeth, N. J. It is installed in a steel and brick structure on a concrete foundation, 240 ft. long by 67 ft. wide. A large part of the side walls is of glass, and efficient lighting and ventilation are further assured by a monitor roof construction.

As one enters the building, on the right there is an office where the test records will be kept, and directly behind it an oil storage and filter room. To the left of the entrance are a chemical laboratory (corner room) and a physical laboratory, where all material furnished the company for the manufacture of its engines may be analyzed and subjected to mechanical tests. In the physical laboratory, in addition to the usual testing machinery, are installed a number of light machine tools for machining up test specimens, and a furnace for heat treating them.

Passing through the entrance way between these two sets of rooms, one enters the main test room, which extends the whole width of the building and 176 ft. in length. This room is equipped with 22 test stands arranged in two rows, one along each wall. The test stands are of the cradle type, the power developed by the engines being determined by measuring, on a scale, the torque reaction of the dynamometer cradle. The cradle is supported by a heavy stub shaft at one end and in a semicircular guide at the other. Secured to the cradle





*Showing one of the test cradles with its equipment and one of the large size clubs used for testing engines*

are two arms which extend in opposite directions, and from the ends of these arms depend steel bars, of which one serves to transmit the pressure of the torque arm to the scale platform while the other merely balances the former. Mounted above each testing stand is a chain hoist. Engines are brought into the test room from the assembling department on industrial trucks, raised by the chain hoist and slid into position on the cradle of the test stand.

Each test stand is provided with its own fuel, oil and water supply and with an electric starter to start the engine. The gasoline tank is mounted high on the wall and feeds by gravity. It can be conveniently filled by means of a pump driven by a separate electric motor, mounted on the wall below the tank. Oil tanks are placed on the floor close to the stand and there is a water tank high up on the wall through which the cooling water is circulated by the pump on the engine.

It can be readily imagined that a 400-500-hp. engine running under full load will quickly heat up an ordinary wall tank full of water, and a means of abstracting heat from the tank had to be provided. This problem was solved in an interesting way by the erection outside the building of a concrete cooling fountain, 50 ft. in diameter, of which a view is shown herewith. The whole cooling system has a capacity of 75,000 gal. A standpipe rises at the center of the fountain, through which the water is forced by a pump driven by an electric motor.

The top of the standpipe is surrounded by a mushroom-shaped plate, and as the water gushes from the pipe it is spread out in an even film. From this plate it drops onto successive annular surfaces of concrete, the film getting gradually thinner and the speed of the water slower as it spreads out, and from the last annular surface it returns to the basin below. Each cooling tank in the test room is connected in circuit with the electric motor pump and cooling fountain, and when the pump is running the water in, the cooling tank is being constantly renewed. The same water, of course, is used over and over, and a considerable economy is effected by this means.

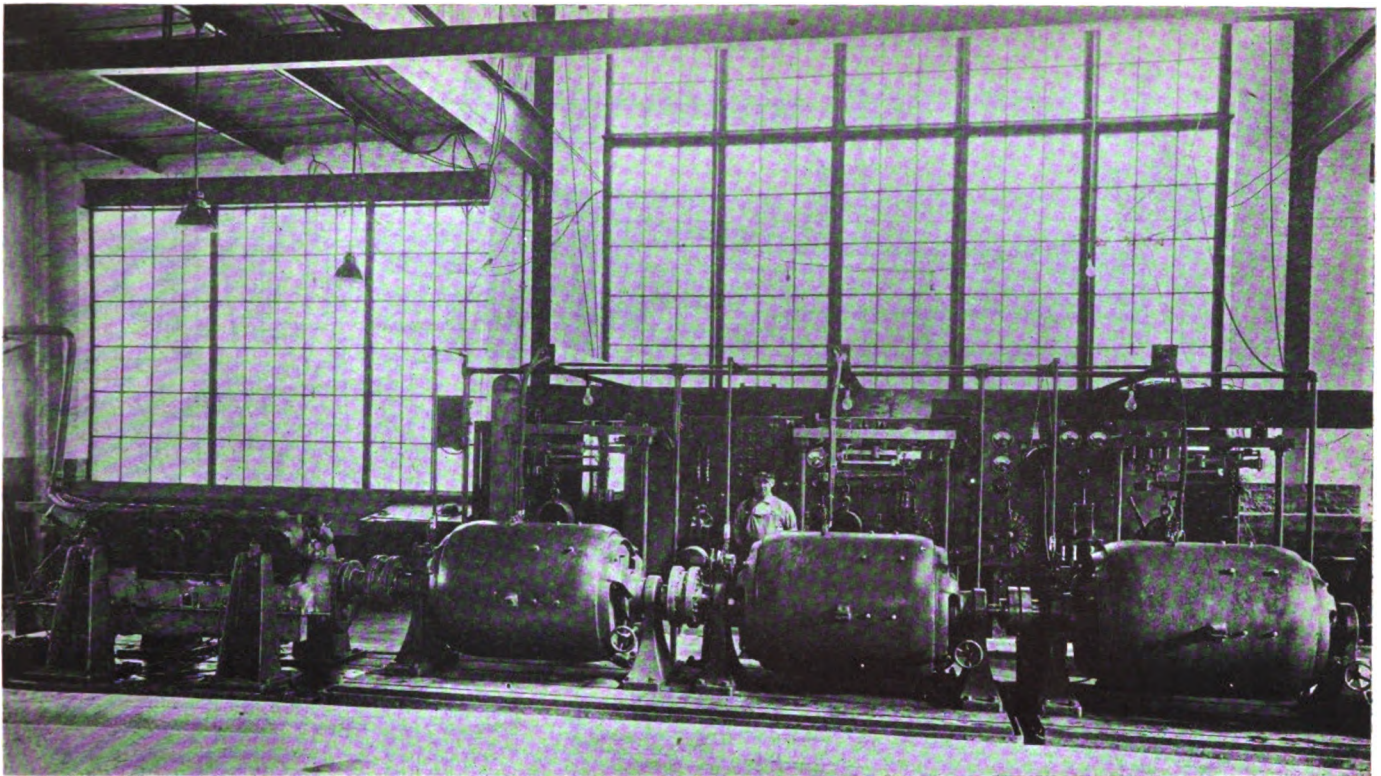
In order to safeguard the men working around the engine under test, a heavy wire screen is placed between the engine and the propeller or club.

A problem of considerable importance is that of disposing of the exhaust products, for with 20 or more engines of several hundred horsepower each running under full load, it would take but a short while to vitiate the air to such an extent as to make it impossible for the testers to remain within the room. In the Duesenberg test room the exhaust gases from each engine are directed through an overhead funnel into a large underground duct which discharges into an 85-ft. stack. Natural draft is depended upon to suck all gases into the funnel and carry them through the underground duct and up the stack. There are two of the stacks, one for each row of test stands.



*The cooling fountain serves the function of a giant radiator*





*View in the dynamometer room, showing three electric dynamometers coupled together*

At the rear of the main test room is the dynamometer room, in which are installed three Sprague electric dynamometers capable of absorbing up to 300 hp. each. These machines are arranged tandem fashion and may have their shafts coupled together for tests of engines of over 300 hp. At each end of the set of dynamometers there is an engine stand, one of these stands being arranged chiefly for tests of very large engines requiring two or even all three of the dynamometers to be coupled together.

It was found that the shafts of the standard dynamometers were sufficiently rugged to permit of this method of connecting them up, but a special coupling had to be designed for the dynamometer closest to the engine. Electric tachometers are mounted on the dynamometers and in addition there is a Schaeffer & Budenberg tachometer driven by belt.

While the writer was at the plant there was a large engine on the dynamometer stand which was fitted with

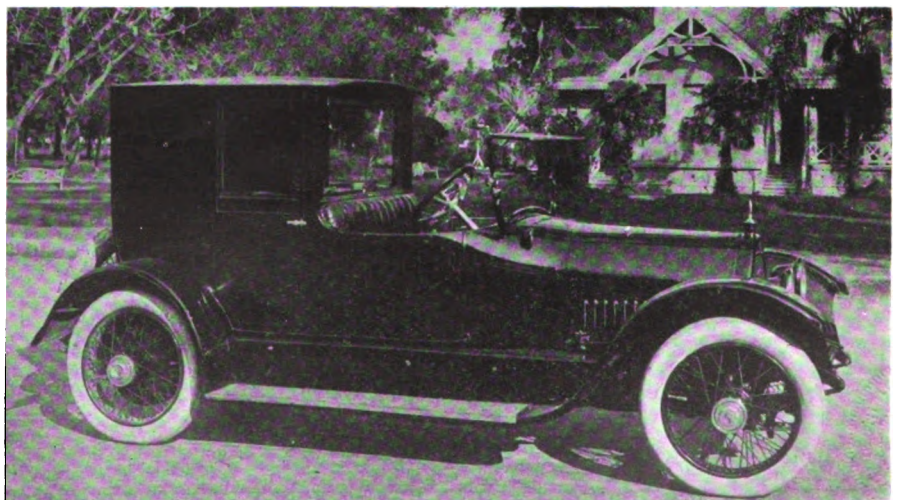
a compressed-air starter. However, provisions are also made for starting the engines under test electrically, through the dynamometers, running as motors. The current used for this purpose is taken from alternating current mains and is converted into direct current by a rotary converter installed in the dynamometer room.

The energy developed by the dynamometers is absorbed in resistance grids located back of the switchboard on the rear wall of the building. These grids are in six sections and each is capable of absorbing 200 hp. An electric motor with a small propeller mounted on its shaft is supplied with current from the dynamometer and is used to blow a current of fresh air over the engine while under test.

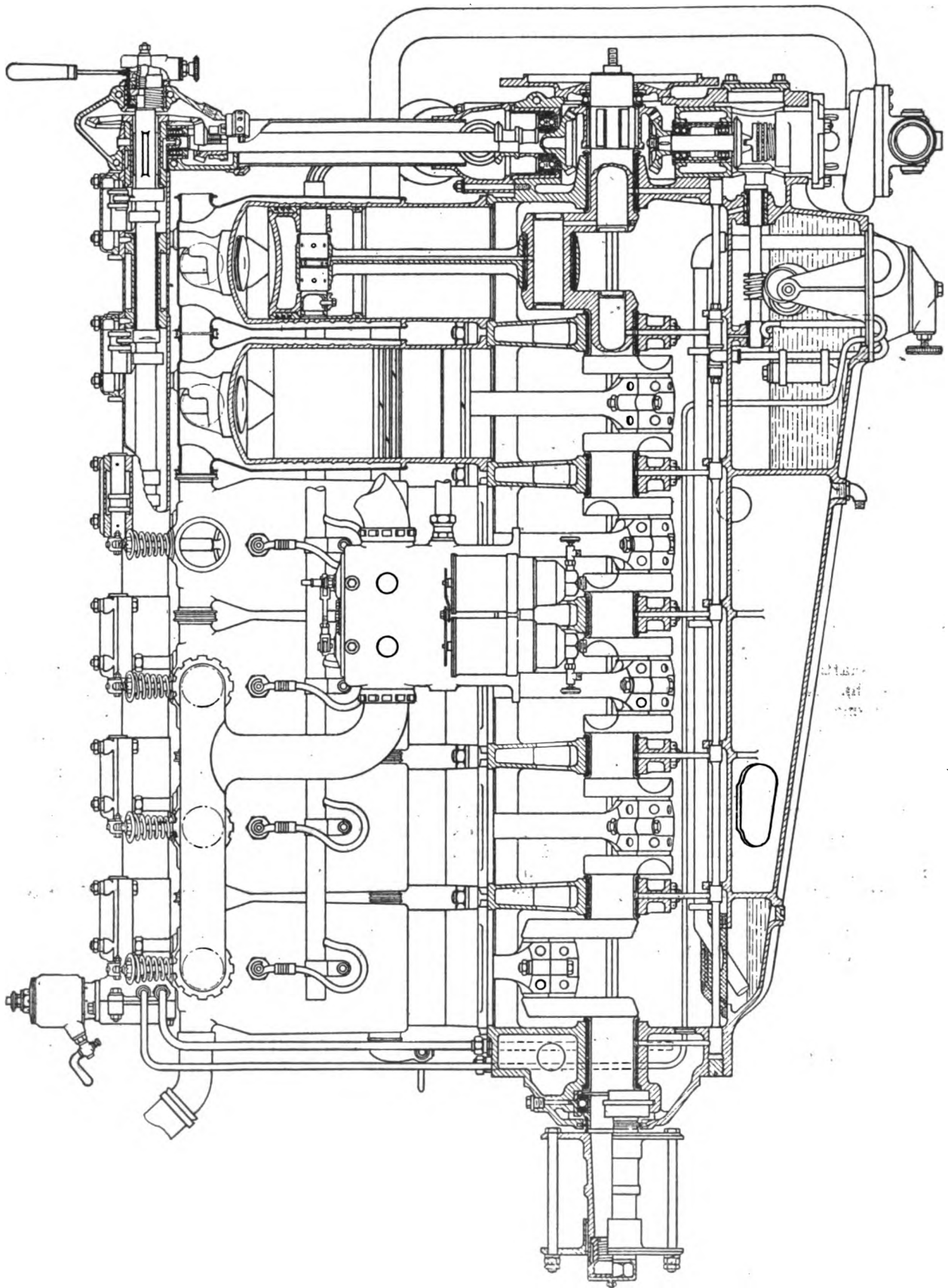
The Duesenberg testing department is remarkable chiefly for the fact that it contains equipment for testing engines up to 900 hp. output, this being undoubtedly the most powerful dynamometer installation in any aircraft engine plant in the country at the present time.

## An Argentine-Built Body

*THIS* photograph shows a car with a body built by Fehling Bros. of Buenos Aires, Argentine Republic. Fehling Bros. are importers of American chassis, and formerly had special bodies built to order in the United States; but they claim that the service was so poor that they were compelled to install their own body-building department, and this is one of the first bodies completed by them.







*Elevation, partly in section, of the Mercedes 180-hp. aircraft engine of 140 mm. bore and 160 mm. stroke*

# The 180-Hp. Mercedes Aircraft Engine

A Development of the 160-Hp. Model, Having the Same Cylinder Dimensions—  
Compression Increased and Many Details Redesigned  
—Fuel Test Results and Table of Data

**E**NGINEERS of the Daimler Motor Co. have redesigned the 160-hp. six-cylinder Mercedes aircraft engine and have succeeded in raising its output to 180 hp. The following report, issued by the Technical Department (Aircraft Production) of the British Ministry of Munitions, is based on an examination of engine No. 35254 taken from the captured German Albatross biplane D.5.A. (G.97), which was shot down by anti-aircraft fire in the 5th Brigade area on Nov. 14, 1917, and the accompanying data on the design of the engine and the particulars of its general performance, have been compiled from results of tests carried out at the Royal Aircraft Factory.

The 180-hp. Mercedes engine is the first engine of a new type to be used in service since the advent of the 260-hp. Mercedes engines in the early part of last year. These 260-hp. engines were apparently so successful that the 160-hp. type have since been remodeled so as to introduce several of the leading features of the 260-hp. practice. The result is seen in the 180-hp. model, with which this report deals.

## Comparison Between Old and New Designs

It necessarily follows from the above that this report will partake more or less of the character of a comparison between the 160-hp. and 180-hp. models. Frequent reference, therefore, is made in the text to the 160-hp. engine.

In many respects the design of this new engine is similar to the 160-hp. Mercedes, which is now obsolescent. The cylinders are of the same construction and of the same bore and stroke as the 160-hp., i. e., 140 mm. x 160 mm., as also are most of the reciprocating parts; in fact, this engine might well be termed "The New 160-hp. Mercedes."

Briefly described, the 180-hp. Mercedes is a combination of the 160-hp. and the new 260-hp. Mercedes engines, and in view of this fact it will be unnecessary in this report to deal at length with the details of the design of those parts which are identical with the components of the above-mentioned engines, of which fully detailed reports have already been issued, and the design of which is now well known in this country.

In comparison with the standard type 160-hp. Mercedes, the new engine shows a marked improvement, both in the design as a whole and in its general performance during power and consumption tests, and as a comparison between the two engines the following comparative table of the leading particulars of the engines is herewith given:

	160 hp.	180 hp.
Bore .....	140 mm.	140 mm.
Stroke .....	160 mm.	160 mm.
Compression ratio .....	4.50:1	4.64:1
Average b.hp. and speed .....	162.5 at 1400	174 at 1400
B.M.E.P. (lb. per sq. in.) .....	102.0 at 1400	109.1 at 1400
*Total weight of engine (dry) ..	618 lb.	635 lb.
Weight per b.hp. ....	3.80 lb.	3.65 lb.
Fuel consumption per hour ....	94.2 pints	94.83 pints
Fuel consumption per b.hp. hr. .	.58 pint	.545 pint
Oil consumption per hr. ....	5.0 pints	7.3 pints
Oil consumption per b.hp. hr. .	.031 pint	.042 pint
Inlet valve opens .....	2° L.	T.D.C.
Inlet valve closes .....	35° L.	40° L.
Exhaust valve opens .....	63° E.	40° E.
Exhaust valve closes .....	13° L.	10° L.
Ignition timing (fully advanced)	30° E.	30° E.
Delivery of water pump .....	41.4 gals. per min.	

\*This weight is weight of engine (dry), excluding propeller hub and exhaust manifold.

The six separate cylinders are exactly the same construction as those used in the standard 160 hp. Mercedes engines, being built up entirely of steel, with the valve pockets threaded and welded into the cylinder heads, and the water jackets of pressed sheet steel welded in position. The pistons also follow the standard Mercedes practice and are similar to those used in the 160 hp. engines, being constructed with concave heads machined from steel forgings, which are screwed into the cast-iron skirts of the pistons and welded in position.

Three rings are provided above the piston pins and one ring below, which is situated at the base of the skirt. The piston pins are carried in lugs machined in the lower part of the steel piston crown. The compression ratio, it will be noticed, is slightly higher in the new 180-hp. engines, being 4.6:1 as compared with 4.5:1.

The H section connecting-rods with their floating cast iron piston pin bushes also follow the usual Mercedes practice, and are identically the same as those used on the 160-hp. engines, and the whole of the camshaft vertical driving shaft and also the water and oil pumps driving gear is similar to the 260-hp. engines.

No alteration has been made in the general design of the crankshaft from the standard 160-hp. type. The leading dimensions, clearances and method of lubrication of the journal and connecting-rod bearings are the same, as shown in the general sectional view of the engine.

The crankcase while following the general construction of the 160-hp. engines, also resembles in many ways the 260-hp. type. The usual Mercedes practice of casting the lower half of the main bearing housings integral with the bottom half of the base chamber, and also the method of holding down the cylinder by long bolts which pass through the base chamber top half and secure the halves of the crankchamber, is adhered to.

## Valve Gear New

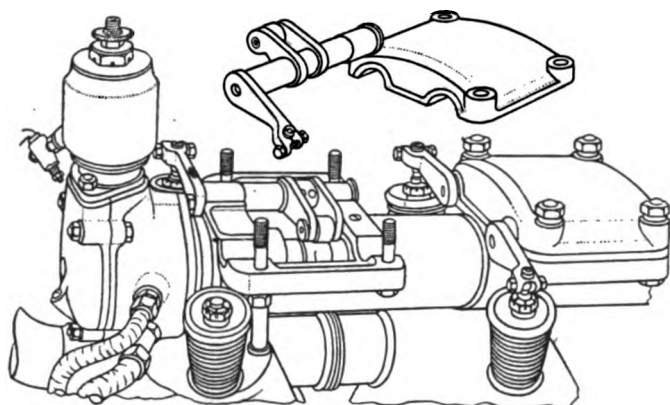
The single inlet and exhaust valve of each cylinder, which work at an angle of 15 deg. to the axis of the cylinder, are interchangeable as in the 160-hp. engines and are of similar design. The valve operating gear is, however, of new design and follows more the construction of the valve gear on the 260-hp. Mercedes engines. General details of this construction and working of the valve gear are shown in the sketch.

It will be noticed that the rocker arms and their spindles are now integral, being machined from steel forgings. The camshaft casing is constructed entirely from malleable-iron castings, and the valve rocker spindles work in direct contact with the malleable iron, no bronze bushes being provided as bearings for the rocker arm spindles, and the covers of the camshaft casing form the top portion of the rocker spindle bearings.

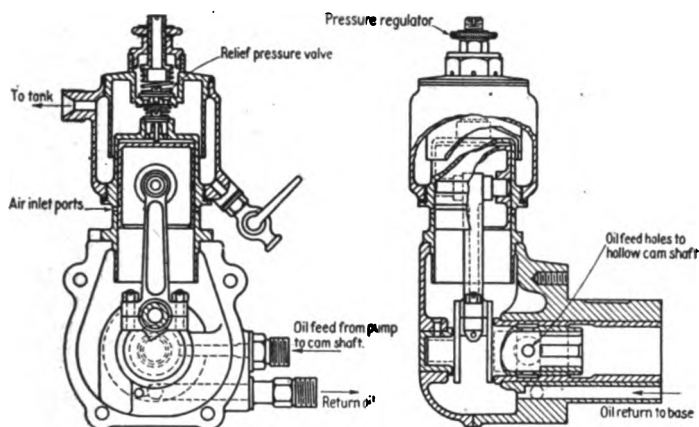
The rocker spindles are hollow, and are lubricated through two holes drilled radially in the spindles by oil thrown off the revolving cams into the two holes drilled in the rocker arm carrying the cam roller.

This design of valve gear is undoubtedly a great improvement on the arrangement adopted in the 160-hp. Mercedes, the construction of which is well known, having the rocker arms working through slots in the camshaft casing, which are provided with felt-packing strips and baffle plates for retaining the oil in the camshaft casing.

The camshaft is of similar design to the 160-hp. Mercedes, and the casing is supported on long studs which are screwed into the head of each cylinder.



Valve gear and air pump



Air pump

With regard to the valve timing, this, it will be noticed, is different from the standard 160-hp. Mercedes, as shown in the comparative list of leading particulars. The valve lift has been increased from 0.440 in. on the 160-hp. engines to 0.452 in. Only very minor differences occur in the actual dimensional details of the half compression gear in the new engine. Details of this mechanism are now well known; the general design is, however, clearly shown in the general arrangement sectional drawing of the engine.

#### Carbureters

No alteration has been made in the design of the twin-jet dual carbureters. Both carbureters are enclosed in a cast aluminum water jacket, which is coupled at the bottom by a water pipe to the delivery pipe of the water pump at the top of the water jacket of the rear cylinder to the top portion of the water jacket of the carbureters.

Each carbureter feeds three cylinders by a branched induction pipe of steel tube which is lagged with asbestos cord and bound with adhesive tape. The throttles are, of course, interconnected, and are operated by a cable and also by a control lever and rod. The float chambers are of ordinary design, but are fitted with separate filters attached to the bottom of each float chamber, which are easily detachable. These filters are provided with needle-valve drain cocks. No compensation arrangement is provided for altitude control. The bore of the main jets is 1473 mm., and the bore of the pilot jets .558 mm., which is the same as in the 160-hp. Mercedes carbureters. A semi-diagrammatic sectional view of one of these carbureters is reproduced for reference.

The air-intake to the carbureters is taken through the passage cast in the central portion of the top and bottom halves of the base-chamber, which forms an air chamber between the front and rear oil pumps in the lower portion of the bottom half of the base. Air enters the central air chamber through two holes cast in the sides of the chamber and

also warm air through a large diameter pipe leading from the central portion of the top half of the crank chamber.

#### Camshaft Drive

The method of fixing the camshaft driving bevel at the top end of the vertical shaft, as shown in the sketch, is unusual. This method is similar to that adopted in the 260-hp. engines, and is so designed as to allow of a certain amount of vertical adjustment of the bevels. The driving end of the vertical shaft is machined and ground parallel, 21 mm. diameter, and is fitted with a key, which fits in a keyway in the driving bevel; a ground taper on the bottom extension of the bevel, which is split by four saw cuts, and into which screws a ring nut, locks the bevel securely in position on the vertical driving shaft.

In the old 160-hp. Mercedes engines the camshaft driving bevel on the vertical shaft is fixed by two bolts in the split extension of the bevel which is fitted on to a ground taper on the vertical shaft.

Referring to the sketch of the vertical shaft, it will be seen that the bottom end of the shaft is carried on a "Skefko" universal bearing, which is mounted inside a steel sleeve, carried at the rear end of the crankcase, and is driven off the floating bevel gear on the rear end of the crankshaft in the usual way.

#### Lubrication

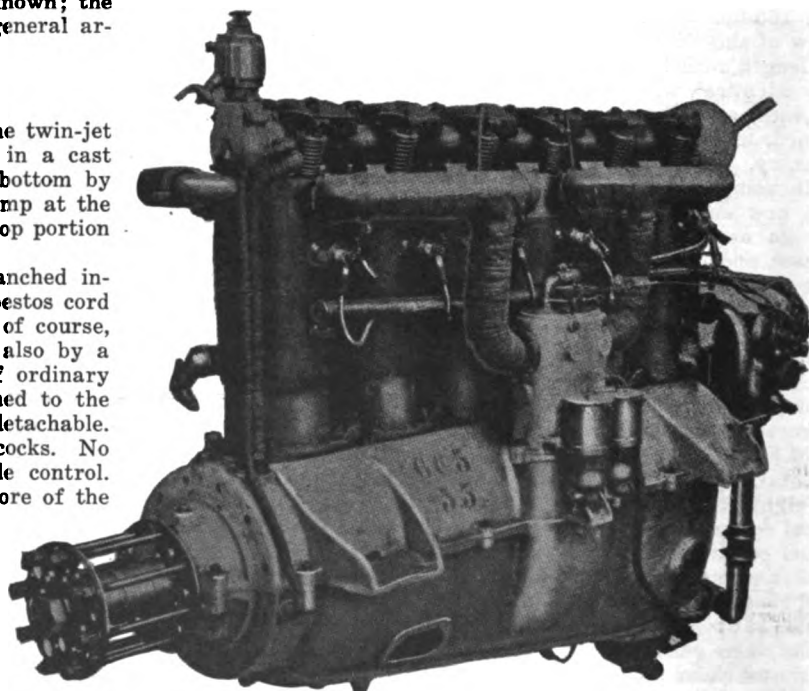
The old 160-hp. type multiple-plunger oil pump has been replaced by the larger pump, similar in design to the 260-hp. Mercedes pump. The oil pump is attached to the bottom of the rear oil sump or reservoir, at the rear end of the base-chamber.

The functions of the oil pump are perhaps most clearly demonstrated in the diagrammatic sectional drawing and in the sectional sketch of the pump.

Briefly described, the functions of the oil pump and the system of lubrication may be sub-divided into three circuits.

(a) *The main pressure circuit*, in which oil is drawn from the main oil sump at the rear of the base chamber and is forced to the main crankshaft journal-bearings and connecting rod bearings, and also the camshaft bearings.

(b) *The supplementary pressure system*, which works in conjunction with the main high-pressure system, in which two auxiliary plungers of the main oil pump draw a small charge of fresh oil from the service oil-tank at every stroke of the

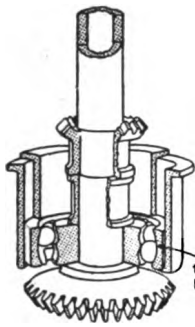


Intake side of Mercedes 180-hp. aircraft engine. This illustration clearly shows the method of supporting the carburetor on the crankcase and drawing the air through the latter in order to heat it

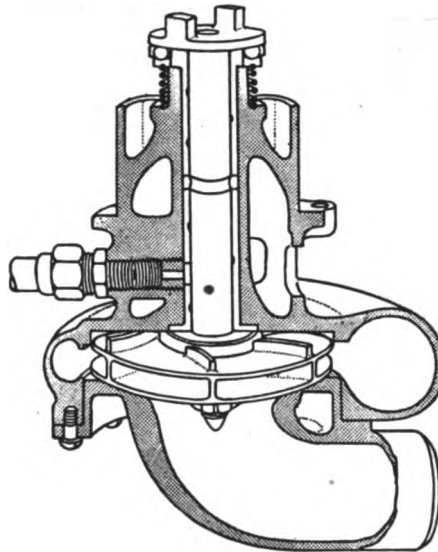




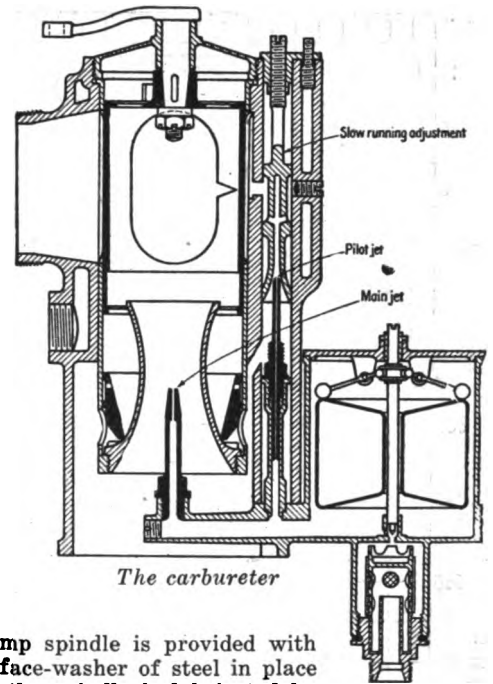
Camshaft driving pinion at attachment and arrangement of ball bearing at bottom end



SKF twin race bearing.



Water pump



The carburetor

pump and force the charge into the main circulation system.

(c) The suction or scavenger circuit, which supplies the main oil sump from the auxiliary drain sump at the front end of the base chamber, the working oil level being maintained in the rear sump by an auxiliary suction pump which draws off the oil above the oil level through an overflow pipe and returns it to the oil tank.

An oil sight level indicator is provided in the side of the rear oil sump.

Full details of the functions and operation of this somewhat complicated oil pump are given in the previous report on the 260-hp. Mercedes engine.

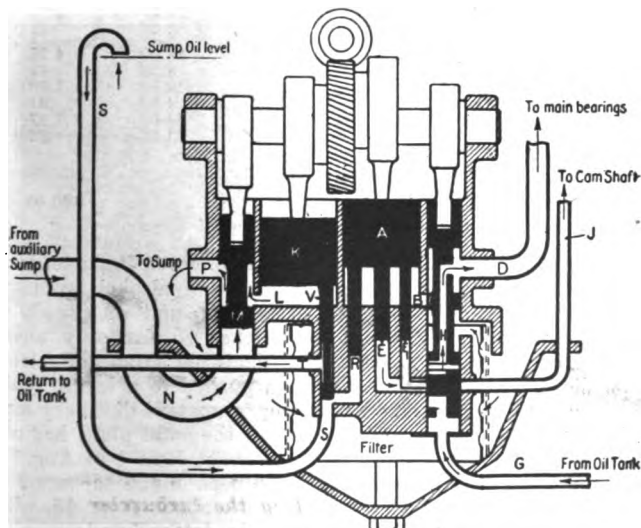
#### Ignition

Two Z.L.6 type Bosch magnetos are fitted at the rear end of the engine and are driven directly off the camshaft vertical driving shaft by bevel gears, as in the 260-hp. engines.

Ignition is by two Bosch 3-point plugs fitted to each cylinder, one on either side of the cylinder below each valve head, and the h.t. cables are carried as usual in fiber tubes attached to the cylinders.

The ignition timing is fixed at the same period as in the 160-hp. engines, i.e., 30 deg. E., and the speed of the magnetos is 1.5 times engine speed. Firing order: 1, 5, 3, 6, 2, 4.

The water pump in the old type 160-hp. Mercedes engines is situated above the magneto drive, and is driven directly off the vertical camshaft driving shaft. In the 180-hp. engine the standard 260-hp. type water pump has been adopted. This is now driven, as in the large engines, by a dog clutch off the bottom end of the lower vertical shaft, which also drives the oil pump worm driving shaft, as shown in the sectional view.



Diagrammatic section of oil pump

The water pump spindle is provided with a spring-loaded face-washer of steel in place of a gland, and the spindle is lubricated by hand, as in the 260-hp. engines, by a large screw-down grease lubricator accessibly arranged on the pilot's seat. Details of this water pump are clearly shown in the sketch.

This is of a new design, and is now driven off the front end of the camshaft, as in the 260-hp. engines. The piston and barrel of the air pump are made of cast iron, and the piston is operated by a small connection rod of bronze and a double webbed crank, as shown in the sectional sketch. The air pump crankshaft is provided with four serrations which fit into the corresponding splines cut on the inside of the hollow camshaft. The bore of the pump is 40 mm., and the stroke is 40 mm.

Air inlet ports are drilled in the lower portion of the pump barrel and are uncovered by the piston at the bottom of its stroke, and the delivery check valve is situated in the head of the pump barrel. A regulating valve is provided directly above the check-valve, the released air escaping through the center of the hollow adjusting screw, and also through six small holes drilled radially in the threaded cap which forms the seating of the regulating valve.

A self-contained oil trap is provided by the gun-metal jacket which surrounds the barrel of the air pump. This is fitted with a drain cock, as shown in the sketch. The air pump piston and crankshaft are lubricated by the excess oil in the camshaft casing.

#### Details of Oiling System

The main oil lead from the oil pump to the hollow camshaft is taken through a passage drilled in the crank-chamber of the air pump, the oil entering the camshaft through four 5 mm. holes drilled radially in the hollow air pump crankshaft, which register with a groove cut in the inside of its bearing.

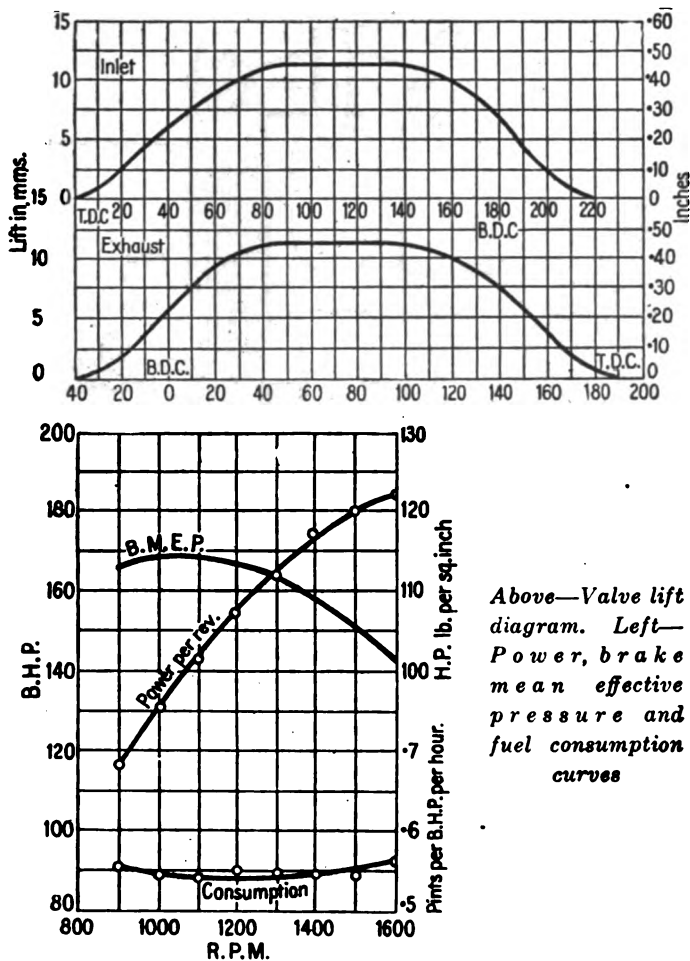
The following is a summary of a report of the 180-hp. Mercedes engine carried out at the Royal Aircraft Factory, Feb. 6, 1918:

The engine was erected on test bed, and coupled to a Heenan and Froude dynamotor, and power readings taken at various speeds, simultaneous fuel and oil consumption readings being taken. The results of these tests are shown graphically on the curves attached to this report.

These curves show the following readings:

R.p.m.	1300	1500
B.h.p.	165	180
B.m.e.p.	112	105.5
Fuel consumption in pints per b.h.p. hour.	.540	.555
Normal engine speed	1,400 r.p.m.	
Average b.h.p.	174	
Average petrol consumption	.545 pint per b.h.p. hr.	
Average oil consumption	.042 pint per b.h.p. hr.	

During a previous test the engine was run up to 1700



Above—Valve lift diagram. Left—Power, brake mean effective pressure and fuel consumption curves

r.p.m., at which speed 197.5 b.h.p. was recorded, but at this speed the engine was found to be incapable of giving constant power.

The engine was run at 1400 r.p.m. for the purpose of calibrating the output of the water pump, which delivered into a graduated tank at the rate of 41.4 gal. per min.

Owing to the fact that during the above test it was found to be impossible to tune up the engine, the power developed does not probably represent its best performance, as from other data and tests of the engine a normal b.h.p. of 179.5 at 1400 r.p.m. and a maximum b.h.p. of 188 at 1500 r.p.m. has been recorded.

Further details of the 180-hp. engine are given in the accompanying list of particulars.

Weights		Lb.
Weight of engine complete, dry, including propeller hub and exhaust manifold		660.0
Weight per b.h.p.		3.79
Weight of exhaust manifold		13.0
Weight of oil carried in engine		19.125
Weight of fuel and oil per hour		93.53
Gross weight of engine in running order, less fuel, oil and tanks, but including cooling system, at 0.64 lb. per b.h.p.		773.0
Weight per b.h.p.		4.44
Gross weight of engine in running order, with fuel, oil and tanks for six hours. (Tanks at 10 per cent weight of fuel and oil)		1,390.3
Weight per b.h.p.		8.00

#### Engine Data

Number and arrangement of cylinders	Six vertical, separate.
Bore	140 mm. = 5.51 ins.
Stroke	160 mm. = 6.30 ins.
Stroke-bore ratio	1.142:1.
Area of one piston	23.84 sq. ins. = 153.9 sq. c.
Total piston area of engine	143.04 sq. ins. = 924 sq. c.
Stroke volume of one cylinder	150.28 cu. ins. = 2.463 c.c.
Total stroke volume of engine	901.68 cu. ins. = 14.778 c.c.
Volume of clearance space	41.3 cu. ins. = 676.64 c.c.
Compression ratio. Total volume—clearance volume	4.64:1.
Normal b.h.p. and speed	174 b.h.p. at 1,400 r.p.m.
Piston speed	1,470 ft. per min.
Brake mean pressure	109.1 lbs. sq. in.
Cu. ins. of stroke volume per b.h.p.	5.18 cu. ins.
Sq. in. of piston area per b.h.p.	0.823 sq. in.

B.h.p. per cu. ft. of stroke volume. 334.0.  
B.n.p. per sq. ft. of piston area. 175.0.  
Direction of rotation of crank and propeller. Anti-clockwise facing propeller.  
Lubrication system. Forced, multiple plunger pump.  
Oil consumption per hour. 7.3 pints = 8.21 lbs.  
Oil consumption per b.h.p. hour. 0.642 pint = 0.047 lb.  
Oil pressure. 20 lbs. sq. in.  
Volume of oil carried in base-chamber. 17 pints.  
Number and type of carburetor. One dual Mercedes, twin-jet.  
Diameter of chokes. 0.945 in. = 24 mm.  
Bore of main jets. 0.058 in. = 1.472 mm.  
Bore of pilot jets. 0.022 in. = 0.559 mm.  
Fuel consumption per hour. 94.83 pints = 85.32 lbs.  
Fuel consumption per b.h.p. hour. 0.545 pint = 0.491 lb.  
Inside diameter of induction pipes. 2.126 ins. = 54 mm.  
Number and type of magnetos. Two, Bosch, Z.L.6.  
Firing sequence of engine. 1, 5, 3, 6, 2, 4.  
Ignition timing (fully advanced). 30° early.  
Speed of magnetos. 1.5 engine speed.  
Inlet valve opens. Top dead center.  
Inlet valve closes. 40° late.  
Diameter of inlet valve (smallest diam.) = d. 2.677 ins. = 68 mm.  
Lift of inlet valve = h. 0.453 in. = 11.5 mm.  
Area of inlet valve opening (w.d.h.). 3.81 sq. ins. = 24.58 sq. c.  
Mean gas velocity through inlet valve. 153.4 ft. per sec.  
Clearance of inlet tappet. 0.017 in. = 0.432 mm.  
Exhaust valve opens. 40° early.  
Exhaust valve closes. 10° late.  
Diameter of exhaust valve (smallest diam.) = d. 2.677 in. = 68 mm.  
Lift of exhaust valve = h. 0.453 in. = 11.5 mm.  
Area of exhaust valve opening (w.d.h.). 3.81 sq. ins. = 24.58 sq. c.  
Clearance of exhaust tappet. 0.014 in. = 0.355 mm.  
Diameter of inlet and exhaust ports. 2.165 ins. = 55 mm.  
Diameter of water pump inlet. 1.692 ins. = 43 mm.  
Diameter of water pump outlet. 1.575 ins. = 40 mm.  
Ratio of water pump speed to crankshaft speed. 1.5:1.  
Delivery of water pump at normal speed. 41.4 gals. per min.  
Inlet water temperature. 64° Cent.  
Outlet water temperature. 74° Cent.  
Water jacket capacity of one cylinder. 1,280 c.c.

Description of Part	No. per set	Average unit weight	Weight of complete set	Percentage of total weight
Cylinders (bare)	6	19.25	115.50	17.5
Pistons, complete with rings and gudgeon pins	6	6.85	41.10	6.23
Connecting rods, with gudgeon pin bushes	6	5.00	30.00	4.55
Valves, complete with springs, etc.	12	1.31	15.74	2.39
Crankshaft (bare)	1	70.00	70.00	10.60
Camshaft (bare)	1	7.75	7.75	1.17
Camshaft casing with bearings and covers	1	27.63	27.63	4.18
Valve rockers	12	.87	10.50	1.59
Half compression gear (complete)	1	7.00	7.00	1.06
Vertical driving shaft (complete), including casing, oil pump, drive, and floating bevel	1	17.50	17.50	2.66
Base chambers (top half)	1	72.25	57.22	10.92
Base chamber (bottom half)	1	100.00	100.00	15.16
Carburetors	one dual	16.75	16.75	2.54
Induction pipes (lagged asbestos)	2	5.00	10.00	1.52
Water pump (complete)	1	7.75	7.75	1.17
Oil pump (complete)	1	13.25	13.25	2.00
Air pump (complete)	1	4.75	4.75	.72
Magnetos (complete)	2	14.00	28.00	4.25
Water piping	—	3.25	3.25	.49
Propeller hub (complete)	1	12.50	12.50	1.90
Ignition wiring (complete)	2	2.00	4.00	.61
Exhaust manifold	1	13.00	13.00	1.97
Miscellaneous parts	—	31.78	31.78	4.82
Total weight of complete engine (dry) (with propeller hub and exhaust manifold)			660 lbs.	100.00

AN item in a recent issue of U. S. Commerce Reports deals with the subject of the manufacture of alcohol from the sotol plant. This plant grows in Mexico, and its supply is practically unlimited. It is stated that so far only about 100 bbl. of alcohol has been manufactured from the plant. That the manufacture has not been pushed to a larger scale is due partly to difficulty in securing competent distillery men and partly to the fact that the sap of the sotol plant has not the proper chemical properties from about June 1 to Aug. 15. Arrangements are reported to have been made to secure a good distillery man and to begin work about Aug. 15, with the expectation of having the plant operate at full capacity from that time on.

# A New Method of Obtaining Brinell Hardness\*

An Impact Substituted for a Steady Pressure to Reduce the Time Required for Applying the Test—Method Consistently Accurate

By J. G. Ayers, Jr.

THE present types of Brinell machines generally follow the original Brinell principle of forcing a ball of standard diameter into the steel under test by means of a standard load hydraulically applied. Several seconds are required to bring the full load to bear upon the ball and test specimen, and several more are used in maintaining this pressure, according to approved practice.

Under laboratory conditions, where time is not so important a factor as accuracy, the present types of machines are entirely satisfactory. There are cases, however, where testing must be done on a large commercial scale, as in the acceptance of raw material, and where the hardness range permissible does not require tests of laboratory accuracy. In such cases the rapid and approximate determination of the hardness of thousands of pieces is more important and productive of better results than the extremely accurate testing of a limited number whose hardness, unfortunately, is not always representative of the lot as a whole.

With the idea of overcoming this objection and of making possibly a simpler machine which, while not possessing the accuracy of the ordinary Brinell machine, would be capable of giving results that would be satisfactory for tests on a commercial scale, the writer has conducted experiments which have led to results far more encouraging than he had hoped. While the final form of the machine, including the necessary mechanical details, has not yet been developed, a description of the principle involved and the results obtained in the various experimental tests may prove of interest.

Instead of applying a standard dead load as in the ordinary Brinell machine, a given or standard impact was

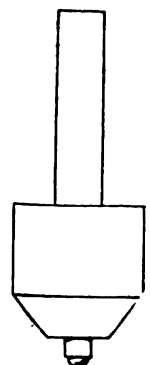


Fig. 1—Cylindrical weight and 10 mm. ball

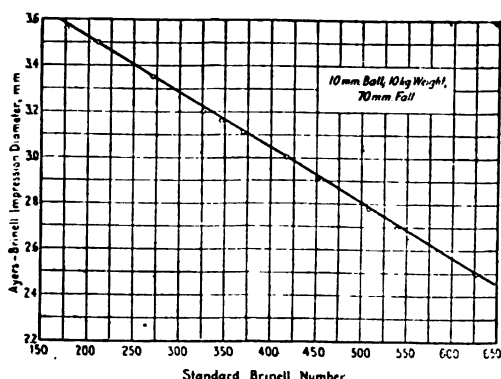


Fig. 2—Ayers-Brinell diameters plotted against standard Brinell hardness

used. It is of course impossible to choose a standard impact that will produce the equivalent Brinell impression in a steel of any hardness, but for a given Brinell hardness it is possible to determine empirically the impact required to produce an impression identical with the one produced by the

standard Brinell machine. It was decided to choose that impact which gives a 3-mm. diameter impression in a steel of 418 Brinell hardness. This impact would therefore give the same result on a steel of this hardness as the standard Brinell machine using a 10-mm. ball and a 3000-kg. load. A cylindrical 10-kg. weight with a cone-shaped lower end was used, in which the standard 10-mm. ball was fastened securely. See Fig. 1. The proper height from which the

TABLE I—BRINELL HARDNESS NUMBERS FOR "AYERS-BRINELL" MACHINE  
10-MM. BALL; 10-KG. WEIGHT

Diameter of Ball Impression, Mm.	Hardness Numbers		Diameter of Ball Impression, Mm.	Hardness Numbers		Diameter of Ball Impression, Mm.	Hardness Numbers		Diameter of Ball Impression, Mm.	Hardness Numbers	
	36-mm. Fall	70-mm. Fall		36-mm. Fall	70-mm. Fall		36-mm. Fall	70-mm. Fall		36-mm. Fall	70-mm. Fall
2.00	629	838	2.50	419	628	3.00	209	418	3.50	.....	208
2.05	608	817	2.55	398	607	3.05	188	397	3.50	.....	187
2.10	587	796	2.60	377	586	3.10	167	376	3.60	.....	166
2.15	566	775	2.65	356	565	3.15	146	355	3.65	.....	145
2.20	545	754	2.70	335	544	3.20	125	334	3.70	.....	124
2.25	524	733	2.75	314	523	3.25	104	313	3.75	.....	103
2.30	503	712	2.80	293	502	3.30	83	292	3.80	.....	82
2.35	482	691	2.85	272	481	3.35	62	271	3.85	.....	61
2.40	461	670	2.90	251	460	3.40	41	250	3.90	.....	40
2.45	440	649	2.95	230	439	3.45	20	229	3.95	.....	19

weight should fall to produce a 3-mm. diameter impression was determined experimentally by raising it to various heights by means of a supporting wire and hand crank and then severing the wire. This height was found to be 70 mm., and the impact would therefore be 0.700 m.-kg. Using this impact as a standard, specimens of various Brinell hardness were tested by this device and the diameters of the impressions obtained were plotted as ordinates against the standard Brinell machine hardness numbers as abscissas. Fig. 2 shows the results obtained.

As it is sometimes advisable to use a lighter load than 3000 kg. with the standard Brinell machine, it was decided also to try the effect of a lesser impact. Instead of taking one-half the standard impact of 0.700 m.-kg., that height of fall was determined which would give a 3-mm. diameter impression in a steel of 209 Brinell hardness using the same 10-kg. weight and 10-mm. ball. In other words, the new device would give the same result on a steel of this hardness as the standard Brinell machine using a 10-mm. ball and 1500-kg. load. This height was found to be 36 mm., giving an impact of 0.360 m.-kg.

In Fig. 2 the hardness-impression curve is practically a straight line and the points experimentally determined fall as closely to this line as could be desired, considering that in no case does their deviation from the line amount to a greater distance than that corresponding to the error involved in the microscopical determination of the diameter of the impression. Repeated tests gave excellent checks in all cases and showed that this method is consistently accurate and free from erratic tendencies. Each determination can be read directly in standard Brinell numbers by the use of Table I, the data for which has been obtained from Fig. 2.

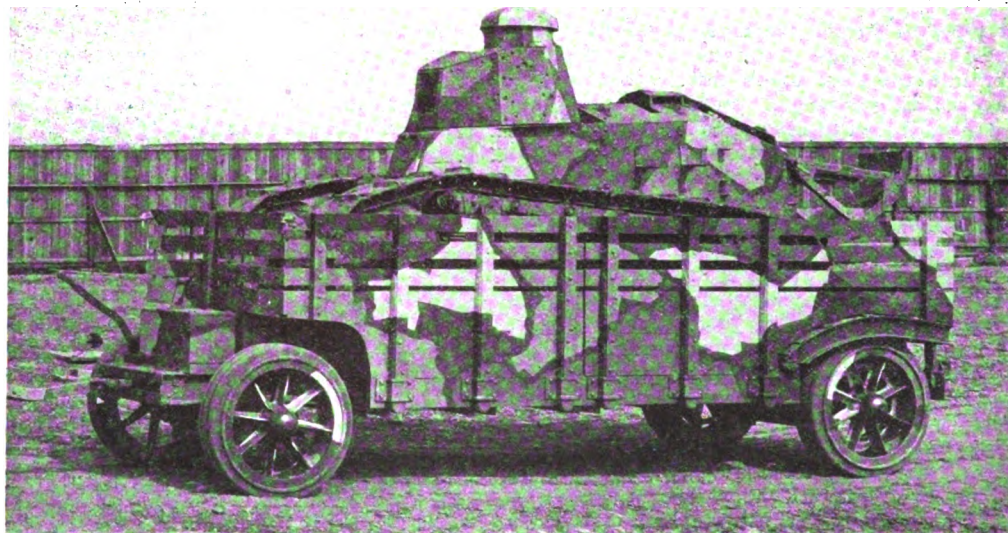
(Continued on page 481)

\*Paper presented to the American Society for Testing Materials at its annual meeting at Atlantic City, June 25-28, 1918.



# Grant Company Making Three Ordnance Trailers

Types Adapted for Use as Cargo Carriers, Gun Platforms and Shops—Incorporate Standard Features Where Possible



*Ten-ton trailer loaded with a small French tank*

THE line of trailers manufactured for the Ordnance Department by the Grant Motor Car Co., Cleveland, clearly illustrates the great variety of uses to which trailer equipment can be put in warfare. There are three of these trailers, one for moving 3-in. field guns and which is also adaptable to the French 75, or the equivalent English field piece; another, a 4-ton trailer upon which may be mounted a shop body, a cargo carrying body or a variety of other bodies, and the third a trailer for anti-aircraft guns which forms a platform for the gun and upon which the gun is mounted permanently.

The 3-in. field gun trailer has a capacity of 9000 lb. It has a wheelbase of 120 in. and a track width of 77½ in. By its use the mobility of the U. S. 3-in. field piece, or the French and British equivalent, is greatly increased, since this trailer with the gun can be towed behind a tractor or truck at a much higher speed than would otherwise be possible.

The trailer is a four-wheel type having a single-end steer, the steering being accomplished through the drawbar by means of a flexible connection with the steering lever, which is in turn connected to the steering cross-arm. The trailer is built on a pressed steel frame, mounted on semi-elliptic springs on the I-beam front axle and the rectangular dead rear axle. The floor is of oak planks carried on wood bolsters with mountings to support it at the required height above the frame cross members. An inverted panel is provided along the center of the floor and there are four recesses to leave clearance for the gun trail. To provide for the different guns to which this trailer can be adapted, there are three special pintles which can be mounted at the desired points along the platform.

The front axle is an I-beam section to which is bracketed a central supporting member to carry the steering lever. Pivoted to the steering lever on the center line of the trailer are the two steering cross-arms. These connect in turn with the steering knuckles and are laid out so that the trailer will

track accurately behind the tractor which tows it. The front wheels are roller bearing mounted.

The rear axle is a rectangular section forging, carrying the rear axle spindle as an integral unit. Roller bearings are fitted to these spindles to support the load of the rear wheels. The rear axle is a dead member and is dropped just inside the spindle, allowing the semi-elliptic springs to be overslung. The rear wheels carry the brake drums in which operate the internal expanding brake shoes, which are controlled by a hand lever at the front end of the trailer. The brake drums are 19 in. in diameter and the shoes are faced with asbestos fabric. Brake action is controlled by a straight pull rod from the hand lever at the front end of the trailer. There is a ratchet on this lever which allows the brake to be locked on in case it is desired.

The drawbar has a double coil spring housed within it, which takes up the towing shock in either direction. The drawbar is 42 in. in length and connects with the steering lever by means of a pin yoke which allows the drawbar eye to be raised or lowered in engaging it with the pintle on the tractor. On the rear end of the trailer the standard pintle is fitted, which permits towing.

For loading the trailer two channels are provided which hook on the rear end, giving a ramp up which the guns can be hauled. These channels are detachable and are carried on the trailer frame when not in use.

The springs are interchangeable front and rear, being 42 in. long and 3 in. wide. The wheels are cast steel 36 by 6 in., adapted for demountable tires. There are eight spoke wheels and the tire fastenings are so arranged that the tires will be interchangeable with those used on the Nash and F. W. D. trucks. Throughout this trailer is designed to be interchangeable with the trailer used for the 3-in. anti-aircraft gun, in so far as similar products are employed.

For mounting the 3-in. anti-aircraft gun a trailer of 10,000-lb. capacity is provided. This trailer is a four-wheel



type, mounted on a wheelbase of 156 in. The frame is of pressed steel, spring supported on the front and rear axle and dropped for most of its length below the level of the supporting members at the axle. On the pressed steel frame is mounted a base plate suitable for attaching the gun to it, and the front and rear ends of the platform are covered by a steel plate  $\frac{1}{2}$  in. thick, forming a platform for the gun crew to stand upon.

The front end steering mechanism is similar to that of the 3-in. field gun trailer just described. There is also, however, a rear end steer, controlled by a bar or pole at the rear end. The rear wheels are locked in position when this pole is not in use, and the pole is carried in special brackets along the side of the trailer. A locking device is provided which is so designed that the pole cannot be withdrawn unless the wheels are in the center position. After the pole is withdrawn the wheels cannot be steered until it is re-inserted.

#### Front and Rear Axles Similar

The front axle is an I-beam section similar to that of the field gun trailer, and the front axle is dropped and carries the semi-elliptic spring overslung. The rear axle is similar in a great many respects to the front, being also a dropped I-beam section, with the same semi-elliptic springs overslung. The rear steering knuckles are forged and the spindles carry roller bearings which support the wheel load, as in the case of the front wheels. The brake drum is pressed steel, bolted to the rear wheels, in which the internal expanding brake operates. This brake is mounted on a 16-in. gun capable of holding the loaded trailer on a 20 per cent grade. The brakes are operated by a hand lever at the rear right hand side of the trailer. A seat and suitable foot rests are provided for the man operating the brakes. The frame on this trailer is 8 in. deep and is formed from  $\frac{1}{2}$ -in. stock. It is braced at the rear end to take the Ordnance Department standard pintle and to allow for towing of another trailer of the same size as that described herewith.

In addition to the trailers described, the Grant Motor Car Co. is also making a 4-ton trailer suitable for carrying a number of bodies such as a repair shop, a cargo carrying body and other equipment. This is also a four-wheel type with single end steer. The drawbar connection is similar to the trailers described previously. The trailer is built upon a frame of standard 8 in. by 13 $\frac{1}{4}$  in. commercial steel, with channel side rails and front and rear cross rails. This framework is substantially reinforced by cross members of channel and I sections.

The wheelbase of the trailer is 156 in.; the track width, 72

in.; the frame length, 19 ft. 4 in., and the frame width, 44 in. overall. The axles are carbon steel forgings.

The front axle is a drop-forged I-beam section to which is bracketed a central supporting member carrying the steering lever. Pivoted to the steering lever on the center line of the trailer are two cross-arms, these connecting in turn with the steering knuckles and being so arranged that the trailer will track accurately behind the tractor which pulls it. The steering knuckles are drop forged and are the straight Elliott type. The wheels are mounted on roller bearings.

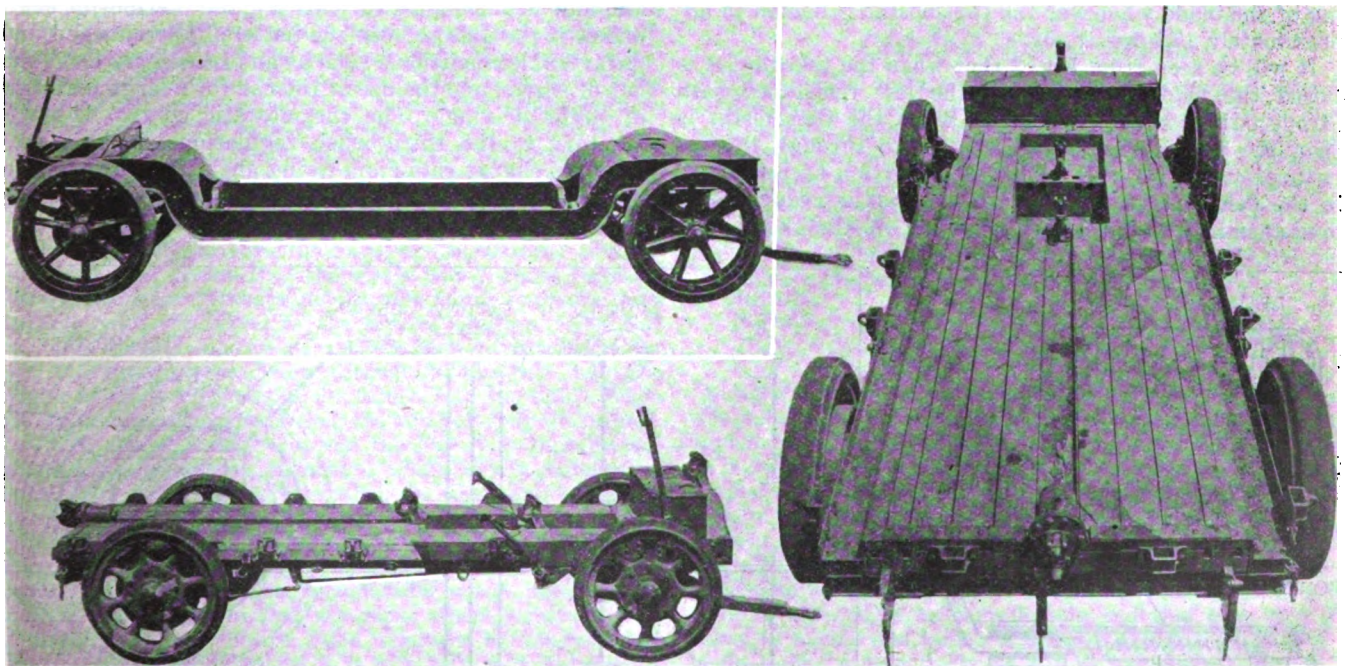
The rear axle is rectangular in section and is drop forged from carbon steel. The axles are 4 in. deep by 2 $\frac{1}{4}$  in. wide. As the rear axle is a dead member, the spindles are forged integrally with it and carry the wheels on roller bearings. The rear wheels carry the brake drums, in which operate the internal expanding brake shoes, which are controlled by a hand lever mounted at the front end of the trailer. The brake drums are 19 in. in diameter and the shoes are faced with asbestos fabric. The brake linkage is controlled by a straight pull rod from the hand lever. There is a ratchet on this lever which allows the brake to be locked.

The drawbar is a standard type, having a double coil spring housed within it. The drawbar is equipped with a spring mounted eye or lunette of 3 in. diameter and 6 in. outside diameter. Attached to the rear end of the trailer is the standard Ordnance type of pintle.

The springs are interchangeable and have main leaves of chrome vanadium steel. The other leaves are of carbon steel. The springs have an eye at one end and an arc at the other which rests over the rear spring mounting in such a way that the spring is free to slip over it when it lengthens, due to reflection. The length is 48 in. from the center of the eye to the center of the rear arc. The width is 4 in., the main leaf  $\frac{3}{8}$  in. thick, and the other leaves are 5/16 in. thick. The springs are held by two clips and the eyed ends are fitted with bushings of the proper size to take a 1-in. spring bolt.

The height from the top of the ground to the top of the frame when the trailer is fully loaded is 31 in. The live load on the trailer approximates 6600 lb. and the dead load totals 4400 lb. The tires are 36 by 6 in., pressed on, and the painting is in accordance with the standard camouflage specifications.

AS an extension of its factory betterment work, the New Departure Co. of Bristol, Conn., is installing shower baths for the men engaged in the hardening shop and other so-called hot departments.



Above—Trailer for anti-aircraft gun. Below—Three-inch field gun trailer Platform of the 3-in. field gun trailer

# Thermostatic Generator Control Now Proved Success

Compensation for Atmospheric Temperature Found  
by Remy to Result in Saving of Battery Life

**C**ARS equipped with the Remy thermostatically controlled generator have been on the road for about 18 months. This has given ample opportunity to observe the success of thermostatic control for automobile starting and lighting systems. The result has been found by the Remy company to be beneficial to battery life and the thermostat controlled generator is now used as standard equipment on the Harroun, Kissel, McLaughlin, Mitchell, Oakland, Olds, Paige, Reo, Scripps-Booth, Stanley Steamer, Templar, Velie, Atlas truck and Grant Denmo trucks.

The advantage of thermostatic control is based upon the fact that it requires more current for lights and for the starting motor in winter than in summer. The result of this is that the storage battery is more apt to be found in a drained condition during the winter months than in the summer. To meet this variation in demand for current, the Remy generator has been equipped for some time with the thermostatic control, which automatically reduces the generator output in summer time and increases it in winter.

The diagram, Fig. 1, shows the mechanical construction of the thermostat. A stamped steel bracket carries a resistance unit, a silver contact point and a thermal blade, insulated from the bracket and carrying a second silver contact point. The contact point in the thermal blade is held against the similar contact in the bracket, by the spring tension of the blade itself, at low temperatures. The blade is, however, made of a strip of spring brass welded to a strip of nickel steel, a combination which warps when heated, due to the greater expansion of the brass. The contacts are thus separated by the bending of the blade whenever the thermostat is heated to approximately 175 deg. Fahr.

It will be seen from Fig. 2 that when the thermostat is closed the field current takes the low resistance path through the contact points, but when the thermostat is open the field current is forced to go through the resistance unit. By this automatic insertion of resistance in the field circuit the generator output is reduced to a predetermined value. The operation of the thermostat

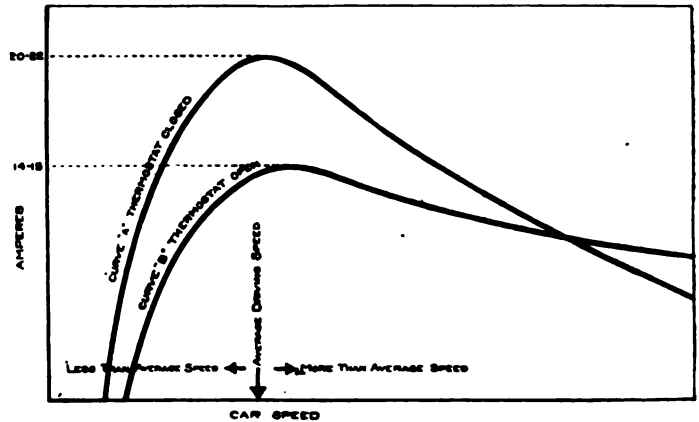


Fig. 3—Output curves with thermostat open and closed respectively

is illustrated in Fig. 3. The generator output is 21 or 22 amperes after starting with a cold machine, and with atmospheric temperatures around 70 deg. the thermostat will open after 2 or 3 miles, which is sufficient time to make up the amount of energy taken from the battery in starting. When the thermostat opens the output will drop to 14 or 15 amperes at average driving speed. In very hot weather the thermostat will open much quicker. In extremely cold weather the thermostat will remain closed, insuring the continuous high generator output needed to meet the increased demand made by the starting motor and the increased burning of lights.

In addition to correcting the difference between winter and summer demands for current, the thermostat control makes it possible to keep the battery fully charged under unfavorable conditions, such as an exceedingly large number of starts, and the use of the car for a large percentage of night driving. The thermostatic control is supplementary to the third-brush regulation which is set to keep the charge rate from rising above the predetermined maximum of 20 to 22 amperes for a cold generator when the car is operated above the average driving speed.

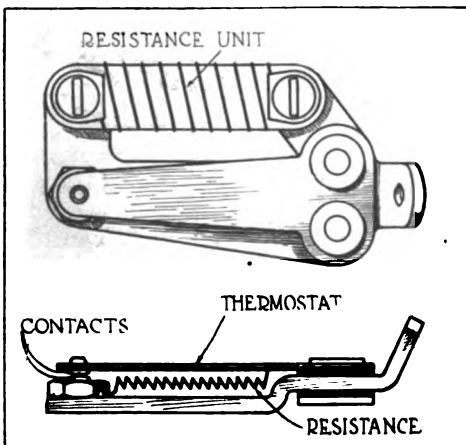


Fig. 1—Remy thermostat

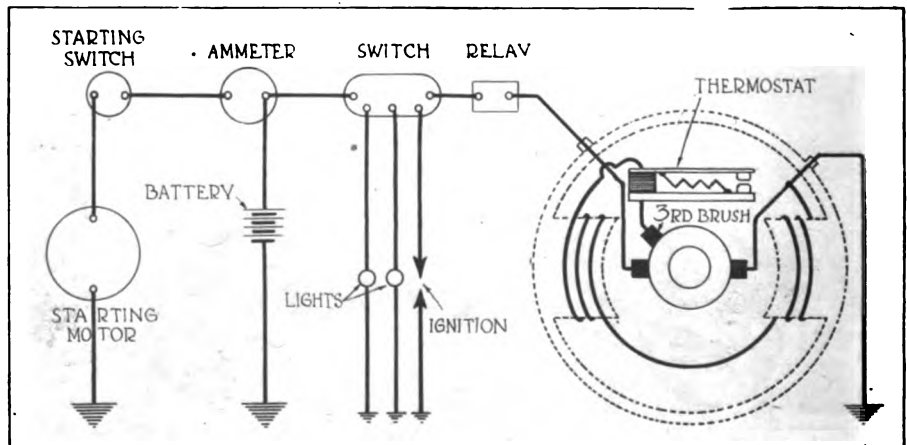
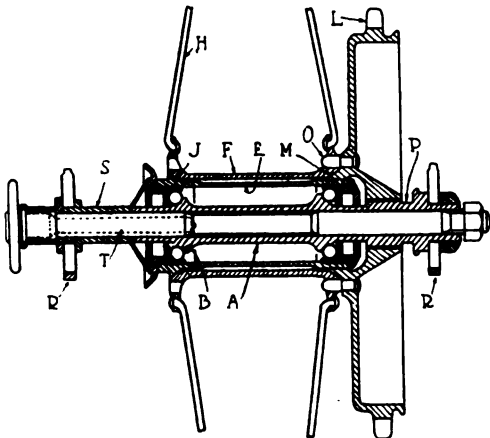


Fig. 2—Circuit diagram of Remy third brush control system with thermostat

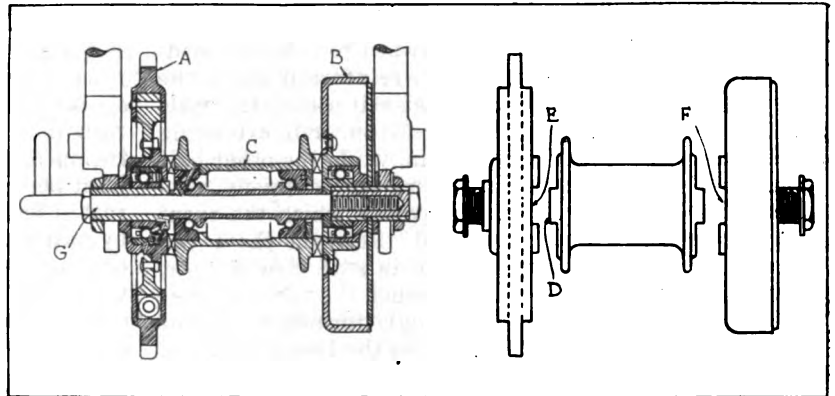


# Two New Demountable Motorcycle Wheels

In One the Driving Hub Is Driven by Pins in the Flange of Combined Chain Sprocket and Brake Drum—In the Other the Drive Is Through Hookham Joints



*Comery demountable motorcycle wheel*



*Lechmere demountable wheel, driven through a Hookham joint*

**P**ATENTS have recently been issued by the British Patent Office on two designs of demountable wheels for motorcycles. The first of these is in the name of W. Comery, who is connected with the Raleigh Cycle Company of Nottingham. Mr. Comery forms the hub proper *E* as a separate fitting, which is mounted upon a hollow sleeve-like spindle *A*, the usual ball or roller bearings being interposed. The wheel is provided with a tubular, shell-like center *F* which is flanged on the outside to receive spokes *H* and is adapted to fit on to the hub *E*, an inclined projecting rim *J* on the latter engaging one end of the wheel center.

The sprocket wheel *B* is centered on a member *P*, secured to the frame, and is provided with an inclined surface *M*, adapted to engage with the adjacent end of the wheel center *F*, inter-engaging screw threads being provided on the driving element *L* and hub proper *E* to secure the same together, with the wheel center wedged between the two. When so connected, the driving element, wheel and hub are firmly locked together, projection *O* on one member entering recesses in the other. The member *P* secured to the frame is bored to correspond with the hub spindle, and a short sleeve or spacer *S* is correspondingly bored to complete the distance between the sides of the frame *R*, a removable bolt *T* being threaded through the three members and the side frame to secure them together, with the wheel in the correct position. The bolt may be bored and one end enlarged to form a lubricant reservoir, transverse holes being formed in the bolt and hub spindle to allow lubricant to be forced into the hub. When it is desired to remove the wheel, the two bolt *T* is withdrawn, the short spacer *S* removed, and the hub *E* is then disconnected from the driving element *L* which is left centered on the member *P* attached to the frame, the wheel and hub being removed bodily and then slid apart.

The other demountable wheel is patented by W. F. Lechmere of the James Cycle Co. of Birmingham. This bears considerable resemblance to the demountable wheel used on the U. S. A. motorcycle, in that the whole wheel construction is in three parts, which are fitted together by tongues and grooves. The sprocket wheel *A* is rotatively mounted upon a sleeve secured to the frame, and the brake drum *B* is rotatively mounted upon another sleeve secured to the opposite

side of the frame, while the hub *C* is disposed between the sprocket wheel and the brake drum. Mutual engaging projections and recesses are formed on the outer spaces of the hub and the inner spaces of the sprocket wheel and brake drum, and a detachable, non-rotatable spindle passes through the hub and sleeves. Each end of the hub is provided with a diametrically disposed projection *D*, which is adapted to engage with the correspondingly shaped recess *E* in the sprocket, and a similar recess *S* in the brake drum. The hub is secured in position by means of a detachable spindle *G*.

## Cellulose Acetate Dope

**C**ELLULOSE acetate is the principal ingredient in dope for Caeroplan wings, requiring for that purpose to be mixed with certain solvents. It is also used in film form for windshields for aeroplanes, etc., its main value for both these purposes lying in its non-inflammable character. It is employed for a vast number of peace time products, and by-products in its manufacture are of importance, both in war time and peace. In the manufacture of cellulose acetate the principal ingredients are paper or pulp and acetic anhydride.

## A New Type of Link Chain

**A** NEW type of chain made up of weldless links is being announced by the Cleveland Galvanizing Works Co. Hodell chain is made of flattened wire in a machine which, it is claimed, automatically rejects any wire which is imperfect. This machine loops the wire, bends it and laps the ends in such a way that the next link cannot drop back and wedge, as happens in ordinary flat chains. This, and the smoothly rounded contacts, due to the use of smooth drawn wire, give what is referred to as a roller bearing effect. The chain is claimed to be very flexible and free from any tendency to buckle and kink. A feature of value in the Hodell chain is the double thickness of the eye where the wear is greatest, and the reinforcement there which prevents the chain from flattening and lengthening under strain.

# The Pfalz Single-Seater Fighter\*

## Part II

### Mounting of Tail Plane, Tail Skid, Vertical Fin and Rudder and Construction of These Parts

**A**T the stern the Pfalz body terminates, as shown in the illustrations, in a somewhat elaborate framework of wood, which performs the various functions of forming supports for the tail plane, tail skid, and vertical fin with its rudder. The second former from the stern is, it will be seen, sloped backward to form the leading edge of the vertical fin, and is reinforced above the body with other pieces of wood to give it a rounded edge. The last former is in duplicate, its front half extending upward to form a member of the fin, while the other half terminates just above the body and serves chiefly as a support for the short length of spar to which the front spar of the tail plane is attached. Between these two formers, and sloping so as to form in side view a cross, are two other formers, built up in much the same manner as the main body formers. The angle formed by one of these and the longeron accommodates the leading edge of the small plane permanently fixed to the body, while the point of intersection of the two formers supports a short

transverse cylindrical piece of wood, around which are wrapped the shock absorbers for the tail skid. The details of both these joints are shown in the sketches. The small tail plane root is covered with plywood.

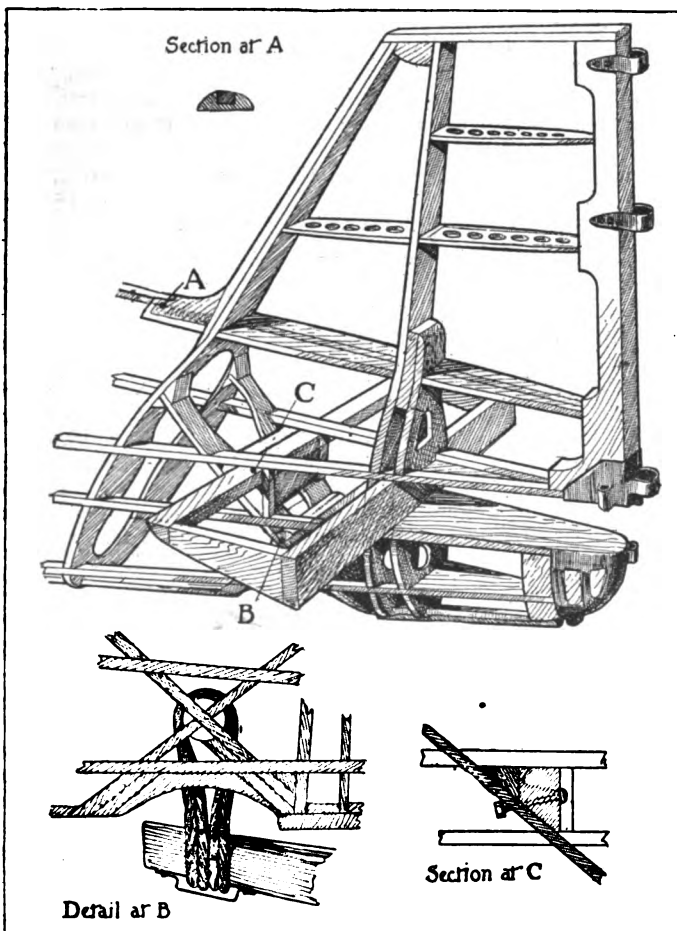
The tail plane itself is in one piece, and fits into the slot provided for it in the body. The manner in which it is secured after being placed in its slot will be clear from an inspection of the tail plane drawing. The front spar rests in the slot in the body, and is secured against lateral tilting by a steel band on each side, overlapping the butt joint between the front part of the rib and the tail plane root. The rear spar of the tail plane is locked in place by two long bolts and a stud. The two bolts are placed one on each side of the stern, as indicated in the sketch, while the stud passes through a lug welded on to the extreme rear of the steel shoe surrounding the heel of the fuselage into another lug near the foot of the stern post. The whole tail plane with its elevator can therefore be removed by undoing five nuts, and, of course, the connections in the elevator control cables.

\*From *Flight*.

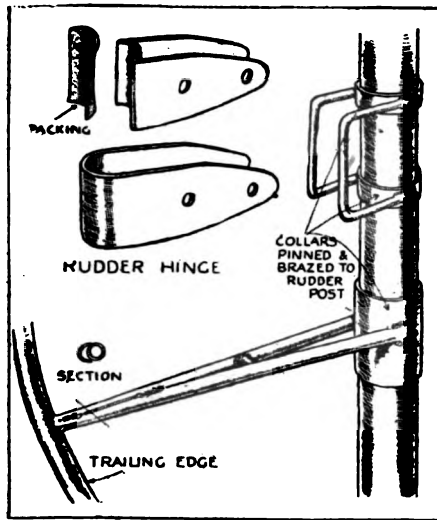
#### Tail Plane and Elevator

As regards the tail plane and elevator themselves, these are constructed along more or less standard lines and do not present any especially remarkable features. It has already been pointed out that the tail plane appears at first sight to have been put on "upside down," having a flat top surface and a convex bottom surface. The reason for this is not apparent, but it is possible that the disposition of the various weights and surfaces is such that there is either a lift-weight couple or a thrust-resistance couple or both, and that this section tail plane has been employed to equalize such couples. However, in a later machine captured and now at the Enemy Aircraft View Rooms the shape of the tail plane has been altered to a symmetrical section, so that it would appear that the "inverted" section has either been found unsatisfactory in practice or the reasons for its employment removed in a later design. Structurally the tail plane is built up of spruce spars with ribs having ash flanges and poplar webs. The inner ribs are covered with three-ply to give extra rigidity for attachment to the body. The front spar is of I section, while the rear spar is channel section, with recesses top and bottom for forming a flat surface with the rib flanges. There is no internal wire bracing, the necessary rigidity being obtained by means of diagonal ribs and by plates of three-ply placed over the joints between ribs and spars. The leading edge, which is also bent back to form the tips of the tail plane, is laminated as shown, and is lightened by spindling between the ribs. The laminations are probably steamed so as to be easily bent to form the rounded corners of the tail plane.

The elevator, owing to the fact that the rudder has no downward projection, is in one piece, and is built up in a manner similar to that of the tail plane. Its leading edge is formed by a box spar, and the ribs are similar to those of the tail plane. The attachment of the ribs to the trailing edge is somewhat unusual. Instead of the flanges of



Framework of the stern



Steel tubular frame of rudder and rudder hinge

the ribs passing over the trailing edge they are thinned down and pass into a slot in the trailing edge. They are then secured in place by a small metal clip. The slots in the trailing edge appear to have been made with a circular cutter of about 3 in diameter, the ends of the rib flanges being placed where the slot is deepest. The ele-

vator hinges are formed by forked bolts passing through the rear spar of the tail plane, and corresponding with eye bolts through the leading edge of the elevator.

The elevator crank levers are of a type frequently found on German machines. The crank itself is of stream-line section and is welded to a channel section base plate surrounding three sides of the leading edge. Another base plate of similar shape, but made of lighter gage, is slipped over the leading edge from the front and forms a washer for the hinge bolt, which passes through the leading edge at a point coincident with the crank lever. The attachment of the elevator and rudder cables to their respective cranks is in the form of a ball and socket joint, or, more correctly speaking, the ball portion of it is not a complete ball but a slice of a sphere, formed integrally with the bolt passing out of the socket into the barrel of the wire strainer. The socket, and also the ball, have a flat formed on one side so as to prevent the ball from turning in the socket. Behind the ball a small split-pin passes transversely through the socket, thus preventing the ball from dropping out of the socket when the control cables are removed. The socket is kept filled with grease.

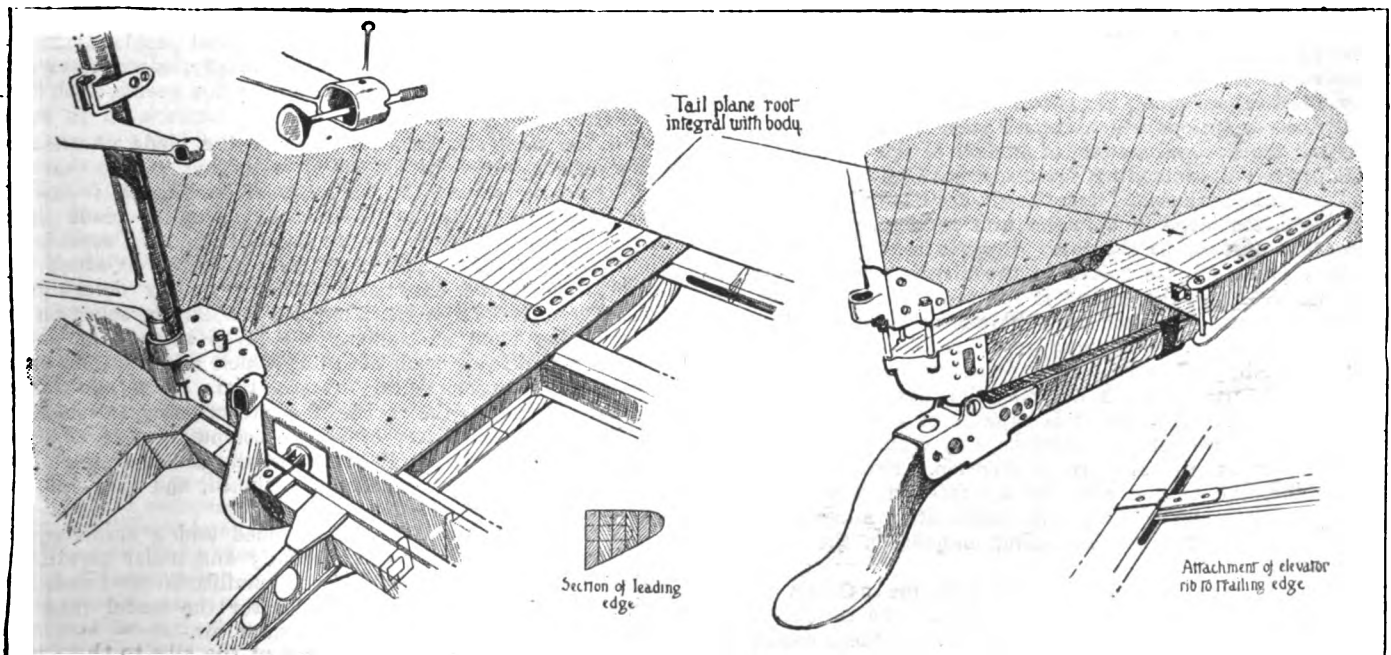
The rudder, which, as already pointed out, is placed wholly above the elevator, is built entirely of steel tubing. The ribs are joined, not directly to the rudder post, but to a collar of very light gage, which is in turn pinned and braced to the rudder post. The object of this construction probably is to avoid weakening the rudder post by welding, since all the rudder ribs can then be welded to their collars on a jig, the rudder post being inserted afterward and the collars pinned in place.

The rear end of the ribs is joined direct to the trailing edge by welding. The method of tapering the rib tubes down toward the trailing edge is different from anything we have yet seen on a German machine. A vertical slice is taken out of one of the tubes, and the edges thus formed are pushed over the other tube of the rib, the two tubes being held together by short welds at intervals.

The foot of the rudder post rests in a cup or shoe on the trailing edge of the vertical fin, while additional hinges are provided at intervals. To prevent the rudder post from sliding up and down a collar is placed above and one below each hinge. To these collars are welded two U-shaped rods around which is wrapped fabric in order to form an airtight joint at the points where the hinge pierces the rudder covering. In the illustration the fabric wrapping has been omitted for the sake of clearness.

The tail skid is of somewhat unusual shape, as shown in the right-hand sketch. Owing to the fact that there is no vertical fin below the body of the Pfalz, and no downward projection of the rudder, it has been possible to reduce the head resistance of the skid by making it horizontal for the greater part of its length, with just a downward curve at the rear to give greater clearance for the tail plane. The skid is pivoted on a bolt passing through a lug on the heel of the fuselage. Its free end is sprung by rubber cord from the short cylindrical piece of wood already referred to. This attachment looks remarkably weak—a piece of wood, slotted at its ends to fit over the cross formed by the two sloping body formers. Yet in all the captured specimens of Pfalz machines that we have had an opportunity to examine, this particular member has never been broken. As to the skid itself, it is built up of ten laminations of wood, each about 5 mm. thick. At the rear the skid is provided with a sheet metal shoe to protect it against wear.

(To be continued)



Some tail plane details of the Pfalz biplane



# Some Outstanding Problems in Aeronautics\*

## Part III

### Problems of Propeller Design—Propellers with Adjustable Pitch—Stability and Control—Armament and Instruments

By Dr. W. F. Durand

WE shall now turn our attention for a few moments to one of the most intricate and hence one of the most interesting of the many problems presented to us by the aeronautic art, that of the airscrew or propeller.

The function of the airscrew is, of course, to take the torque of the engine and to transform it into a propulsive thrust; or otherwise to take the power given by the engine to the crankshaft and transform it into driving or propulsive power for the aeroplane. The problem is further complicated by the fact that expressed in terms of a power relation, it is not simply the question of an engine handing so much power over to the airscrew for the latter to transform into propulsive power. Instead, the power which the engine itself can develop is dependent on the propeller and likewise on the aeroplane to which they are both attached. We have here, in consequence, a series of complicated implicit relations, and from which the propulsive characteristics of the plane-propeller-engine combination take their origin. In fact, it must never for a moment be forgotten that the moving aeroplane is in effect an aeroplane-motor-propeller combination and that no one of the three can be determined independent of the other two.

#### Influence of Airscrew

Without entering into any detailed discussion of this problem, it will be clear that the airscrew will exercise a controlling influence on the power which the engine can develop. Thus, it is evident that an aeronautic engine, in order to develop power, must be permitted to move its pistons, to revolve its crankshaft; in other words, to make revolutions; and other things equal, the power developed will vary directly with the revolutions which are realized. Again, it is easy to see that the size and amount of surface of the airscrew blades will present a controlling feature regarding the revolutions which can be realized. Thus, the airscrew may be enormously over size, too large in diameter and presenting a large and unwieldy surface to the air. Suppose this to be the case with a plane of size suited to the airscrew but not to the engine. That is, the engine is far too small for either airscrew or plane. In such case the engine simply will not be able to make its normal number of revolutions. It will be held down by the excessive resistance to rotation presented under such circumstances, and may thus develop far less than the normal power which it is capable of under proper conditions. Many other combinations may occur which we cannot stop to discuss or even to mention. Broadly speaking, the plane, the engine and the airscrew, as the propelling agent, form a most closely knit combination and each interacts in a more or less controlling manner on the operation of the other two.

In order even to make a start with the problem of the airscrew it is therefore necessary to assume conditions regarding both the plane and the engine. If these conditions,

as assumed, are then realized in practice and if the design has been well carried out, the anticipated results may be reached. If, on the other hand, the assumed conditions are not realized as regards the plane and the engine, then no matter how well the design of the airscrew may have been carried out, the anticipated results will not be realized. Hence, no matter how good the airscrew may be by itself, no matter how carefully designed and constructed, no matter how faithfully it may be able to realize the conditions for which it is designed, if these are not the conditions under which it is actually placed for service, the results, economic and otherwise, will be unsatisfactory; not necessarily by reason of any fault in the airscrew as such, but due simply to its lack of adaptation to the conditions of operation. An effective airscrew is therefore not only one which is properly designed and constructed in itself, but also one which is permitted to operate under the conditions intended and contemplated in its design.

All this is, of course, well known, and if I have taken the time to repeat these well-known facts, it is the more clearly to bring to our minds at the present moment the fact that the airscrew represents not only a problem in itself, but also one of adaptation to and of usage with the proper combination of plane and of prime mover.

The general problem of the airscrew is by no means, however, to be classed distinctively as outstanding. Instead, an enormous amount of work has been done on it, both theoretically and experimentally, and in its main features it has been brought fairly within the limits of a solved problem. There have been three modes of approach, briefly, as follows:

#### Three Methods of Treatment

(1) The analysis, geometrically, of the blade of an airscrew into a series of elements, occupying each a narrow strip running across the blade from leading to following edge and making up, by their summation, the blade as a whole. Each of these elements or strips is then considered as, in effect, a little elementary aerofoil and for which the usual aerodynamic characteristics are readily determined, either by direct experiment on a model, or by selection or interpolation from and among the large amount of available data regarding such aerofoils which have already been submitted to experimental investigation. With such data in hand relating to the series of elements going to make up the blade, it is a matter of simple computation to combine them in such manner as to represent the action of the blade as a whole, under the conditions assumed, and thus in general terms the problem is solved.

(2) A law of similitude is assumed and a small model propeller is tested out experimentally and under conditions which permit, under the law of similitude assumed, the translation of the *observed* results for the model into the *probable* results for the full sized airscrew.

(3) Full sized airscrews are tested out as nearly as may be under flying conditions and are made the ultimate basis of design.

\*Sixth Wilbur Wright lecture read before the Aeronautical Society of Great Britain at London, June 25.

The limitations of method No. 1 arise from the following:

(a) The coefficients derived for aerofoils correspond to straight line motion between the air and the foil, whereas, in the airscrew, the relative motion is in a helical or spiral path.

(b) The actual velocities for which such coefficients are derived are usually for speeds not exceeding 60 or 70 miles per hour, whereas the actual speeds of the tip elements of airscrew blades may move at speeds of 500 m.p.h. and upward. The extent to which the usual square of the speed law may be extended to such values is not as yet fully known.

(c) The coefficients used are derived for the various aerofoil sections or elements individually, whereas, in the actual airscrew, they all act conjointly or collectively in making up the airscrew blade.

#### Application of the Three Methods

Application of method No. 1 cannot therefore be made except in so far as it is justified by actual and final experience on full sized forms under flying conditions.

Method No. 2 (that with reduced size models) has the limitation that the law of similitude employed is, of necessity, not exact but approximate, and the degree of reliance which can be placed on results thus found can again only be determined by ultimate reference to full sized forms under flying conditions.

Method No. 3 (that with full sized forms under actual flying conditions) has the limitation of very high cost, both in equipment and time, and as a result of which only a relatively small number of forms can actually be subjected to adequate test in this manner.

Again, method No. 1 (that of computation based on coefficients determined by laboratory experiment) has the advantage of requiring only a pencil and pad of paper with a table of predetermined coefficients. No. 2 (that with the small models) has the advantage over No. 3 of relatively small cost, of permitting the tests to be carried out in a wind tunnel with all conditions under control, and finally it permits of carrying quickly through the test program a very large number of types and forms. It should perhaps be stated here that as between methods No. 1 and No. 2 the latter is accepted as much the more reliable of the two. In fact, it is not too much to say that when used with judgment it furnishes a very satisfactory and well-nigh universally accepted method for dealing in a laboratory way with most problems of airscrew design and operation.

#### Parts of Problem Still Unsolved

If we have tarried so long over these phases of the problem of the airscrew propeller, present methods of design, etc., it is in order to bring into clearer relief the parts of the problem which are not yet well in hand—the parts which are as yet outstanding and waiting our further study.

These phases which thus stand out represent in effect the lack of an adequate correlation between the three methods of approach as above described.

It is obvious that if we could develop an adequate and reliable correlation between the results of the computation according to method No. 1 and the final test under flying conditions according to No. 3—if, in other words, we could adequately determine the error of No. 1 and hence the correction to be applied in any given case, then a pencil and pad of paper would go a long way toward furnishing the material for the solution of the problem of airscrew design, once we are permitted, of course, to assume a definite set of operative conditions.

Or again, if we could know more accurately and more widely the character and amount of error to be anticipated in the use of the small models according to method No. 2, we should be in a position to use the experimented model method with better assurance of definite and reliable results for the full-sized screw later to be constructed.

It seems likely that this final correlation of computation with ultimate result may best be made in two stages. The first should comprise a careful study of the relation between the results derived by the computations of method No. 1 and the model tests of method No. 2. Such a correlation would then permit us to pass readily from the results by computation to the probable results by model.

The second correlation should then comprise a series of comparative tests to determine with sufficient generality of application the character and amount of correction to be applied to the results of model tests in order to satisfactorily reproduce the results to be expected from full-sized forms.

This would, by no means, require the testing of a full-sized form corresponding to each model. If so, there would, of course, be no use in making model tests. The whole program might as well be carried out directly by tests on full-sized forms. It appears reasonable to expect, however, that a well selected and not too numerous series of tests, properly distributed among the various characteristics of form and of operation, would serve adequately to give the correlation desired.

With such correlations established we should then have two methods, Nos. 1 and 2, available for the design of airscrews. No. 1 available with no more than a pencil and a pad of paper (once the standard section coefficients determined), and No. 2, by model, ready to supply a vast amount of detailed information regarding operation under varying conditions, and which may be realized rapidly and effectively once the model is made.

If we have spent so much time over these matters relating to the airscrew, it is because of its importance as an element in aerial navigation, and in order that we may the better note just what part of the general problem is still outstanding.

This, as we have seen, lies primarily in the matter of the correlation between the three methods outlined. There is indeed need for continuing experimental research, especially on systematically selected forms, both model and full size; and such continuing experimental work combined with carefully directed studies of correlation will go far toward giving us an assured and adequate basis for the practical solution of the airscrew problem as applied to aerial navigation.

#### Reaction Between Airscrew and Plane

Perhaps the widest and most important outstanding problem in connection with aeroplane propulsion has relation to the reaction between the plane and the propeller—the influence of the structures adjacent to the propeller on its performance, economic and otherwise, and the influence of the propeller on the plane, both as regards its lift and its net resistance to propulsion. This is a field which is largely outstanding. It must be attacked chiefly by the experimental method—by model with results checked up by comparison with full scale trials so far as practicable. Time forbids more than the mention of this promising and largely uncultivated field of aerodynamic investigation.

Of a closely related nature is the problem of the interaction of two or more airscrews on one shaft. This is a problem which is becoming of importance in connection with the increase in power of aeroplane power plants and with the fitting of more than one airscrew on the same shaft.

This likewise is a problem which must be approached experimentally—again through model research checked up by comparison with full scale tests. A beginning has been made on this important and interesting problem, and we may expect, in a not distant future, to find it brought within limits of control similar to those surrounding the problem of the individual airscrew.

#### Airscrew with Adjustable Pitch

In addition to these problems which relate to aeroplane propulsion in its general aspects, and more especially when for the sake of simplicity we assume that the aeroplane remains under a uniform regimen as regards external conditions, there arises a problem of very great present importance, that of some form of adjustment in the technical characteristics of the aeroplane—propeller combination permitting it to be made responsive to variations in the regimen of operation, as for example, change in the density of the air due to change in altitude, or change of regimen required for climbing flight as compared with horizontal flight.

In connection with the prime mover, mention was made of the very important problem of maintaining power at altitude in spite of the decrease in the density of the air. In reality this problem is very intimately bound up with another

of scarcely less importance, that of devising means for effectively using such power for propulsive purposes. Without attempting any technical discussion of the question, it will be apparent that the whole problem of the operation of the airscrew as a means for absorbing the power of the prime mover and converting it into the propulsion of the plane will depend on the density of the medium in which and on which it operates. Again, in climbing flight a part of the weight of the aeroplane is carried by the pull or thrust of the airscrew. In horizontal flight it is all borne by the planes (assuming the airscrew shaft then horizontal). Hence, the pull or thrust of an airscrew and indeed its whole regimen of operation may vary widely according as the plane is climbing or flying horizontally. It thus seems reasonable to conclude that for the best results there should be provided some mode of adjustment or compensation so that the airscrew, as it finds itself operating in a medium of continuously decreasing density, or as it finds itself called upon for varying amounts of thrust or pull with varying angles of climbing flight, may be correspondingly adjusted in order to give continuously the best results.

The problem is further complicated by the fact that the aeroplane itself needs a correlative adjustment. As we have already seen, the one factor in aerial flight which remains sensibly constant under all conditions and at all altitudes of flight is the weight of the plane and its equipment. The vertical supporting force gained from the reaction of the air must therefore be maintained constantly equal to this weight at least for the conditions of horizontal flight, while for climbing flight the weight will be divided and borne partly by the supporting planes and partly by the airscrew. The problem of the economic use of power at varying altitudes and under varying angles of climbing flight involves therefore the following chief elements:

#### Chief Elements Involved In Use of Power

- The weight of the plane.
- The surface of the wings and their aerodynamic characteristics.
- The angle of attack of the wings.
- The speed.
- The power developed by the engine.
- The revolutions of the airscrew.
- The area and form of the blades of the airscrew.
- The pitch of the airscrew.

These various factors react and interact in a most complex manner, and any attempt to discuss the problem in detail would carry us too far afield on the present occasion. Reference has already been made to the problem of wing surfaces, adjustable either in area or form. Such adjustments are, however, not yet available, and at present the angle of attack is the one feature about the plane which may readily be varied. On the other hand, there is no feature of the propulsive agent, the ordinary airscrew which admits of equally simple correlative variation. What is needed with regard to the airscrew is, indeed, some means of realizing an adjustment correlative to the change in the angle of attack for the plane. To this end a change of pitch is most suitable, some means of varying, at the will of the pilot, the pitch of the screw in order that with the fixed diameter and area of surface, and with the work available per revolution of the engine as affected by the density of the air, the pitch may be so adjusted as to secure the number of revolutions best adapted to the economic use of the power given out by the prime mover. This will then insure the thrust needed to overcome the resistance of the plane at the angle of attack and speed which, taken conjointly, will give the lifting force needed to support the weight of the plane, either in whole or in part, according as the plane is flying horizontally or climbing.

#### Two Problems Involved

All of this somewhat complicated statement means simply that what is wanted is an airscrew with blades adjustable for pitch. Such an airscrew may be realized by so pivoting the blades that they may be turned about a radial axis, thus changing their angle relative to the axis of the screw itself. Extreme changes of such a character result in a very wide variation of pitch from root to tip and in the end will

result in a serious loss in efficiency. There are therefore two problems involved:

(1) The aerodynamic problem of determining the best form and proportions of an airscrew, the blades of which are intended to be pivotable in this manner, so that under the widely changing conditions of flight which may be met with, there may be effective operation and a well sustained efficiency.

(2) The mechanical problem of so designing and building an airscrew with adjustable blades that it will meet the rigorous requirements imposed upon it by the exacting conditions of aeroplane navigation.

It is perhaps not too much to say that the first problem is already well in hand. We know reasonably well what forms and proportions to give to such an airscrew, and if it were only a matter of design or of the determination of form and proportion, the problem could hardly be called outstanding.

As much cannot be said regarding the second problem. The practical construction of an airscrew with adjustable blades is not an easy matter. Several modes of construction have been attempted, but with only moderate success. The problem is clearly defined, of the highest order of importance, and is outstanding as one of the appliances for which the art of aerial navigation is definitely in waiting.

#### Three Fundamental Requisites

The three fundamental requisites of an aeroplane are strength, movement and stability with control. We have noted some of the problems arising under the requirements of strength, and movement or propulsion. We may now turn very briefly to a glance at the situation regarding stability and control. Any detailed discussion of these problems would be quite out of the question on the present occasion, and time in any event will only allow us a brief glance at the general situation.

Regarding stability and control it is not too much to say that the general principles underlying these characteristics of an aeroplane are now reasonably well understood, due largely to the splendid theoretical and experimental investigations initiated by British scientists and to which certain workers in the same field in the United States may have contributed something, and by no means overlooking certain important contributions by French and Italian investigators. These investigations, both analytical and experimental, have placed the study of these subjects on a reasonably sure foundation, and have served to mark out the way to secure any desired degree of stability which may be desired or which may be consistent with other valuable qualities. We are here confronted with one of those situations, so frequently encountered in scientific and technical work, where a choice must be accepted on some middle ground between wide extremes, and where the attempt to secure some desirable quality in high degree may lead to a limitation of desirable qualities in other directions.

#### Desirability of Extreme Stability

So it is with stability and control. If stability is carried to an extreme then mobility and quickness of maneuvering are reduced and control in the sense of ready response is lacking. For military purposes, especially for machines of the fighting type, where mobility is of the highest importance, this would be a serious shortcoming, and hence such machines cannot be given too much stability in the ordinary sense of the term. On the other hand, for heavy machines of the bombing type, where mobility of evolution is not so vitally important, the margin of stability may be greater. Going to a still further extreme, it is perfectly easy to build a safe moderate-speed family carriage sort of machine which will be stable and secure, under almost any conditions likely to develop. Such machines would be scorned by fighting pilots, but when civil aeronautics begins to come into its own after the war and under peace conditions, and there comes a demand for safe machines for civil purposes, including family outings for the week-end from the city to the country or to the seacoast, then we may anticipate a larger recognition of the qualities making for safety and stability, and we shall find machines provided having such characteristics and in practically any desired degree. Here again, however, there will be degrees of choice, because it will be found that



with too high a degree of stability, what may be termed the riding qualities of the plane will be poor, while with low stability the riding qualities may be much smoother.

The general problem is therefore pretty well solved so far as the ground work is concerned. This does not mean, however, that there is nothing further for us to learn in this connection. There are many problems of a detailed nature inviting the student of this fascinating field of study, and the solution of which will serve to round out and broaden our general grasp of the subject. In particular, we need further study on the interaction between elements which insure stability and those which permit mobility and readiness of response to control agencies, to the end that we may control more effectively the combinations which may be desired regarding stability and mobility of evolution.

Again, while the elements of control are well understood, there is room for further study as to the best means of actually developing the control forces required and of applying them to the plane itself. These are partly aerodynamic and partly structural problems, each phase reacting more or less on the other.

#### An Example

One instance of problems of this character will serve to illustrate the type.

Thus, we know that an aeroplane is provided with rudder surfaces of two kinds, one to determine movement in a vertical direction, up or down, and the other to determine horizontal motion, right or left. But these motions, vertical and horizontal, assume that the plane itself is horizontal or sensibly so. However, when a plane is circling on a steep spiral or making a quick turn, it is inclined or "banked," in order to avoid side slipping, until, in extreme cases, the wings are nearly vertical, and frequently much more nearly vertical than horizontal. In such cases, the functions of these control services are reversed. Those which, with normal aspects, serve to produce movement right and left will now serve to determine motion rather in a vertical direction, and those which formerly served for movement up and down will now serve to determine motion to the right or left. For intermediate angles of bank, each set of control surfaces will give control forces in both directions, up or down and right or left.

Now, it is by no means sure, having in view this double and interchanging function between these two sets of surfaces, whether we have as yet realized the ultimate and best arrangement either as regards the surfaces themselves or their control by the pilot.

It seems decidedly probable that we have not and that some arrangement yet remains to be devised which will be more effective in the matter of this double and interchanging function of control, and simpler in its relation to the pilot.

This and other like problems are still awaiting investigation and offer a delightfully promising field for the further study of the aerodynamic engineer.

There still remain two large and important fields, rich in

aeronautic problems. These are armament and instruments. I shall attempt no more than the briefest general reference to these two classes of problems.

Those arising under the head of armament are, of course, strictly military in character, and but little of interest could, in any event, be said in a public address. Such problems relate naturally to the number, type and size of guns to be carried, their mounting and special sights; bombs and devices for carrying, aiming, dropping, etc.; questions of armor and protection of vital parts against gunfire or shrapnel bursts, etc.

Expressed in their most general terms, these problems resolve themselves into an attempt all along the line to meet the requirements imposed by the desired military uses of the plane, and to anticipate or improve upon the devices and designs of the enemy in the same fields.

Regarding instruments, little more specific can be said. This field does, however, bristle with problems of the highest interest to the scientist, and may well challenge his best efforts. It is interesting to note the extent to which the modern aeroplane has become a flying meteorological and physical laboratory. Thus, a recent list of aeroplane instruments shows some 25 or 30 different instruments and devices, not indeed all to be carried on one plane, but all included in the general aeronautic military program, and each serving some specific and important purpose.

With these instruments, as with armament, the problems reduce themselves to an effort to meet the military or the navigational and operative requirements of the situation, and in these days of war in particular, to anticipate or improve upon the similar devices and designs of the enemy.

Much of the work relating to these problems under armament and instruments is already done and well done. There do remain, however, many problems, especially of detail or of improvement, and which must be considered as outstanding; but of these I shall attempt no mention or discussion.

By way of conclusion, reference may, for a moment, be made to a problem of the most vital and far-reaching economic importance, and which will be upon us with the arrival of peace conditions. This is the problem of the best economic utilization of the enormous investment which has been made in aeronautic production, expressed in terms of money and human time and energy, and now represented by factories, machinery and equipment, finished product, trained industrial organizations, human skill and productive capacity.

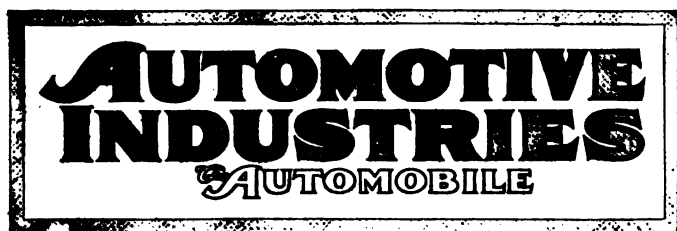
And so with all our problems; we can only look hopefully forward for the future to give to us such measure of answer as our patience and study may merit.

Of one thing, however, we may be sure, and that is that the day will never come when we have no more problems to solve. But, on the contrary, the number of problems still outstanding, as the years go by, is likely, rather, to increase with our acquaintance with the subject, and we may be sure that before this or any like audience under the auspices of the Aeronautical Society of Great Britain there will never lack material for a discussion of "Outstanding Problems."

## A Trophy Show

*British motorcycle machine-gun men with their trophies. It will be noticed that the machine guns are mounted on side cars*





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## Sixteen-Cylinder Engines

AS the multiplication of cylinders in automobile engines had been carried to the point marked by the twelve-cylinder or twin six, it was to be foreseen that in aircraft engines, where very much larger powers are called for, this number would be exceeded. One of the first steps beyond the twelve was the so-called W type of engine of 18 cylinders for which a well-known English designer was responsible. It received considerable publicity at the time of its appearance, but little has been heard of it since. The engine was laid out to give uniformly spaced explosions, and, consisting of three sixes on a six-cylinder crankshaft, it was, of course, in absolute balance so far as reciprocating parts are concerned. Probably the most objectionable feature of the engine was its necessarily considerable frontal area and consequent high parasitic resistance. This resistance is less the greater the number of cylinders that are placed in a row and the fewer the number of rows.

A comparatively small parasitic resistance may also be achieved with a 16-cylinder type engine, as the natural angle of V for such an engine is 45 deg., the angle of the Liberty engine. As compared with the 12-cylinder 45 deg. V engine, the 16-cylinder has the advantage of evenly spaced explosions and it also possesses an advantage in respect to parasitic resistance, because with the same cylinder dimensions, arrangement of accessories and general design of the crankcase, the parasitic resistance due to both engines should be alike, while the power output of the 16 would be 33 1/3 per cent greater.

As regards mechanical balance, the 16 is probably not quite as good as the 12. This depends somewhat on the manner of arranging the crankshaft. In all-in-line eights, it has been the custom to use what is virtually two four-cylinder crankshafts joined end to end and set at right angles to each other as regards the throws. We have, therefore, two four-cylinder engines end to end with their cranks rigidly held in synchronism. Each engine has an unbalanced secondary inertia force having twice the frequency of crankshaft rotation. The secondary inertia force of one engine is a function  $\cos 2\theta$ , where  $\theta$  is the angle its crank has passed through from the top dead center position, and the secondary inertia force of the other engine or set of four cylinders is a similar function of  $\cos 2(\theta + 90^\circ) = \cos 2\theta + 180^\circ$ . But the cosine of an angle plus 180 deg. is the negative of the cosine of that angle, hence the two secondary inertia forces will be equal and opposite to each other. However, since one force acts near one end of the engine and one near the other, they do not cancel each other but result in a rocking action in a plane through the crankshaft.

The arrangement of the crankshaft described is undoubtedly used because of the ease of its manufacture. By having alternate throws of the crank at right angles the rocking moment can be almost eliminated.

All the above arguments relate to eight-cylinder engines. Since the inertia forces are reciprocating forces acting in a single plane, those due to one set of cylinders in a V engine cannot be balanced by those due to the other set. Therefore, the balance of a sixteen-cylinder V engine is the same as that of an eight having the same crank design.

## Skilled Acetylene Welding

THE art of acetylene welding will undoubtedly be greatly advanced by the large-scale manufacture of aircraft engines, for most of these engines involve numerous welding operations, some of them of a most difficult nature. Acetylene welding has now been practised for more than a decade, and such welding equipments are found in repair shops all over the country, yet the number of expert operatives is none too great. An ordinary repair job, such as welding up a crack in a cast iron cylinder or an ordinary break in any casting, is easy enough to handle, but when welds have to be made between

very thin sheet metal parts, as is required in welding up the jackets and valve fittings of an airplane cylinder, more than usual skill is required if a neat job is to result. Practice, of course, makes perfect, and with the large amount of work of this class now needed a great many welders will become very proficient at the job.

## The Employment Department

**T**HERE is real cause for wonder at the late germination and slow growth of a good idea in the fact that, measured by the length of time that other modern industrial methods based on the same fundamental principles have been in general use, the employment manager's department is still very new and in fact, is as yet unknown, in many industrial organizations.

Isn't it a bit odd and rather hard to explain that industry as a whole should have so long failed to appreciate the importance of the scientific, not to say the semi-intelligent, selection of its labor elements? Isn't it difficult to understand why we should not long ago have seen, without being shown, the advisability of having our industrial hiring done by one department in each plant with special knowledge, training and equipment for the job instead of leaving it to foremen, superintendents and department heads who, having vacancies to fill, fill them with whatever type, manner or character of applicants happen to apply, if they measure fairly well up to certain not clearly defined standards of their own creation?

Imagine the state of things which would result from having the buying of materials and supplies done in this same decentralized and disorganized manner.

The advantages of the purchasing agent are apparent. The results of his efforts are readily observed, measured and appreciated. With the employment department, however, it is not quite so easy to determine just what benefits are derived, particularly when by benefits we mean financial return. These benefits are real but they do not make themselves so directly manifest. They are hard to calculate on a dollar and cents basis except after a comparatively long period of time.

Now that the United States Government has taken a strong hold of the labor situation and pretty well controls the unskilled supply, the employment manager has become an industrial agent in whose doings the Federal authorities take a direct and active interest. Labor is so scarce, it must be used economically. Every man must do what he can do best. The worker must be assigned to the kind of work for which he is best fitted through past experience, temperament and natural inclination. It is no time, from either the point of view of the individual manufacturer or the nation as a whole to permit waste effort and inefficiency resulting from unscientifically combined men and jobs.

The Government is so thoroughly alive to the importance of the efficient distribution of labor that it is conducting courses of instruction for the training of employment managers.

## Americanization from the Practical Point of View

**T**HE manager of an electrical equipment manufacturing plant chiefly engaged now on Government work, recently complained that the greatest obstacle in the way of obtaining desired and necessary production in his organization is not so much a lack of workers or capacity of equipment as it is indifference on the part of the operatives. He described this indifference as a lack of patriotism, as a failure to appreciate the need for whole-hearted and continuous effort at this particular time. He disclosed the fact that most of the operatives who manifested a spirit of disinterestedness were foreign-born, but not enemy aliens. Patriotism does not, of course, move such as these. What this plant needs, and so we told its manager, is to be Americanized.

Others, many of them, have met this same condition. In many plants, forced to run with a large proportion of a lower grade of foreign-born and often non-English speaking workers, there is noted a very marked check on production, beyond a certain comparatively low limit which arises from indifference on the part of these workers to the benefits of piece-work rates and other inducements which seemingly should affect their selfish natures, but apparently do not, beyond a given point. There is evidence aplenty that Americanization in such cases will work wonders, that it will do what bonuses, premiums and other usually effective production stimulants fail to accomplish.

Americanization, that is industrial Americanization, is not, as the condition described will testify, a philanthropic movement. It is purely commercial, purely a production building undertaking. And the fortunate part is that it benefits both employer and employed, one as much as the other, if indeed it does not benefit the latter more. This, however, from the point of view of the employer, is merely incidental. His interest in the movement lies in its practical results as they may be observed in his business records.

Looking at Americanization in this coldly practical way, it can be said that it has been found to be a good, and in many cases a necessary, investment. Workers, to be good workers, to be the kind of workers that make for maximum production, must have the American point of view. They must have American ideals and ambitions. They must first of all speak and read our language. They must like our country well enough to become citizens of it. They must feel that their home is here and that this is the land in which they will experience the realization of their highest hopes.

A number of our big business organizations have come to realize the importance of this great truth. In our own industries there are several excellent examples of what can be done along this line. There should be more and those who apply the principles involved should not be only the larger concerns. The smallest one in any industry is not too small to benefit by the thorough Americanization of its employees.



# □ Latest News of the

## Motor Trucks Under Quartermaster

### Colonel Glover Placed in Charge of Purchasing, Production and Procurement of All Vehicles by Order of General Goethals

WASHINGTON, Sept. 11—Following closely upon the creation of the Motor Transport Corps, new orders inaugurated by Major General George W. Goethals, assistant chief of staff, take the purchase, production and procurement of motorized army vehicles from the new corps and again place these duties under the Quartermaster Department in charge of Colonel Fred Glover who was transferred from supervision of this work less than a month ago.

Colonel Edwin S. George, who worked with Colonel Glover and was also transferred, is again in charge of production.

Colonels C. B. Drake, James F. Furlow and C. Seamon remain in charge of the Motor Transport Corps which now controls the engineering, operation and maintenance of motorized army vehicles.

#### Rearrange Whole Plans

The Motor Transport Corps will instruct Colonel Glover of the army needs and it will be his responsibility to meet these requirements.

Complete rearrangement of practically the entire army plan of operation preceded these moves. At the direction of General Goethals who is also Director of Purchase, Storage and Traffic, orders were issued recently and speedily making him the direct chief of all purchases and ordering General W. Wood, Quartermaster General, to report directly to General Goethals. Following this, additional orders were as speedily promulgated taking the control of purchase, production and procurement from the Motor Transport Corps and again placing it under Colonel Glover.

These changes come most abruptly regarding the program of army truck activities. There has been considerable jockeying for control of the army truck activities. First there was the Motor Transport Section of the Quartermaster Department in charge of trucks under Brig. General C. B. Baker who favored the standardized trucks designed especially for the army. Last spring, after continuous attacks upon these war trucks, the control of trucks was taken from General Chauncey B. Baker. A Motor Transport Service was organized under Colonel F. Glover with the aid of General Goethals. Tests were held and some of the standardized war trucks were discarded in favor of standard makes of trucks. After about 10 weeks of control following Secretary Baker's return

from Europe, the Motor Transport Service was abolished, Colonel Glover was transferred, and the Motor Transport Corps was created with the same men in charge who had been under General C. B. Baker. This was within the last 30 days. Now comes the new abrupt change, following Secretary Baker's return to Europe, with Colonel Glover again in charge.

The opinion was expressed in Washington that the creation of the Motor Transport Corps with the regime favoring standardized trucks in charge meant that the truck policy of the Army was permanently settled. Officials told of past lobbying and politics and claimed that the "election was over." Apparently they were incorrect. A recount, it seems has been taken.

At the same time that General Goethals was hurrying these orders through, it appears that those interested in maintaining the Motor Transport Corps were rushing orders through to gain more substantial control for that Corps. The orders from General Goethals were somewhat speedier and more powerful.

In consequence of these rapid changes civilians and officers, four weeks ago under the Motor Transport Service, suddenly found themselves under the Motor Transport Corps and now as abruptly find themselves in the Quartermaster Department as all those connected with purchase, production and procurement, including the branch offices in New York, Cleveland, Detroit and Chicago some under Colonel Glover. It is expected that there will be some transfers, resignations and appointments.

#### Changes Cause Confusion

As a result of these many changes considerable delay and confusion exists. While the changes have been in process army truck plans have been neglected. In addition there is the confusion of the reorganization. Up to late last week the Motor Transport Corps had no knowledge of the new change and proceeded to build up an organization calling upon many important individuals who in turn proceeded to give up their present connections to come to Washington. Some of these men have arrived and they do not know now what positions they hold or what to expect.

Following is a circular by General Goethals explaining the organization of and assignment of duties as regards pur-

chase in the Army, and also the supervision of the Quartermaster Department.

Subject: Organization of the Division of Purchase and Traffic, General Staff

1. Organization of and assignment of duties in and under the direction of the Division of Purchase, Storage and Traffic, General Staff, shall be as follows:

(a) Office of the Director of Purchase, Storage and Traffic, General Staff.—Duties: Responsibility for and authority over—

(1) Supply of the army, including analysis and computation of requirements, purchase, production, inspection, acceptance, transportation, storage, issue within the United States and embarkation.

(2) Relations with all other agencies, governmental and otherwise, in regard to army supply, including representation of the War Department on the War Industries Board and business with representatives of the allied governments.

(b) Facilities Department.—Duties: Responsibility for and authority over procurement of real estate.

(c) Accounts Department.—Duties: Responsibility for and authority over disbursements, fiscal accounting, preparation of estimates, and reports of accounts.

(d) Traffic Department.—Duties: Responsibility for and authority over inland transportation.

(e) Embarkation Department.—Duties: Responsibility for and authority over embarkation and ocean transportation.

2. (a) The Quartermaster General of the Army shall report to the Director of Purchase, Storage and Traffic.

(b) The Quartermaster's Department, in addition to its other duties, shall have responsibility for and authority over storage, distribution, and issue within the United States of all supplies for the army.

(c) The chiefs of all other bureau corps, and departments of the army shall report to the Director of Purchase, Storage and Traffic on all matters enumerated in section 1 (a) hereof.

3. The present supply organization of the army shall continue as heretofore until changed by orders issued by this office from time to time.

By authority of the Secretary of War.  
GEO. W. GOETHELS,  
Major General, Assistant Chief of Staff, Director of Purchase, Storage and Traffic.

#### Motor Transport Corps to Consist of 154,774 Men

WASHINGTON, D. C., Sept. 12—An additional statement regarding the Motor Transport Corps was issued here to-day and says that this corps will eventually number 154,774 men. The army motor trucks with this corps will number 40,803. There will be 24,250 motorcycles, 7905 passenger cars, and 6598 ambulances with a total of 100,000 riders and drivers. There will be 4298 officers and 30,090 non-commissioned officers. The executive organization will comprise 3122 men and 679 officers and the total repair personnel in the 273 service parks which will be constructed for the upkeep of the vehicles, will comprise 34,319 men, mostly trained mechanics.

Each additional American army will require a similar motor transport personnel and it is expected that by the time the United States has 4,000,000 troops in France, 500,000 of them will be engaged in motor transport work. The Motor

(Continued on page 478)

# Automotive Industries □

## To Maintain Average Truck Output

May Produce During Last Half of Year One-Third Made During Last 18 Months

NEW YORK, Sept. 10—Manufacturers of motor trucks are to be permitted to maintain production during the last half of 1918 at the average reached during the past 18 months. They are to receive priority ratings in class B4 for such materials as may be necessary to produce during the period July 31 to Jan. 1, one-third of the number of vehicles produced for civilian use during the whole of 1917 and the first half of 1918.

The certification of Priorities Certificates which will enable manufacturers to obtain raw materials and parts already has been commenced by the Automotive Products Section of the War Industries Board, and these are now being cleared by the Priorities Division. Such certificates, it is pointed out by the National Motor Truck Committee of the N. A. C. C., cover only vehicles intended for civilian uses, which take a B4 rating under the ruling of the War Industries Board, and not trucks built for war purposes, which may take a higher rating.

It is believed that manufacturers of road tractors, trailers, truck attachment units of the truck-former type and body builders who build for the trade and do not dispose of their entire outputs to manufacturer will come within the same classification as the truck manufacturer. Where they have not already done so, they will be required to supply the Automotive Products Section with sworn statements of their production during 1916, 1917 and the first half of 1918.

In its statement, the National Motor Truck Committee says: "It is felt that the board will not look with favor on any increased production beyond the average of the last 18 months. Indeed it will be disappointed if sales are not reduced. In view of trucks being sold only to essential industries, it is expected that substantial savings will be made from past production. So you should constantly bear in mind that the number you may be permitted to make by the terms of the Industry Certificate issued you does not justify you in making such number unless such number is necessary to supply your demand from essential industries."

In those cases where production of individual companies shows a reduction during the first half of 1918 as compared with the previous year, due to

heavy production of military vehicles, the allotment has been reduced to a basis of the production for the first six months of 1918, on the expectation that continuing or expected additional war orders will counterbalance the reduction; and in cases where companies were not in real production during the last of 1917 the allotment has been based on the average of production during the time they were in production.

When approved by the Priorities Division, certificates will be mailed or delivered to the manufacturer. These will authorize him to purchase the necessary materials to complete the specified number of trucks and will contain a form of affidavit which must be attached to each order for material. This affidavit is the only receipt needed by the supplier to release the materials.

The new arrangement supersedes the older one requiring individual priority certificates for each order. Priority certificates that have already been filed with the board will not, therefore, be acted upon.

### Urge Abandonment of Shows

WASHINGTON, Sept. 12—Following the cancellation of the National Automobile Shows by the National Automobile Chamber of Commerce the Chamber and the War Industries Board are urging promoters of local shows for automobiles trucks or accessories to abandon all plans for such during the coming winter to save fuel, labor and transportation.

In a statement issued here to-day it is said that the Chamber cancelled the 1919 shows at the request of Bernard M. Baruch and George M. Peek of the War Industries Board. Following a meeting here between Baruch, Peek, Alexander Legge, Judge E. B. Parker and all of the War Industries Board and Hugh Chalmers and Alfred Reeves of the Chamber, a letter was sent to the Board to the effect that the Chamber concurred unanimously in the opinion of the Board and adopted the following resolution:

"Resolved that the promotion of National Automobile Shows during the winter of 1918-1919 with consequent use of transportation, fuel and labor would in the opinion of this body be inconsistent with patriotic obligations of the industry and that therefore national shows be suspended until further action of the association.

Resolved that the reasons expressed in the foregoing resolution promoters of local and other shows be respectfully requested not to hold automobile truck or accessories exhibitions during winter 1918-1919."

## Preference List of 74 Industries

Aircraft Leads Activities Entitled to Preferential Treatment—To Name Plants

WASHINGTON, Sept. 8—Seventy-four industries are named in a new preference list, just compiled and issued by the War Industries Board, as the primary industries of the nation, entitled to preferential treatment because of war or national interest demands. The industries, named, together with a list being compiled of 6500 individual plants engaged in whole or part on war work, will receive preferential treatment through priorities on all matters of:

Fuel	Materials
Labor	Transportation
Capital	Facilities

The list will also be used by the War Department as the guide for allowing industrial exemptions from the draft.

The numerous factories listed individually are so handled because the industries to which they belong were not entitled to preferential treatment as a whole. "In numerous instances," says the War Board, "individual plants have been found entitled to high preference while the industry to which they belong is not."

Motor trucks for example are not specified in the list of industries and those truck plants entitled to preference treatment will be listed individually, as will passenger car and motorcycle manufacturers engaged in work entitled to preference in priorities.

The industries are arranged in four groups, group No. 1 being the most important. While those in group No. 2 are chiefly more important than group No. 3 and No. 3 is more important than No. 4, there are many instances where an industry though no more important than another is given a higher class rating because its production is not equal to the demand and special preference is extended in order to supply the materials, transportation or labor as the case may be, so that the production of that industry may be speeded.

The industries named that are of particular importance because of their connection with automotive activities are as follows. The group classification is also shown:

Aircraft .....	I
Ammunition .....	I
Small arms .....	I
Blast furnaces (producing pig iron) .....	I
Brass and copper (plants engaged prin-	

(Continued on page 483)

## Restrictions in U. S. Affect Canada

### No Maker of Complete Cars in Dominion—Dependent on United States for Parts

MONTREAL, Sept. 10—Some people might imagine that the Canadian end of the industry is not much affected by decisions of the U. S. War Industries Board, but a little thought will show the fallacy of this. Canada does not possess to-day an automobile manufacturing plant that is complete in itself.

Most of the parts of the cars that are made in Canada are, it is well known, manufactured in the United States and are assembled in Canada, only a small proportion of the actual production being done in this country. This is unfortunate, but it is nevertheless true.

### Shortage of Steel

Consequently any restrictions that are put upon the manufacture of parts in the United States affect the supply to Canada, and it is sure that the industry in the States is not going to supply Canada when it cannot supply its own needs. This particularly applies to steel, while apart from this the Canadian Government regulates every pound of steel that comes into the country, and it is so much needed for munitions work that there is not even any available for the manufacture of rails for the railroads.

There will be practically no new models for 1919, for not only are the designers engaged in more important work but with the increased restrictions on manufacture there is no object in making expensive experiments now in order to secure an improvement which with the rapid strides that engineering science is making under the stress of war may have to be discarded for something better when the war is won.

### Trucks and Tractors Only Hope

Dealers who are hard hit by present conditions are keeping a smiling countenance and doing the best they can with what is at their disposal, hoping always for the best.

The only automobile construction work that is likely to be done anywhere in the Dominion next year will be in the building of trucks and of tractors and other automobile machinery which will aid in the production and transportation of necessities. There are some agencies in Montreal that have already been notified that the passenger car portion of their firms has been entirely suspended and that the trucks are all that will be turned out in limited quantities for the general market.

The agents will presumably turn their attention to the development of the truck industry, and in this way the restrictions that are being placed on the whole industry will be somewhat of a blessing in disguise. So big has been the demand for passenger cars in the past that agents who have handled both truck and pas-

senger cars have not devoted so much attention as they might have done to the transportation vehicle.

### Canadian Ford Stops Dividends

WINDSOR, ONT., Sept. 6—The Ford Motor Co. of Canada has only paid 5 per cent in dividends to shareholders in the past few years, and announces that further dividends will not be paid for some time to come. This is due principally to the fact that all the reserves were used in purchasing materials with which to keep the plant in operation, not merely for the next season but for several years.

During 1918 selling prices have been increased 20 per cent, while the cost of production has increased 24 per cent, compared with a 7 per cent decrease in selling prices and a 14% per cent increase in cost for 1917.

A comparative balance sheet of the Canadian Ford company for the past 4 years follows:

Accounts receivable and stock on hand.....	1918	\$8,498,280	1917	5,167,039
	1916	4,916,197	1915	2,678,651
Cash on hand.....	1918	177,252	1917	2,066,455
	1916	486,655	1915	2,809,977
Plant extensions.....	1918	1,072,495	1917	400,000
	1916	1,067,934	1915	1,359,557
Tax payments.....	1918	84,309	1917	596,239
	1916	286,486	1915	697,323
Percentage increase in stocks and plant.....	1918	42%	1917	28%
	1916	46%	1915	31%
Percentage of increase in stocks and plant bears the following proportion to profits	1918	211%	1917	95%
	1916	137%	1915	47%
Selling Price Cost Prod.				
Percentage of selling prices and cost of production.....	1918—Inc.	20%	Inc.	24%
	1917—Dec.	7%	Inc.	14%
	1916—Dec.	10%	Inc.	9%
	1915—Dec.	9%	Inc.	64%
Wages percentage of total expenditure on production.....	1918—16%		1917—16%	
	1916—22%		1915—21%	

### Tire Filler Makers Convene

CHICAGO, Sept. 9—Twelve manufacturers of tire filling products have called an "Automobile Tire Economy Conference" to be held in the Congress Hotel, Sept. 15 to 18. The object of the gathering is to form a national association of standard tire filler manufacturers and to submit to government bureaus a wartime program for salvage of tires. Frank D. Mayer is temporary secretary. The tire filler manufacturers interested are: The Essenkay Products Co., Chicago; Peerless Tire Filler Co., Chicago; Dahl Punctureless Tire Co., Minneapolis; Pan-American Rubber Co., Milwaukee; National Rubber Filler Co., Midlothian, Tex.; Panama Rubber & Equipment Co., St. Louis; Wolverine Tire Cushion & Accessory Co., Detroit; Rubberair, Inc., New York; Bettern-Air Co., Philadelphia; National Synthetic Tire & Rubber Co., New York; Universal Tire Filler Co., Portland, Ore.; National Tire Cushion Co., Kansas City.

## First Jobber Exhibit Abandoned

### N. A. A. J. Ascribes Same Reason as N. A. C. C.—Municipal Pier Show to Be Held

CHICAGO, Sept. 9—The National Association of Automobile Accessory Jobbers has decided not to hold its show, which was scheduled for the week of Oct. 28 to Nov. 2, at Medinah Temple. The reasons for calling off the exhibition are the same as those given by the National Automobile Chamber of Commerce for calling off the national shows. It is probable that the annual convention of the N. A. A. J., which is to be held at the same time, will be carried through with the show feature eliminated. This decision was announced in a bulletin sent to all members Saturday by Commissioner William Webster.

Abandonment of the national motor car shows at New York and Chicago and the jobbers' show leaves the exhibition at the Municipal Pier, known as the National Exposition of Automotive Accessories, as practically the last event of the kind on the program. This exhibit, which opens Saturday, Sept. 14, and runs until the following Saturday, has a good list of exhibitors, particularly of accessories. In addition, there are a number of tractor, truck, truck former, and parts manufacturers who are among the list of exhibitors. Passenger car exhibits will be only incidental.

It is probable that the Pier show will benefit somewhat by the discontinuance of plans for the jobbers' exposition, because there undoubtedly are several jobbers who will take space in the Pier show now that the one at the Temple is not to be staged. Reservations of space are being held open until Wednesday on this account.

Arrangements have been made in connection with the exhibition at the Municipal Pier for a series of conventions to be held there, among which are agricultural organizations, hardware trade and others.

Plans are all in shape for the opening Saturday and the decorations are about completed and the novelty of the show at the Pier may be depended on to attract a number of people who otherwise would not attend. Transportation facilities are exceptionally good, parking space for hundreds of cars being provided and both the surface lines and bus lines provide other transportation.

### England Has Repair Problem

LONDON, ENGLAND, Aug. 20—A recent report shows that there are now in England several thousand motor vehicles awaiting repair and that this number is practically three times what it was a year ago. In France it is reported there is almost an equal number of vehicles in this condition. It is expected that it will take two or three years to put all of these vehicles in good order and dispose of them following the com-



pletion of the war. On the completion of the war there will be a great number of trucks, automobiles, motorcycles and spare parts, as well as machinery that will be brought from France to England, which will represent the value of many millions of pounds. Spare parts for motor vehicles now in government stores are valued at \$25,000,000.

#### Wrench Makers Conserve

NEW YORK, Sept. 6—Manufacturers of drop forged wrenches have adopted a war conservation program for the period of the war. They will discontinue immediately the manufacture of regular finished wrenches in addition to a long list of other wrenches which are considered unnecessary. Semi-finished wrenches may later be eliminated also and their place taken by what is styled a war finish wrench which will be equally as good as the others though slightly different in appearance.

Wrenches will no longer be packed in separate envelopes and all-wooden boxes, and sample and display boards for advertising them are eliminated. The lines retained as necessary are: Engineers' wrenches, check nut wrenches, light cap screw wrenches, hexagon box wrenches, square box wrenches, flat handle "S" wrenches, set-screw wrenches, tool post wrenches, single-head socket wrenches, spanner wrenches, construction wrenches, structural wrenches, round handle track wrenches, car wrenches and light service wrenches, all of which have useful functions to such an extent as to make their elimination doubtful from the viewpoint of conservation.

Those discontinued are all so-called heavy cap screw wrenches, including all millings from those blanks; 22½-deg. angle or textile wrenches, including all millings from that line of blanks; concave "S" wrenches, machine wrenches, long flat handle wrenches, double-head socket wrenches and all miscellaneous wrenches not mentioned in the above paragraph.

#### Fordson Distribution in Canada

DETROIT, Sept. 9—Arrangements have been made whereby the Fordson tractor will be handled by the Ford Motor Co. of Canada, Ltd., through its branches and dealer organizations from coast to coast. Shipments have been made to Ford dealers throughout this section. The tractor will sell to the consumer at \$950 f.o.b. Dearborn, plus the freight to destination. The Canadian government had 1073 tractors delivered to the various provinces in accordance with arrangements made with Henry Ford & Son as a means of assistance in the production campaign carried out by the Canada food board.

#### Wood & Spencer Expands

CLEVELAND, Sept. 6—The Wood & Spencer Co., engaged in the manufacture of machine parts for airplanes and other war munitions, has leased two parcels of land directly in the rear of the factory. The property, which is 78 by 158, was acquired for expansion after the war.

## Export Lines Drawn Tighter

### New Regulations Restrict Licenses to American Firms or Allies of America

WASHINGTON, Sept. 10—New export regulations, effective after Sept. 20, 1918, regarding requests for export licenses, have been made public to-day by the War Trade Board as follows:

Hereafter licenses may be granted by the War Trade Board only upon application of the consignor and only to—

(1) Corporations organized under the laws of the United States, or of any State, Territory, or Possession of the United States or of the District of Columbia, or

(2) Residents of any State, Territory, or Possession of the United States or of the District of Columbia, or

(3) Foreign partnerships with a member who is a resident of any State, Territory, or Possession of the United States, or of the District of Columbia, or

(4) Foreign corporations actually maintaining in any State, Territory, or Possession of the United States or in the District of Columbia an established branch or agency for the regular transaction of its business, or

(5) Any foreign government acting through any member of its embassy or legation accredited to the United States, or

(6) The Traffic Executive of Great Britain, France, Italy, and the consul for Belgium, or

(7) Any official, firm, or corporation appointed by any department or agency of the United States Government to act in its behalf.

Applications for export licenses and supplemental information sheets and any other supplementary documents or letters relating thereto will only be considered by the War Trade Board when filed by such corporations, firms or individuals and only when signed in ink by—

(a) An official duly authorized to act on behalf of a corporation if application for an export license is made by a corporation.

(b) A member of a firm, if application for an export license is made by a firm.

(c) An individual himself, if application for an export license is made by an individual.

(d) A regular employee of a corporation, firm or individual making an application for export license if such employee has been duly authorized in writing to so sign on behalf of such corporation, firm or individual and if such authorization has been filed with the War Trade Board.

(e) An attorney in fact of a corporation, firm or individual making application for an export license, if such attorney has been properly authorized so to act by virtue of a power of attorney duly executed and filed with the War Trade Board.

(f) A person duly authorized to act in their behalf if application for an export license is made by a foreign government, the Traffic Executive, the consul of Belgium, or an agency of the United States Government.

#### Canada Has 237,172 Cars

MONTREAL, CANADA, Sept. 10—The Montreal Automobile Association has compiled the following statistics of automobile licenses issued for 1919 to date in the various provinces:

Prince Edward Island.....	564
Nova Scotia.....	7,290
New Brunswick.....	1,500
Quebec.....	23,337
Ontario.....	97,500
Manitoba.....	22,214
Saskatchewan.....	44,267
Alberta.....	27,000
British Columbia.....	13,500

Total.....237,172

Ontario also has registered 7000 trucks in addition to passenger cars.

#### Australia Needs Battery Men

SYDNEY, AUSTRALIA, Sept. 2—Facilities for looking after storage batteries in some of the more remote sections of Australia are so chaotic that they practically do not exist. In many of these places there is no possibility of getting a battery charged or even buying distilled water for it. The automobile owners in these territories know how to drive cars and that is about all.

Owners of cars requiring their batteries recharged in many cases send them 120 miles where they are charged at the silver mines, where charging is done as a favor by the mine manager or engineer. The mine manager frequently makes distilled water and is dominated by the thought that so long as the water is thoroughly boiled and allowed to cool off, it can be classed as distilled water.

This whole situation points to the need of American manufacturers giving some aid to Australian automobile dealers who ask that certain of their cars be fitted for such a country as this. This calls for magneto equipment and elimination of the electric starting and lighting equipment. Many large owners of sheep farms, or station owners, as they are called, have no facilities whatever for making electrical repairs, and the difficulty of handling a car with complete electrical equipment becomes very apparent. This does not mean that the electrical systems are not good, but while they are ideal for the most populous sections of Australia, they are not fit for the more remote sections which are developing into large car-buying areas.

#### Detroit to Care for Wounded Soldiers

DETROIT, Sept. 10—Plans are being made by the employment department of the Detroit Board of Commerce to take care of incapacitated soldiers and sailors returned from service, and the co-operation of industrial plants has been requested in the work.

## July Exports Are 1% Below June

Tractor Engines and Airplane Parts Show Substantial Gains for Month and Year 1918

1918					
Cars	Value	Trucks	Value	Parts	
July..3,442	\$3,624,870	601	\$1,527,519	\$2,771,193	
June..3,098	2,808,463	829	2,001,488	3,195,353	
1917					
July..5,089	\$3,627,217	1,388	\$3,562,755	2,139,938	

WASHINGTON, Sept. 10—Exports of passenger cars, trucks and parts (not including engines and tires) during July amounted to \$7,923,582, as against a total of \$8,005,304 for the previous month, a loss of but little over 1 per cent. When compared with the total for July, 1917, the falling off for the month is approximately 15 per cent.

A greater number of passenger cars were shipped during July than was the case in June, but both months fall far behind the total for July, 1917.

Exports of commercial cars show a steady decrease from those of 1917, but the value of parts, although lower for the month, show a gain on the year's figures. A significant increase is shown in both the number and value of tractor engines exported. This classification includes engines used for military tractors of creeper type. It should be noted that airplanes exported for military use are not included in the figures given.

Australia proved to be our best cus-

tomor for passenger cars in July, the United Kingdom leads as a truck buyer and the substantial car exports to Latin-American countries indicates improved shipping conditions. Airplane parts exported during July were valued at \$1,913,127 as against \$261,565 for the same month of 1917.

### \$5 a Day Granted by Canadian Ford

FORD CITY, ONT., Sept. 9—Approximately 2500 employees of the Ford Motor Co. of Canada, of which 1900 are employed at the Ford City plant, will benefit by the new \$5-a-day wage scale for 8 hr. which took effect to-day. This will affect every employee of the Canadian plants who has been in the service of the company for 3 months or more. The former minimum wage was 50 cents an hour. Canadian plants are located at Montreal, Toronto, London, Winnipeg, Saskatoon, Calgary, Vancouver and St. Johns, N. B. War conditions and lack of material have compelled the company to cut its staff considerably, but it is using all the men possible at the present time.

### August Acme's Record Month

CADILLAC, MICH., Sept. 9—The Acme Motor Truck Co. had the best month in its history during August. More trucks were sold and more delivered than at any other time since the Acme was placed on the market, and the outlook for future business is reported by officials to be most satisfactory. More agencies are being established and the company's advertising campaign is proving very effective.

## New York's Exports Drop Slightly

July Figures Show a Gain in Passenger Cars and Parts —Trucks Show 46% Loss

NEW YORK, Sept. 9—Although during July both cars and parts exported showed a gain when compared with the figures for June, the falling off in truck exports was sufficiently large to bring the grand total below that of the latter month.

The comparative values are as follows:

	Cars	Trucks	Parts
June .....	\$1,495,346	\$1,370,955	\$767,276
July .....	1,667,464	741,132	1,068,384

The grand total for July is \$3,476,980 as against \$3,633,577 for the previous month. July's exports were a trifle better than those of May, which showed a total of \$3,339,558.

Chile was our best customer for passenger cars in June, taking delivery of 287 during that month. Australia heads the list for July with 293 passenger cars.

Evidence of better shipping facilities is given by Spain taking 87 cars as against 3 during June, and our trade with Latin America is well maintained. Japanese China and Ireland appear in the July table and France's purchases represent over half our month's truck exports in number and two-thirds of the total value.

## Exports of Automotive Equipment for July and Six Previous Months

	Month of July				Seven Months Ending July, 1918					
	1918		1917		1918		1917			
	No.	Value	No.	Value	No.	Value	No.	Value		
Airplanes .....			9	\$120,465	7	\$44,645	136	\$1,059,207		
Airplane parts .....		\$1,913,127		261,565		7,443,615		2,419,641		
Commercial cars .....	601	1,527,519	1,388	3,562,755	5,508	13,705,235	8,574	20,621,248		
Motorcycles .....	740	159,664	941	196,041	6,249	1,452,367	10,174	2,158,991		
Passenger cars .....	3,442	3,624,870	5,089	3,627,217	26,033	24,205,056	41,124	30,748,942		
Parts, not including engines and tires .....		2,771,193		2,139,938		19,033,619		17,094,321		
Total (trucks, cars and value parts only) .....		\$7,923,582		\$9,329,910		\$56,943,910		\$68,464,511		
ENGINES										
Automobile gas .....	3,698	\$730,772	1,932	\$204,497	19,816	\$2,617,144	18,981	\$2,186,707		
Marine gas .....	457	115,891	844	149,168	3,126	1,409,865	6,622	1,267,096		
Stationary gas .....	1,919	209,685	2,078	188,004	16,971	1,945,914	17,178	2,053,806		
Tractor gas .....	1,212	1,292,806	785	943,297	16,202	16,081,106	4,243	8,257,018		
Total value .....		\$2,349,154		\$1,484,966		\$22,071,709		\$13,764,627		
EXPORTS BY COUNTRIES JULY, 1918										
	Passenger Cars			Trucks		Passenger Cars			Trucks	
	No.	Value		No.	Value	No.	Value		No.	Value
Argentina .....	150	\$230,125	1	\$3,250	1,219	\$1,194,409	43	\$39,863		
Australia .....	460	425,443			49	33,498				
British India .....	4	6,000			2,704	2,203,868				
British South Africa .....					664	539,619				
Canada .....	357	281,916	103	165,083	7,274	5,960,916	804	1,007,718		
Chile .....	101	139,053			1,162	1,444,415				
Cuba .....	214	335,912	38	78,057	1,252	1,678,428	316	648,355		
Denmark .....					2	4,100				
Dutch East Indies .....	214	273,417			396	481,372				
France .....	156	111,486	128	503,802	664	915,160	1,459	5,412,496		
Mexico .....	162	147,120			1,308	892,399				
New Zealand .....	197	169,529			976	790,586				
Norway .....	36	92,190			47	124,438				
Philippine Islands .....	195	224,996			1,282	1,071,138				
Russia in Asia .....										
Russia in Europe .....					4	1,720	2	5,454		
Spain .....	87	100,844			436	532,789				
United Kingdom .....	3	8,957	184	547,677	338	957,202	1,616	4,757,638		
Uruguay .....	183	161,221			1,116	653,787				
Other Countries .....	923	916,661	147	229,650	5,140	4,725,167	1,268	1,833,715		
Totals .....	3,442	\$3,624,870	601	\$1,527,519	26,033	\$24,205,056	5,508	\$13,705,235		

## Rubber Imports Decline

August Receipts 5,671 Tons  
Behind Last Year—Six  
Months Totals Ahead

NEW YORK, Sept. 10—Imports of crude rubber slumped considerably during the month of August as compared with July, the net decrease being 5671 tons. During July, 16,092 tons came in as compared with 10,421 tons in August. The total for the year to date is still ahead of the total for 1917 up to the same time, though the ratio of increase has dropped slightly as compared with the total to the end of July. There has been a gain of 3321 tons imported as compared with a similar gain of 10,189 tons reported at the end of July for the seven-month period.

During the first eight months the total quantity imported was 125,891 tons. This compares with a total of 122,661 tons that came in during the same period in 1917. Following are the statistics as compiled by the Rubber Association of America:

Month	1917 Tons	1918 Tons
January .....	12,788	16,084
February .....	10,182	13,108
March .....	18,624	17,161
April .....	13,000	12,703
May .....	18,411	16,288
June .....	15,096	24,124
July .....	17,290	16,092
August .....	17,290	10,421
Total .....	122,661	125,981

### Ryan and Baker in France

WASHINGTON, Sept. 9—Secretary of War Newton D. Baker, accompanied by John D. Ryan, Second Assistant Secretary of War in charge of military aircraft, has arrived in France. It is expected that a complete investigation of aerial activities and aircraft needs will be made. Secretary Baker, accompanied also by the Chief of Embarkation and the Surgeon General, intimated before leaving that the purpose of his journey would be made clear by the interests of the men who crossed the Atlantic with him. Coming closely after the Senate Military Affairs Committee airplane re-

port, the sudden decision of the Secretary of War to visit Europe is taken by many here to mean an intensive study of air needs and possibilities at the front.

### Gear Makers to Meet Sept. 20-21

SYRACUSE, Sept. 9—The semi-annual meeting of the American Gear Manufacturers Association is to be held at the Onondaga Hotel, Sept. 20 to 21. Following is that portion of the program which has been completed: "Priority," Charles A. Otis of the Priority Committee; "What Is the Possibility of Women Becoming a Permanent Factor in the Gear Industry," W. H. Diefendorf; "Trade Acceptances," C. E. Crofoot; "The Outlook of the Steel Supply," C. E. Stuart, secretary and treasurer of the Central Steel Co., Massillon, O.

### Canada Conserves Gasoline

MONTREAL, Sept. 10—Canada has fallen in line with the policy which went into effect across the line a few days ago of conserving gasoline by refusing to sell to owners on Sundays. The Imperial Oil Co. has led the move, and all Imperial service stations in Canada will be closed on Sunday, this ruling to be effective for the duration of the war. An announcement has been received from Ottawa which will make the measure Dominion wide.

### Gasoline and Oil Exports Run Into Big Figures

WASHINGTON, Sept. 7—Figures issued to-day by the Bureau of Foreign and Domestic Commerce deal with the exports of various oils and gasoline for the month of July and also for the seven months ending with July of 1918 and 1917.

On a seven months' basis substantial gains are shown in crude mineral oil, gasoline and naphtha and residuum and fuel oil. Both illuminating and lubricating oil show a decrease. Taking the seven months of 1917 against a similar period in 1918 the latter year shows a total gain of \$60,926,383 in value of exports of this class and 120,697,443 gal. in quantity. The remarkable gain in fuel oil may be accounted for by the increasing needs of oil-burning naval and merchant vessels.

## Navy Airplane Base at Galveston

Mammoth Plant to Cost \$3,-  
000,000 and House 1200 Men  
—Nine Hangars Planned

GALVESTON, Sept. 10—As a result of a revision of the plans of the Navy Department for the construction of a naval air station here the total cost of the improvements will be more than three million dollars, or nearly double the original estimate. The proposed plant will consist of nine large hangars, repairshops, officers' and student aviators' quarters, barracks and medical quarters, for the accommodation of approximately 1200 men. Of this number about 1000 will be ground men and mechanics, 100 officers and 150 student aviators.

Each of the nine hangars will be 104 x 105, and will accommodate four machines. The first plans considered by the Navy Department called for six hangars and twenty-four sea-planes.

The site is 60 acres, between the railroad tracks leading out of the city and the bay. Three hundred and fifty thousand yards of dredging will be required for the work. Around the front and two sides of the 5-ft. elevation will be built a wooden bulkhead and an earthen levee around the back or south end. From 4800 to 4900 lineal feet of bulkheading, or filling material, will be required for filling in the dredged-in portion of the property. The basin will be dredged to a depth of 5 ft. the entire length of the building for a take-off, which will be 200 ft. in length. Construction will begin immediately.

### More Money for Continental Parts

KNIGHTSTOWN, IND., Sept. 6—Continental Auto Parts Co. has increased its capital stock from \$10,000 to \$50,000, and is now making extensive additions to its plant and installing additional machinery and equipment in order to take care of its Government contracts. The company manufactures a line of shop and factory equipment.

### Comparative Exports of Gasoline and Oil for 1917-1918

	JULY				SEVEN MONTHS ENDING JULY			
	1918		1917		1918		1917	
	Gals.	Value	Gals.	Value	Gals.	Value	Gals.	Value
Crude mineral oil.....	20,027,967	\$1,263,926	6,291,853	\$413,952	122,996,597	\$6,906,301	96,312,004	\$4,435,660
Illuminating oil.....	31,923,154	3,685,582	28,446,670	2,561,655	284,853,931	28,129,970	411,316,265	28,697,871
Lubricating oil.....	19,845,998	6,149,031	17,442,864	3,298,598	147,949,076	40,854,295	156,309,835	29,406,604
Gasoline, naphtha, etc...	47,720,802	11,943,248	22,076,243	4,801,724	321,676,878	79,847,476	242,001,564	51,458,110
Residuum, fuel oil, etc...	119,260,316	6,588,551	69,741,043	2,979,606	713,266,308	38,812,510	564,105,679	19,625,924
	238,778,237	\$29,630,338	143,998,673	\$14,055,530	1,590,742,790	\$194,550,552	1,470,045,347	\$133,624,169



## Résumé of Allied Airplane Bombing

### British Ministry Reports Remarkably High Average of Enemy Machines Downed Each Week—Ineffectual German Retaliatory Measures

WASHINGTON, Sept. 10—Little detailed information regarding the amount of air bombing now being carried on by the Allies has heretofore penetrated to this country, though intensive air bombing is constantly increasing and few German cities within a radius of 250 miles of the airplane bases have escaped. Consequently the following résumé of operations during a recent week by the British Royal Air Forces is particularly interesting and illustrative of the enemy's air losses and the numerous raids which are being carried on daily. Following is the complete résumé issued by the British Air Ministry:

Those who follow closely the news of the war in the air have been impressed by two things:

The first is the consistent and remarkably high average of enemy machines destroyed week by week. The second is the singularly spasmodic and obviously nervous way in which Germany seeks to carry the three-fold British aerial offensive which is being sustained against her.

#### Enemy's Heavy Air Losses

Taking the figures for the past week for example, 70 enemy machines have been destroyed and 11 driven down out of control by British airmen on the Western front alone. During the same period 27 British machines were reported missing; thus, for every British airplane which failed to return to its base, more than two German machines are known to have been smashed.

That these figures are by no means exceptional is shown by the fact that during the last four weeks 324 enemy machines have been accounted for under similar circumstances, while only 116 British have been reported missing.

The same broad results are observed upon the Italian, Balkan and Palestine fronts, where 18 enemy machines have been destroyed or driven down out of control. During the last week 12 British machines have been reported missing. Taking the whole of the European Mediterranean battlefields together, the Royal Air Force has accounted for in the neighborhood of 120 enemy aircraft against a net loss of 29 British machines.

#### Britain's Triple Air Offensive

It is, however, upon the Western front that this remarkable disparity is most significant, for it is here that Germany is concentrating the major portion of her strength. It is here also that she is faced with the three-fold problem, not only of defending her long battle front, but also of warding off the insistent and formidable British attacks upon her right and left flanks—Belgian naval

bases—and the industrial centers on the Rhine.

#### A Week of British Air Raids

Some idea of the scale of Britain's effort in this quarter can be gained from the following list of successful bombing raids undertaken by the Royal Air Force on the Western front during the past week:

Raids Into German Territory	No. of Raids
Offenburg .....	3
Stuttgart .....	2
Saarbrücken .....	2
Barden .....	2
Coblentz .....	2
Hagenau .....	1
Nahr .....	1
Rastatt .....	1
Söllingen .....	1
Pforzheim .....	1
Dürren .....	1
Traves .....	1

Raids Into Belgium	No. of Raids
Ostend Docks .....	4
Bruges Docks .....	3
Zeebrugge Docks .....	2
Westende .....	2
Nieuport-Ostend Canal .....	1
Nieuport-Bruges Canal .....	1
Middlekerke .....	1
Aerodromes and dumps .....	4

Innumerable raids have been made on all fatal enemy positions, including Seclin, Lille, Menin, Cambrai, Valenciennes, Cortrai, Armentieres, Douai, Bapaume, Chaumes, Peronne, etc.

#### Intense Local Air Fighting

The highly damaging results to the enemy of these incessant raids is strikingly shown, not only by the photographic records by our pilots, but by the spasmodic attempts of the enemy to frustrate them.

By withdrawing urgently needed machines from other fatal points, he has occasionally been able to secure a local numerical superiority, as was the case last week at Mannheim, where, in the course of an early morning raid, we lost seven machines after "bitter fighting." This fact, however, did not prevent the Royal Air Force from renewing their attacks on Mannheim the evening of the very same day when, despite an even greater resistance than they encountered in the morning, double the number of bombs were dropped, and all our machines succeeded in returning.

Hardly less significant to Germany is the skill with which the bombing of these towns is being carried out. The courage and ambition of the average German aerial bomber does not seem to carry him beyond the perfectly promiscuous bombing of towns, except perhaps when he locates a big American or English hospital far from the battle line, then he will descend from his safe height, and having bombed the building, will adventurously expose himself to a chance rifle or revolver bullet, while machine gunning the doctors, nurses and orderlies as

they are trying to carry their patients into shelter.

The Royal Air Force is singularly different in its tactics, and confines itself to important and legitimate military objectives, invariably descending low enough to make a certainty of inflicting genuine military damage. For example, to take at hazard a specimen page of R. A. F. aerial photographs we find the indisputable camera record of the following bomb bursts:

OBENDORF—3 bursts, one on the railway sidings, one alongside the extensions of the Stauer Works, one on the Auser Works.

OFFENBURG—3 bursts, two beside the railway work shops, one on station.

OFFENBURG (following day)—5 bursts, one on main station, two on railway, one direct hit on railway bridge, one on railway south of the station.

Facts such as these go far to explain the intense resentment which Germany feels with regard to the now incessant attacks upon her centers of munitions production, attacks which not only cause her grave military damage and delay, but compel her to detach a large and growing number of machines for the defense of the threatened centers.

#### Growth of Cleveland Plants

CLEVELAND, Sept. 10—As an indication of the continued development of the automobile and allied industry in this section, building permits issued in Cleveland during 1917 offer interesting figures. The following are some of the important permits granted to concerns manufacturing automobile products:

Cleveland Welding & Mfg. Co. ....	\$50,000
Cleveland Welding & Mfg. Co. ....	40,000
Warner & Swasey Co. ....	60,000
American Steel & Wire Co. ....	25,000
Park Drop Forge Co. ....	60,000
Park Drop Forge Co. ....	36,000
Grant Motor Car Corp. ....	65,000
U. S. Tool Co. ....	25,000
Lang Body Co. ....	75,000
Parrish & Bingham Co. ....	80,000
Hydraulic Pressed Steel Co. ....	30,000
Hydraulic Pressed Steel Co. ....	300,000

#### Work of Highways Transport Committee

WASHINGTON, Sept. 10—The work of the Highways Transport Committee, Council of National Defense, this committee having been appointed to make the most effective use possible of the highways as one of the means of strengthening the nation's transportation resources, is now being developed in such a way as to take in every state in the Union. Further, through the medium of State Highways Transport bodies, functioning with the national body, this organization is being developed in some states not only down to the districts but to the counties and even communities.

The State Highways Transport bodies are a part of the State Council of Defense. They consist of the following:

The chairman of the State Highways Transport Committee, five members of the Highways Transport body and a secretary.

The five members in question are named to represent areas of varying sizes and populations, each of the five mem-

bers being chosen from one of such five different areas, and in turn serving as chairman of his district committee. The district boundaries are laid out in harmony with existing conditions, the aim being that the most effective results possible may be brought about. For instance, in one locality large population centers may be found to be best as the heart of one or more districts. Again, in other sections, where cities of large population are not found, the district boundaries may be made to embrace agriculture, lumber, oil or other areas.

#### Milwaukee-Chicago Motor Truck Line

MILWAUKEE, WIS., Sept. 10—The first regular freight service by motor truck to be established between Milwaukee and Chicago was opened during the past week by the Motor Transportation Co. of Milwaukee, organized with a capital stock of \$100,000 by Milwaukee capital and Charles C. Newburn, of Chicago. Four trucks, each of 3-ton capacity, are now being operated over the 90-mile route. Besides the terminal offices in Milwaukee and Chicago, the company will maintain stations at South Milwaukee, Racine, Kenosha and Waukegan for the handling of freight. The Milwaukee interests in the new company are represented by Charles A. Robinson and George D. Persons, formerly passenger engineers on the Milwaukee road. During the first few days of the operation of the new service no difficulty has been encountered in getting capacity loads, going and returning. In fact, much more freight has been offered than can be carried with the present equipment of four trucks, and the promoters expect to add as many more within a short time.

#### Carload of Fordsons Sent to Mexico

DEARBORN, MICH., Sept. 10—Henry Ford & Son received a visit last week from Randolph Robertson, vice-consul of the United States, who came from Monterey, Mexico, to make arrangements with the plant to have a carload of tractors sent down to that country. This carload, with the two tractors sent recently to President Carranza, makes a total of nine Fordsons that will soon be doing work on Mexican soil.

Two expert men are being sent to Mexico to give demonstrations with a view of educating the natives in modern methods of agriculture. The carload of tractors has been sold to Mexico at the fixed factory price, viz., \$750.

Owing to the shortage of pig iron and chrome nickel steel, the production of the plant has dropped slightly during the last week. Only 803 machines were produced as against 919 the week previous. The average daily production now is 125 to 130.

Plans for the new plant at Hamilton, Ohio, have been drawn and are now awaiting the O.K. of C. E. Sorenson, manager of the company, who will soon go to that town to start building activities.

## Flying "Stunts" Are Vitally Important

Essential That Military Aviators Be Taught Every Trick of the Trade—Successful Flier Must Be Able to Surpass Opponent in Skill

WASHINGTON, Sept. 10—Flying stunts are vitally important if the flier is to be victorious in combat with the enemy, according to statements made here by British air authorities. The lives that are lost in teaching stunts in training are but few in comparison to those that would be lost if the fliers were sent against the Boche without stunt practice.

"Not every one realizes," say the British authorities, "what a long time it takes to make a service flier. The average period from the time the pupil is brought to the Cadet Schools of the Royal Air Force to the time he is ready to go overseas and fly over the lines is about 7 months; yet the actual training in flying is one of the simplest items.

"The principal factor to consider in teaching flying in war time is whether it is worth while to spend the necessary time on a pupil.

"If a country is at peace, and there are plenty of machines available, it may pay to stick to a man who will undoubtedly make a flier sooner or later, for any one can fly if sufficient time be given to his instruction. But in times of war, as at the present time, when we have neither a surplus of machines available for flying nor the extra time to spend in training, it is not a practical thing to do.

#### Specialized Training Essential

"The hard specialized training which every one has to come to sooner or later is not only important, it is absolutely essential.

"Much has been said about 'dangerous stunts,' with the implication that these are spectacular performances which thrill the spectators but are needlessly risky, and I think this needs a little explanation.

"It is quite true that some lives were lost in the earlier days in instructing pupils in what we call 'stunting,' but it is quite useless to send a man overseas if he is unable to 'stunt.'

"In individual fighting, unless the flier can really do things better than the German, he is not going to come out alive, and it is no earthly use imagining that when the crucial moment arrives stunting is going to come naturally. For instance, when one machine meets another, each speeds up and goes through every kind of maneuver to get into a good position so as to be able to 'get' his opponent. The man who is going to come out alive is the man who can outdo his opponent in flying. It is not a question of 'getting away from the German.' It is not a matter of getting away at all, but of getting into a good position so that you can down him.

"He is going to do the same thing, and unless you are able to outdo him in his

maneuver you are going to come out beaten; and unless you are trained to do real stunts (which are really not at all dangerous) you are not going to be able to down him. The danger is not in 'stunting,' but in not being able to 'stunt.'

"If a flier goes overseas, and is not able to do these things, then his life is not worth a cent. If he can do these things, and the time comes when he is absolutely face to face with his opponent, the man who will kill his opponent is the one who can throw his machine about the most and get out of a difficult position. Getting out of the difficult position saves his life, but this is not all; the real problem is to get into a good position so that he can down the enemy, and the downing of the Boche is the thing that every flier is out for. He is not there to get away, he is there to kill his opponent.

#### Flier Must Be Properly Trained

"To succeed, the flier must be taught properly. It may cost one or two lives this side of the water, but if the men are taught thoroughly it will mean the ending of these casualties on the other side, and the causing of many more to the enemy.

"What is more, if the pilot does not know how to 'stunt,' it will not only mean the death of the pilot himself, which is relatively not so important in view of the fact that so many thousands of men have been killed in the war, but it may result disastrously to a great number of men on the ground. When the man in the air goes down, there may be batteries dependent upon him for spotting our own fire and the enemy's artillery; there may be infantry regiments waiting to know where the Germans are, and there may be whole divisions waiting for certain information.

"It is thus absolutely criminal to send a pilot to the front who does not know how to fly, and the only way to make him capable is to teach him to 'stunt.'"

#### Willys-Overland to Have Barracks

TOLEDO, OHIO, Sept. 10—The government is preparing to handle the labor supply for munition manufacture in the Willys-Overland plant. Plans have been completed for the first unit of a cantonment to house laborers, just north of the factory. The buildings will be similar to those at the army cantonments. The first one will furnish temporary sleeping quarters for 200 and will contain a mess hall.

#### Lober Radiator Enlarges Capacity

TOLEDO, Sept. 7—The Lober Art Brass & Specialty Co. has leased adjoining rooms and will double the floor space and capacity of its plant. New equipment is being installed.

## Passenger Car Prices Going Up

Eight Makers Boost Lists Substantially—Truck Prices, Too, Advanced

DETROIT, Sept. 5—The Willys-Overland Co., Toledo, has increased the prices of all its models, effective Sept. 1, as follows:

Model	Old Price	New Price
90 (T) Touring.....	\$895	\$1095
90 (R) Roadster.....	895	1095
90 Country Club.....	925	1145
90 Sedan.....	1385	1665
90 Panel Delivery.....	895	1045
90 Express Delivery.....	875	1025
1200-lb. Express Delivery	1075	1150
1200-lb. Spec. Open Panel		
Delivery, right-hand		
drive.....	1075	1150
85-4 Touring.....	1025	1175
85-4 Roadster.....	1025	1175
85-6 Touring.....	1300	1495
85-6 Roadster.....	1300	1495
85-6 Coupe.....	1550	1750
85-6 Sedan.....	1720	1920
89-6 Touring.....	1525	1775
89-6 Club Roadster.....	1525	1775
84-4 Touring.....	1650	1925
88-4 Coupe.....	2600	2850
88-4 Sedan.....	2650	2950
88-8 Touring.....	2500	2750
88-8 Coupe.....	3175	3425
88-8 Sedan.....	3200	3475
88-8 Limousine.....	3300	3500

### Cadillac Prices Increase

DETROIT, Sept. 5—The Cadillac Motor Car Co. has advanced its prices \$300 on the following models, effective Sept. 1:

Model	New Price	Old Price
Touring Car.....	\$3520	\$3220
Phaeton.....	3520	3220
Roadster.....	3520	3220
Brougham.....	4390	4090
Suburban.....	4640	4340
Limousine.....	4695	4395
Landaulet.....	4795	4495
Town Limousine.....	4660	4330
Town Landaulet.....	4810	4510

F. O. B. Detroit, not including war tax.

### Nash Prices Go Up

KENOSHA, WIS., Sept. 10—The Nash Motors Co. increased the price of its cars and trucks on Sept. 1 as follows:

	New Price	Old Price
5-pass. touring.....	\$1490	\$1395
7-pass. touring.....	1640	1545
4-pass. roadster.....	1490	1395
6-pass. sedan.....	2250	2085
4-pass. coupe.....	2250	2085
1-ton chassis.....	1650	1595
2-ton chassis.....	2175	2075

### Kissel Prices Revised

HARTFORD, WIS., Sept. 10—The Kissel Motor Car Co. has increased the price of its cars and trucks as follows:

	New Price	Old Price
4-pass. roadster.....	\$1743	\$1645
4-pass. sedan.....	2293	2195
5-pass. touring.....	1743	1645
5-pass. sedan.....	2293	2195

#### Trucks

	New Price	Old Price
General Utility, 2-ton....	\$2073	\$1885
Freighter, 2½-ton.....	2832	2575
Heavy Duty, 4½-ton.....	3905	3550
Dreadnaught, 6-ton.....	4785	4350

### Jones Car Prices Advanced

WICHITA, Sept. 7—The Jones Motor Car Co. has advanced its prices as from Sept. 1 as follows:

	New Price	Old Price
27-B 7-pass.....	\$2100	\$1875
Sport. 4-pass.....	2350	....

Several minor refinements have been incorporated in the 7-passenger model and the 4-passenger sport model is fitted with wire wheels, 32 x 4½ in. cord tires and paint and upholstery colors are optional.

### Hupp Prices Advance

DETROIT, Sept. 10—The new price of both the Hupmobile touring car and roadster is \$1,500 instead of \$1,350. This advance was effective Sept. 1.

### Packard Prices Increase \$500

DETROIT, Sept. 10—The Packard Motor Car Co. has advanced its prices, effective Aug. 26, as follows:

Model	New Price	Old Price
3-25 Touring.....	\$4,800	\$4,300
3-25 Limousine.....	6,350	5,850
3-25 Brougham.....	6,500	6,000
3-25 Coupe.....	6,150	5,650
3-35 Touring.....	5,150	4,650
3-35 Limousine.....	6,700	6,200

### Hudson Super-Six's Advance \$250

DETROIT, Sept. 10—The Hudson Motor Car Co. has advanced the prices of the Super-Six models, \$250, effective Sept. 1, as follows:

Model	New Price	Old Price
Seven-pass. Phaeton.....	\$2,200	\$1,950
Four-pass. Phaeton.....	2,300	2,050
Sedan.....	3,000	2,750
Runabout Landau.....	2,690	2,440
Limousine.....	3,650	3,400
Town Car.....	3,650	3,400
Coupe.....	3,100	2,850
Town Limousine.....	3,400	3,150

### Motor Transport Corps to Consist of 154,774 Men

(Continued from page 470)

Transport Corps is operating 1500 trucks in convoy trains in this country exclusive of the trucks used at the various army posts. These 1500 trucks carry various kinds of merchandise and munitions for the army over an average of 100,000 miles every 24 hr. The Motor Transport Corps is desirous of securing a great number of men and officers, men especially qualified to drive motor vehicles by the thousand, and executives with business experience are wanted for officers. Men in the deferred classes of the first draft will be inducted into this service. Further information can be secured by addressing the chief of the Motor Transport Corps, Washington, D. C.

There is quite a difference of opinion here as regards the re-establishment of the original A and AA standard trucks in the army program. Members of the Motor Transport Corps state that it is most improbable, while on the other hand several consider it a possibility. It is also stated by members of the Purchasing Section that the report of contracts placed for 17,000 A trucks, which was given out by an officer of the Motor Transport Corps, is incorrect and that only a small part of this business has been confirmed.

### To Enlarge Selfridge Field

WASHINGTON, Sept. 10—Eighteen hundred acres of land adjoining Selfridge Field, Mt. Clemens, Mich., have been acquired and will be added to the field for aviation instruction purposes.

## Industries Must Use More Women

H. E. Miles Says 500,000 More Skilled Workers Will Be Needed in 90 Days

CHICAGO, Sept. 10—American industry is not as yet at war and it is time that it were. It does not realize that 2,000,000 men will be taken from the industries of the United States within a few months, and that it will take 12,000,000 people to produce what these 2,000,000 consume. This is the way in which H. E. Miles, chairman Section on Industrial Training for the War Emergency Advisory Commission, Council of National Defense, aroused the Employment Managers' Association of Chicago at its dinner last night.

Mr. Miles' work is seeing that training courses for unskilled labor are installed in industries. His plan, which is the plan of the Government, is to install practical training courses in the larger factories for the development of semi-skilled employees.

In emphasizing the need for skilled labor, Mr. Miles said that within 90 days over 500,000 new skilled laborers will be needed for manufacturing operations. This is more than the total of skilled mechanics in the whole country in 1910. The production of our factories must be doubled. So imperative is the need that Mr. Miles asked in the name of the Government that the Chicago employers act to-morrow in the establishment of these schools. In illustrating what could be done the speaker told of the results of similar schools in England, and stated that European factories are getting out a much greater per capita production since the war and a 25 per cent increase in per capita production is expected in America.

England's original method at the beginning of the war consisted of taking 60 schools from which they discharged the teachers and installed shop foremen, etc., as instructors. By this means, however, they got only two thousand new skilled laborers a month. They undertook to train thousands of women not only in the schools but in the factories themselves in separate instruction bays. English employers set up human tool-rooms in each factory. France is doing the same thing and requires every plant employing 300 people or more to put in training schools. In England it is made as a part of the ordnance contract.

Mr. Miles insists that American plants must use more women and must depend on women chiefly for their skilled labor.

"Sex has nothing to do with machine production," said Mr. Miles. He stated that there is nothing on an airplane that women are not doing in England. The Curtiss company here is training women for skilled operation in four days. The Wolwich Arsenal in England has 40,000 women in it.

The best method of training, said Mr. Miles, is to take men from the factory



who can tell what they know, send them to schools and make them high class instructors, then send the women, old men and boys for a short period of intensive training on some particular job.

As a rule these schools are not an operating expense, as the material they turn out is production material, and the rate of pay during training is low enough so that the unit cost is not higher than that of the regular production part of the plant. Some of the plants in this country pay 20 to 30 cents an hour while training on work that pays 45 cents an hour in production.

E. A. Russell, chief ordnance inspector, added that with 4,000,000 men on the other side next year the army program would call for \$14,000,000,000 worth of material. He said that the shells already contracted for in America if placed end to end would reach around the earth at the equator and then overlap for 5000 miles.

#### Passenger Car Pledge

WASHINGTON, Sept. 10—No special priority class rating has been assigned to the passenger car industry and it will be necessary for each manufacturer to make application for the steel he requires. The preference in priority will be graded, possibly, by the class of steel required. A "passenger automobile manufacturer's pledge" has been approved by the War Industries Board and must be filled in by every manufacturer who desires to secure steel and filed with the Automotive Section of the Board. After the pledges have been signed and sent in, the manufacturer may make application to the Director of Steel Supply, War Industries Board, Washington, for a permit to purchase the steel or manufactured steel products.

The manufacturer's pledge is as follows:

War Industries Board,  
Washington, D. C.

Gentlemen:

Attention: Automotive Products Section  
The undersigned hereby pledges itself:

- (1) Not to purchase iron or steel or iron or steel parts or equipment except under permit from the Director of Steel Supply.
- (2) To limit its purchase of materials, parts, equipment and supplies to an amount which does not exceed either
  - (a) The amount absolutely necessary to match up its stocks now on hand, or
  - (b) The amount necessary to permit a production of passenger automobiles and all repair parts therefor for the six months ending Dec. 31, 1918, not in excess of 25 per cent of its production for the calendar year 1917.
- (3) That it will conserve and economize in every possible way its stocks of iron and steel and their products now in its hands, or that may come into its possession, and will release on request of the War Industries Board to such other manufacturer of passenger automobiles as may be designated by the said board such of its stocks as can be utilized by such other manufacturers and which are not required by it for either the limited production above specified or for war work.
- (4) That it will from time to time render such reports of its activities under oath or otherwise as may be called for by the War Industries Board.

## Ford Stops Building Passenger Cars

Company to Devote Entire Plant to War Work—Franklin and Hudson Quit, Too

DETROIT, Sept. 10—The Ford Motor Co. will immediately abandon the manufacture of passenger cars during the period of the war; only a limited number will be made for the use of the Government. From this time forward the entire resources of the company are to be devoted to war work. The Ford plant will be used exclusively for the production of Liberty engines, tanks, ambulances and such other work as the Government may desire.

Ford is the third manufacturer to announce a policy of 100 per cent war work. The Hudson Motor Car Co. already has let it be known that henceforth and until after the war no more Hudson cars will be produced. This week the Franklin Automobile Co., Syracuse, has made public that its plants are now practically 100 per cent on war work and that it is the intention not to produce any more Franklins until after the war.

The decision to devote the entire Ford resources to war work applies also to the 31 branch assembly plants scattered throughout the large industrial centers of the country. Six of these, located in Cambridge, Mass.; Louisville, Ky.; Philadelphia, St. Louis, Washington and Long Island City, already have been turned over entirely to the Government and the others will be turned over rapidly.

Abandonment of the manufacture of passenger cars will not affect the production of trucks and tractors. Trucks are considered essential by the War Industries Board, and their production will be continued. The Fordson tractor is produced by Henry Ford & Son in an entirely separate plant at Dearborn, Mich., and its production will be continued.

The conversion of the Ford passenger car production facilities to 100 per cent war work has not been entirely unexpected. As long ago as November there were persistent rumors that the manufacture of passenger vehicles was to be eliminated. These, however, were denied at that time.

Immediately following the denial of these rumors, announcement was made from the Ford plant that the top notch in production had been reached, the factory having turned out a total of 3000 cars on Nov. 23.

This production was maintained practically constant until early in February when it was cut down 50 per cent and remained practically constant until nearly the end of June. At that time the production had been further reduced to 750 cars a day.

Beginning Aug. 1 production was further reduced to 350 passenger cars a day. The production of trucks has been steadily increasing, until at the present time approximately 400 are being turned out daily.

During the fiscal year ending July 31 last the production of the Ford Motor Co. totalled approximately 700,000 cars as compared with 785,000 during the last year. On June 10 there were unfilled orders on hand for more than 110,000 cars.

#### Owen Develops Farm Light System

NEW YORK, Sept. 10—A farm lighting system completely automatic in operation has been placed on the market by R. M. Owen & Co., 1765 Broadway, New York. It comprises a single cylinder 8 x 4-in. water-cooled vertical engine direct-connected to a four-pole generator of 1250 watts output. Engine speed is controlled by a centrifugal governor acting on the throttle valve, and a constant voltage is maintained by the use of compound field windings.

Included in the outfit is a 16-cell, 80-ampere-hour Willard battery in glass jars. The outfit is started by pushing a button switch and stopped by pushing similar switch. When once started the engine runs until the battery is full, when it is automatically shut off. When the battery has been discharged to a certain predetermined state the engine is automatically started.

#### Packard 100 Per Cent On War Work

DETROIT, Sept. 12—Packard starts Thursday 100 per cent on war work. Packard will confine its efforts to the production of Liberty engines, of which it is now making about 35 daily, airplane bodies, war tractors and trucks.

There are several airplane body models one of which is an entirely new one the French Commission is working on. There have been some completed which are now in use in tests at Dayton and elsewhere.

Sensing the placing of an order for Liberty engines from the government the company stimulate the production of Twin Six power plants and was fortunate in producing 6000 before the first order for 600 Liberty engines was placed. The production of trucks includes all war models and those for commercial use which are intended for essential industries. The truck production schedule provides for 8000 to 10,000 vehicles for the fiscal year ending Sept., 1919. Fully one hundred million dollars worth of war work will have been completed during the coming year.

Twelve thousand men and women are employed by the company in the sixty-one buildings which cover fifty-six acres of ground.

During the suspension of car manufacture the company will endeavor to maintain service on all trucks and the forty-five thousand passenger cars that are now running.

The company has affiliated with it 110 dealers who will be affected by the new arrangement; many of these have increased their stocks of accessories. Those who are handling trucks will be permitted to continue, provided they sell the vehicles to essential industries.

**Horowitz in Charge of Tanks**

WASHINGTON, Sept. 6—Louis J. Horowitz, formerly president of the Thompson Starrett Construction Co., New York, has been appointed assistant chief of ordnance, in charge of tanks. Mr. Horowitz will have complete authority on the engineering, manufacturing and inspection of tanks.

Brig.-Gen. J. T. Thompson, U. S. A., retired, has been made director of ordnance training, and will work out the types of training to be given the personnel of the Ordnance Department, and will make provisions for this training. Capt. S. E. Blunt has been appointed employment supervisor in charge of the personnel employment bureaus of the several arsenals and other ordnance establishments.

H. E. Henry has been appointed general sales manager of the Fulflo Pump Co., Blanchester, Ohio, succeeding A. N. Martin, who has accepted a position with the Pyle National Co., Chicago.

Thos. J. Little, Jr., engineer of the Lincoln Motor Co., Detroit, has been appointed a member of the welding research committee of the Emergency Fleet Corp., United States Shipping Board.

W. G. Bell, for the past 4 years assistant sales manager in the Dominion of Canda for the Studebaker Corp., has been appointed Canadian sales manager of the Cleveland Tractor Co., Cleveland.

William B. Stout has resigned his position as technical adviser to the Aircraft Board at Washington and has returned to Detroit to take up the manufacture of a plane of his own design. The experimental work and preliminary construction is being carried out by W. C. Rands, of the Rands Mfg. Co., Detroit.

J. H. Fenton of the Los Angeles office, of the Westinghouse Electric & Mfg. Co. has recently been appointed manager of the Industrial Division of that office, which includes jurisdiction over the Tucson and El Paso offices.

J. N. Mahoney, for 12 years a member of the Engineering Department, has tendered his resignation from the Westinghouse Electric & Mfg. Co. to open consulting offices in New York.

B. F. Page, formerly eastern representative of the Four Wheel Drive Auto Co., Clintonville, Wis., has been appointed assistant to L. P. Fortin, acting manager of the Oneida Motor Truck Co., Green Bay, Wis.

E. J. Wright, formerly with the Allen Motor Car Co. has been appointed assistant to the sales manager of the Dort Motor Car Co., Flint.

Ralph J. Handy, former distributor of the Tonford truck attachments in Detroit, has become sales manager of the Laiton Truck Co., Youngstown, Ohio.

## Men of the Industry

### *Changes in Personnel and Position*

John Squires has resigned as general manager and chief engineer of the Signal Motor Truck Co., Detroit, his duties as manager being taken up by F. W. Henderson, and those of chief engineer by S. Deutsch. Mr. Squires will shortly announce his plans for the future.

W. C. Anderson, manager of the Ford Motor Co. assembling plant at St. Louis, has been transferred to Chicago following the turning over of the St. Louis building to the quartermaster's department of the United States Army. He will have charge of assembling plant in Chicago for the present.

Charles E. Becker, formerly advertising manager of the Jones Motor Car Co., Wichita, Kan., has been called to the colors.

A. B. Jones, second vice-president of the B. F. Goodrich Co., Akron, has been appointed by the American Red Cross to the post of director of transportation and distribution of Red Cross supplies in France.

Frank M. Eldredge, Detroit, has assumed entire charge of the sales and advertising departments for L. V. Flechter & Co., New York. He has been handling all the national advertising for the company for the past year and will now add the sales to his other duties. He will continue his publicity and sales promotion bureau.

C. W. Whitson, formerly with the Fulton Motor Truck, Farmington, Long Island, and who recently resigned from that organization, has been appointed general sales manager of the Panhard Motors Corp., Grand Haven, Mich.

A. W. Redlin, for the past 2 years division superintendent of the Mitchell Motors Co., Racine, has been appointed assistant works manager of the Erd Motor Co., Saginaw.

L. F. Collins has been appointed truck sales manager of the Nash Motors Co. This position was left vacant by H. C. Hart, who recently received a captain's commission in the Ordnance Department of the United States Army.

**Mor: Money for Kelly Men**

CLEVELAND, Sept. 9—The Kelly Resmer Co. has voluntarily increased the wages of its employees ten per cent beginning August 24. The increase was unsolicited.

**Appoint Fordson Export Distributer**

DEARBORN, MICH., Sept. 6—Henry Ford & Son, Inc., have appointed Sherman & Sheppard as export distributors of Fordson tractors. This firm has a New York office and will also have one in Buenos Aires.

**Urge Bankhead National Highway**

WASHINGTON, Sept. 10—Delegations representing chambers of commerce from Richmond, Va.; Atlanta, Ga.; Memphis, Tenn.; Dallas, Tex.; Oklahoma City and other southern and western cities will meet in Washington Dec. 10 to urge upon Congress the necessity of the Bankhead National Highway from Washington to Los Angeles. The meeting will probably be in the form of a joint hearing with Senators and Congressmen, and the establishment of the road will be urged as a war measure. It was pointed out that the highway traverses 22 cantonments, aviation and military posts.

**Anthracite Production Gains Slightly**

WASHINGTON, Sept. 10—Bituminous coal production for the week ended Aug. 31 was 12,642,000 tons, approximately the same as the preceding week. Anthracite production for the week was 2,259,716 tons, an increase of 125,716 tons or 5.9 per cent over the preceding week.

During the week of Aug. 24 the bituminous mines operated 81.5 per cent of their full time output. Production losses were due to car shortage, 9.9 per cent; labor shortage, 3.5 per cent; mine disability, 3.9 per cent; no market, 0.4 per cent; all other causes, 0.8 per cent.

**254,722 Cars in Michigan**

LANSING, Sept. 9—On Sept. 1, 1918, there were 254,722 automobiles in the State of Michigan, according to the Secretary of State. The registration records also show that of the 254,722, 229,762 were passenger cars and 24,960 were commercial vehicles. The number of motorcycles registered was 7452 and there were also 22,648 chauffeurs on Sept. 1. The total fees collected up to Sept. 1 is \$2,840,995.35.

**Chicago Pneumatic Enlarges**

CLEVELAND, Sept. 9—The Chicago Pneumatic Tool Co., Chicago, will erect a \$150,000 addition to its plant, in order to double its present capacity. Work on the building will be completed about Nov. 1.

The Cleveland Twist Drill Co. will also erect a \$120,000 addition to its factory.

**Car Makers Want Tools**

DETROIT, Sept. 9—The Maxwell Motors Corp. is inquiring for a large number of tools for shell-making. The Winston Motor Car Co., Cleveland, is in the market for screw and milling machines as well as drill presses. It recently obtained a large order for tripods for Browning machine guns.

**Electric Steel Absorbs Crucible**

CLEVELAND, Sept. 7—The Electric Steel & Forge Co. has absorbed the Crucible Steel Forge Co. of this city and will continue and expand this business. For this purpose it will purchase adjoining land on which to erect suitable buildings, install two electric furnace units, heat-treating furnaces, rolling mills, machinshop and other necessary equipment. It will have a production capacity of 9000 to 10,000 tons per annum of tool steel and alloy steel, and a rolling and forging capacity in excess of this tonnage.

The products of the company will include carbon and tungsten tool steel, nickel, vanadium, chrome, chrome-vanadium, chrome-nickel, silicon-manganese and other kinds of tool steel and special alloy steel. Among its specialties, besides billets and bars for the market, will be heat-treated piston rods, die blocks and rings, gun forgings, gun mount forgings, spindles, gear rings, blanks and shafts.

The officers of the company are: President, James H. Foster, president and general manager of the Hydraulic Pressed Steel Co.; vice-president and general manager, D. W. Wells, formerly general manager of the Crucible Steel & Forge Co.; secretary, C. R. Cross, president of the Colonial Savings & Loan Co.; treasurer, A. B. Smythe, president the A. B. Smythe Co. The board of directors is composed of the officers and the following: C. R. Hamilton, director Cleveland Brass & Copper Mills, Inc.; Harnes Herron, consulting metallurgist the Cleveland Engineer Society; J. A. House; W. D. Sayle, president the Cleveland Punch & Shear Works Co.; W. H. Staring, vice-president and general manager the Peerless Motor Car Co.

**Wisconsin Schedules Tractor "Rally"**

MILWAUKEE, Sept. 9—The Wisconsin Power Farming Association, organized recently at Milwaukee by manufacturers and distributors of farm tractors and power farm machinery, will hold a "tractor rally" at the Republican House, Milwaukee, on Friday evening, Sept. 13, to acquaint dealers and owners of such equipment with its plans to guarantee every owner proper service after he has been sold. The meeting is held at this time to take advantage of the presence of many dealers and owners attending the Wisconsin State Fair, which closes on Saturday. During the fair the association is making an energetic campaign for new members among the thirty-six tractor manufacturers represented on the grounds.

**Northern Foundry to Double Plant**

MARINETTE, WIS., Sept. 8—The Northern Foundry Co., organized early this year by Marinette, Milwaukee and Racine capital to engage in the manufacture of automotive and agricultural castings, has concluded arrangements to double the size of its plant by taking over adjoining buildings. The present

**Current News of  
Factories***Notes of New Plants—Old  
Ones Enlarged*

force of 60 will be increased to 125 or more by the end of September. Much of the output is being taken under contract by the J. I. Case T. M. Co., Racine, Wis., maker of passenger cars, tractors and other power farm machinery. J. M. Fitzpatrick is manager of the Marinette foundry.

**Puritan Gets Alco**

DETROIT, Sept. 6—The Puritan Machine Co. has completed arrangements with the American Locomotive Co. covering the purchase of the entire service repair parts business, including the existing stock of spare parts, tools, jigs, dies, blueprints, etc., covering the Alco passenger cars and trucks formerly manufactured in Providence, R. I. The service business will be continued from the Providence plant for the present.

**New Plant for Wells Mfg. Co.**

FOND DU LAC, WIS., Sept. 9—The Wells Mfg. Co., Fond du Lac, Wis., manufacturing electric lighting units and other accessories for motor vehicles and similar purposes, has moved its plant into new quarters, consisting of a two-story fireproof building, 50 x 120 ft. in size, which makes available considerably more floorspace than in its former works. The company is extensively engaged in Government contracts, the nature of which is not disclosed.

**More Room for Highway Trailer**

EDGERTON, WIS., Sept. 9—The Highway Trailer Co., Edgerton, Wis., has started work on a large factory addition, 40 x 200, one and two stories high, to provide the additional facilities required to adequately handle large Government orders for trailers for hauling ordnance, munitions, aircraft, etc. About \$30,000 will be invested in the improvement. James W. Menhall is general manager.

**Buick Starts on Two New Units**

FLINT, Sept. 3—The Buick Motor Co. will erect two new factory buildings to aid in Liberty engine production. One is a two-story structure, 80 by 240, to cost \$77,760, to take care of the overflow production of the eight-cylinder Liberty engine from Plant No. 11. The contract calls for completion by Nov. 1. The other is a two-story aluminum foundry, 120 by 300, in which will be the melting room, molding floor and core room, and a front building, 90 by 240 ft., in which the cleaning and sand-mixing rooms are to be located. The estimated cost of the latter is \$163,500.

**Wisconsin Duplex Becomes Oshkosh**

OSHKOSH, Sept. 9—The Wisconsin Duplex Automobile Co., Oshkosh, Wis., which recently completed development work and is now engaged in a regular production of commercial chassis, has changed its corporate style to the Oshkosh Motor Truck Mfg. Co. and adopted the trade-mark of "Oshkosh" for its product. The principal object of the change is to give due recognition to the city where the truck is being made, and also to avoid confusion with existing concerns which include the word "duplex" in their corporate names. It is planned to manufacture from sixty to seventy-five trucks for delivery by Jan. 1. The first five cars of the initial commercial output will be ready during the coming week, and most of them will go to purchasers in and around Oshkosh. A sales organization is now being perfected and the company plans to undertake an extensive advertising campaign.

**New Method of Obtaining Brinell  
Hardness***(Continued from page 457)*

As in the case of the standard Brinell machine, there are certain limitations to all ball hardness testers. In those cases in which the metal is extremely hard a permanent deformation of the ball results. Where the test specimen is soft, the ball penetrates so closely to the supporting surface or anvil that the hardness of the latter affects the results. Small narrow specimens of hard steel crack under test, and soft narrow ones permit of an easy lateral flow which affects the accuracy of the test. Fortunately, with the exception of thin pieces such as sheets, none of the above cases are so extremely common as to materially curtail the use of the Brinell machine. In the case of thin soft sheets, by reducing the load to 1000 kg. or by reducing the size of the ball consistent results can be obtained; with the device described it is necessary to use a smaller ball and less impact.

**Two Varying Factors**

In the standard Brinell machine there are only two factors which can be varied, namely, the load and the size of ball. In the device described the weight, the height and the diameter of the ball may be varied. Just what values will eventually be assigned to these factors has not as yet been determined.

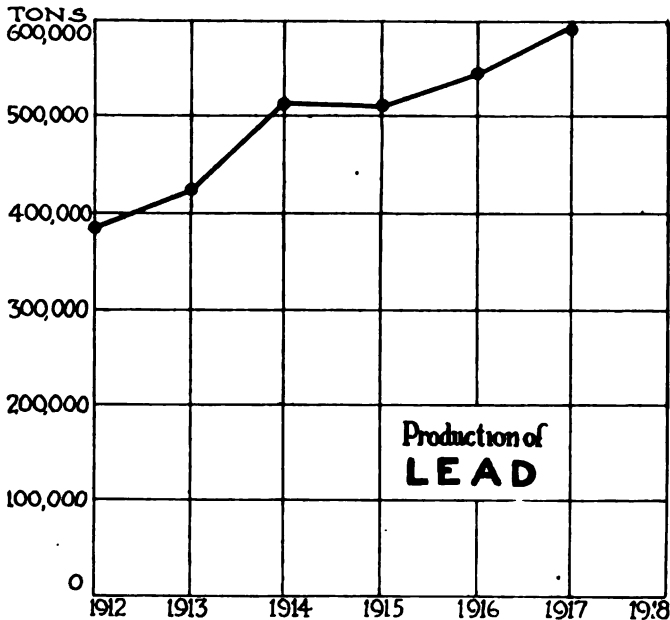
In designing a machine upon the principle described, it is possible to have it either hand or power operated. The weight can be raised and tripped at as rapid a rate as the samples can be supplied and removed, so that it will work if required with the regularity of a shear or punch press. The cost of manufacture will be less than that of the standard Brinell machine, since there are fewer accurately machined parts required, and this, together with the rapidity with which tests can be made, should, in the writer's opinion, create a useful field for a device of this nature.



## AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>		<b>Burlap:</b>	
Muriatic, lb. ....	.02-.03	8 oz., yd. ....	.17½
Phosphoric, ct. ....	.35-.39	10 oz., yd. ....	.23
Sulphuric (60), lb. ....	.009		
<b>Aluminum:</b>		<b>Copper:</b>	
Ingots, lb. ....	.33	Elec., lb. ....	.26
Sheets (18 gage or more), lb. ....	.40	Lake, lb. ....	.26
<b>Antimony, lb. ....</b>	<b>.13½-.14½</b>	<b>Fabric, Tire (17½ oz.):</b>	
		Sea Is., combed, lb. ....	1.65-1.70
		Egypt, combed, lb. ....	1.25-1.35



Although showing a slight decrease during the first year of the war, the annual production has advanced steadily since

Egypt, carded, lb. ....	1.20-1.30	<b>Rubber:</b>	
Peelers, combed, lb. ....	1.05-1.20	Ceylon:	
Peelers, carded, lb. ....	.95-1.05	First latex pale	
Fibre (½ in. sheet base), lb. ....	.50	crepe, lb. ....	.63
<b>Graphite:</b>		Brown, crepe, thin, clear, lb. ....	.60
Ceylon, lb. ....	.07½-.25	Smoked, ribbed sheets, lb. ....	.61½
Madagascar, lb. ....	.10-.15	<b>Para:</b>	
Mexican, lb. ....	.03½	Up River, fine, lb. ....	.68
Lead, lb. ....	.08-.09	Up River, coarse, lb. ....	.40
<b>Leather:</b>		Island, fine, lb. ....	.59
Hides, lb. ....	.18-.35½	Island, coarse, lb. ....	.27
Nickel, lb. ....	.40-.48	<b>Shellac (orange), gal. ....</b>	<b>.70-.76</b>
<b>Oil:</b>		<b>Spelter, ....</b>	<b>.09½-.09%</b>
Gasoline:		<b>Steel:</b>	
Auto., gal. ....	.24½	Angle beams and channels, lb. ....	.03
68 to 70 gal. ....	.30½	Automobile sheet (see sp. table).	
<b>Lard:</b>		Cold rolled, lb. ....	.06½
Prime City, gal. ....	2.30	Hot rolled, lb. ....	.03½
Ex. No. 1, gal. ....	1.60	Tin ..... .80	
Linseed, gal. ....	1.90	Tungsten, lb. ....	2.45
Menhaden (Brown) gal. ....	1.30-1.31	Waste (cotton), lb. ....	.12½-.17
Petroleum (crude), Kansas, bbl. ....	2.25		
Pennsylvania, bbl. ....	4.00		

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping.....	6.20	6.10
Automobile body stock, extra deep stamping.....	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
Black Sheet Extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Ch'ge Net
Ajax Rubber Co. ....	60½	62½	-1½
J. I. Case T. M. Co., pfd. ....	78	83½	..
Chalmers Motor Co., com. ....	4	6	-½
Chalmers Motor Co., pfd. ....	20	30	..
Chandler Motor Car Co. ....	87½	88½	+1¼
Chevrolet Motor Co. ....	129	131	+2
Fisher Body Corp., com. ....	36	37	+1
Fisher Body Corp., pfd. ....	84	87½	-1
Fisk Rubber Co., com. ....	60	62	..
Fisk Rubber Co., 1st pfd. ....	97	103	-1
Fisk Rubber Co., 2nd pfd. ....	79	83	+1
Firestone Tire & Rubber Co., com. ....	105	107	..
Firestone Tire & Rubber Co., pfd. ....	94	96	..
General Motors Co., com. ....	125	128½	-7
General Motors Co., pfd. ....	78½	78½	+½
B. F. Goodrich Co., com. ....	46	46½	+1¼
B. F. Goodrich Co., pfd. ....	99½	101	+½
Goodyear Tire & Rubber Co., com. ....	152	155	+2
Goodyear Tire & Rubber Co., pfd. ....	98½	99½	+¾
Grant Motor Car Corp. ....	2¼	3	..
Hupp Motor Car Corp., com. ....	3	3½	+1½
Hupp Motor Car Corp., pfd. ....	78	82	..
International Motor Co., com. ....	31	36	+3
International Motor Co., 1st pfd. ....	62	68	..
International Motor Co., 2nd pfd. ....	36	41	+1
Kelly-Springfield Tire Co., com. ....	47	47½	-½
Kelly-Springfield Tire Co., 1st pfd. ....	81½	87	+½
Lee Rubber & Tire Corp. ....	19½	20½	-¼
Maxwell Motor Co., Inc., com. ....	26½	27	-¾
Maxwell Motor Co., Inc., 1st pfd. ....	58	59	+1¼
Maxwell Motor Co., Inc., 2nd pfd. ....	20½	21½	+½
Miller Rubber Co., com. ....	106	108	..
Miller Rubber Co., pfd. ....	95	96	..
Packard Motor Car Co., com. ....	118	125	..
Packard Motor Car Co., pfd. ....	91	95	-3
Paige-Detroit Motor Car Co. ....	16	17	-1
Peerless Truck & Motor Corp. ....	15	16	..
Portage Rubber Co. ....	105	109	..
Reo Motor Car Co. ....	14½	15½	..

	Bid	Asked	Ch'ge Net
*Saxon Motor Car Corp. ....	5½	5½	-¾
Standard Motor Construction Co. ....	12½	13½	+¾
Standard Parts, com. ....	60	65	+1
*Stewart-Warner Speed. Corp. ....	57	58	+1
*Studebaker Corp., com. ....	46½	46½	+3½
*Studebaker Corp., pfd. ....	80	90	-4
Swinehart Tire & Rubber Co. ....	50	60	..
United Motors Corp. ....	31½	31½	-1¼
*U. S. Rubber Co., com. ....	62	63	-½
*U. S. Rubber Co., pfd. ....	103	104½	-½
*White Motor Co. ....	46	46½	+¾
*Willys-Overland Co., com. ....	20	20½	+¾
*Willys-Overland Co., pfd. ....	82	83	..

\*At close of business, Sept. 7 Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE  
ACTIVE STOCKS

	Bid	Asked	Ch'ge Net
Auto Body Co. ....	..	7½	..
Bower Roller Bearing Co. ....	16½	18½	..
Chevrolet Motor Co. ....	125	130	-10
Continental Motor Co., com. ....	5½	5½	..
Continental Motor Co., pfd. ....	..	17	..
Edmund & Jones, com. ....	..	90	..
Edmund & Jones, pfd. ....	..	151	+2
Ford Motor Co. of Canada. ....	151	155	..
Hall Lamp Co. ....	..	14½	..
Michigan Stamping Co. ....	..	126½	..
Packard Motor Car Co., com. ....	124	126½	..
Packard Motor Car Co., pfd. ....	91	94	..
Paige-Detroit Motor Car Co. ....	..	17½	..
Prudden Wheel Co. ....	9½	..	..
Reo Motor Car Co. ....	15½	15½	-¾

## INACTIVE STOCKS

Atlas Drop Forge Co. ....	25	25	..
Kelsey Wheel Co. ....	..	..	..

## Process Refining System Would Increase Gasoline Production

(Continued from page 447)

taken up process systems as they should. It is estimated that of the 75,000,000 barrels of crude oil which go to the refineries each year for gasoline manufacture, not over 15,000,000 barrels are distilled by process systems.

Some experts familiar with the oil refinery field declare that many of the oil refiners are narrow-minded on this process system of production and do not seem willing to take up process systems in use by other companies, which can be done on a royalty basis. Recently the Standard Oil Co. offered the Burton process free to other refineries for the period of the war but this was not attractive because it called for large installation by these refineries, which installation would be useless after the war unless under a royalty basis with the Standard Oil Co. There are, however, other processes not taken up by the large companies which have demonstrated that they are practically as efficient as those processes now in extensive use.

The Fuel Administration should give some attention to more rapid introduction of the process systems rather than focusing its attention too much on the curtailment method, which seems the only one up for consideration at present.

The necessary expenditure for installing a process system is not prohibitive; estimates made by men who have spent a lifetime in the refining field declare that it is possible to pay off the cost of the installation of a process system in 3 months. The figures they give are as follows:

It will cost from \$80,000 to \$120,000 to construct a process plant that will refine 1000 bbl. per day.

The profits that will come from this process plant as compared with the skimming plant are estimated as follows by these experts:

By the skimming method the refinery earns on an average of 60 cents per bbl. Sometimes the profit is as low as 35 cents and at other times it rises to 75 cents.

By installing a process system these profits are increased from 60 cents to \$1.75 per bbl., or a profit of approximately \$1.15 per bbl. additional by the process system.

Estimating roughly on an added profit of \$1 per barrel, the process system installation which will handle 1000 bbl. per day would give an added profit of \$1,000 per day, and in 80 days would show a profit equal to the cost of installing the best systems.

Under the skimming system of gasoline refining a barrel of crude oil which reaches the refinery is broken up approximately as follows:

Gasoline .....	25 per cent
Light oil .....	8 per cent
Fuel oil .....	67 per cent

Under the process system the refining of this same gallon of crude will yield as follows:

Gasoline .....	50 per cent
Fuel oil .....	47 per cent
Losses .....	3 per cent

In view of these figures it would seem of importance that steps be taken to conserve our supply of crude oil and incidentally our supply of gasoline by insisting upon process installation. In the present war this seems just as important as conserving our food supply by calling for various mixtures of grains as suggested by the Food Administrator. The advice of the Food Administrator has not been to curtail except beneficial to the human being but rather eat according to the suggested combinations of food.

## Preference List of 74 Industries

(Continued from page 471)

principally in rolling and drawing copper, brass and other copper alloys in sheets, rods, wires and tubes)..... II

Chain (plants making principally iron and steel chains)..... III

Chemicals (plants making same for aircraft and war needs)..... I

Chemicals (other chemical plants)..... IV

Coke (plants engaged in producing metallurgical coke and by-products, including toluol)..... I

Electrical equipment (plants engaged principally in manufacturing same)..... III

Farm implements (plants engaged principally in manufacturing farm operating equipment and agricultural implements)..... IV

Ferro-alloys (plants engaged principally in producing ferro-chrome, ferro-manganese, ferro-molybdenum, ferro-silicon, ferro-tungsten, ferro-uranium, ferro-vanadium and ferro-zirconium)..... II

Machine tools (plants principally making same)..... II

Mines (coal)..... I

Mines (producing metals and ferro-alloy minerals)..... II

Mines (plants making principally mine tools and equipment)..... III

Oil and gas (plants engaged principally in producing oil and natural gas for fuel or for mechanical purposes, including refining or manufacturing oil for fuel or mechanical purposes)..... I

Oil and gas (pipe lines and pumping stations engaged in transporting oil and natural gas)..... I

Oil and gas (plants engaged principally

in manufacturing equipment or supplies for producing or transporting oil or natural gas or for refining and manufacturing oil for fuel or mechanical purposes)..... III

Steel making furnaces (plants engaged solely in manufacturing ingots and steel castings by the open hearth, Bessemer, crucible or electric furnace processes, including blooming mills, billet mills and slabbing mills for same)..... I

Steel (plate mills)..... I

Steel (all plants operating steel rolling and drawing mills exclusive of those taking higher classification)..... III

Tanners and tanning (all plants engaged principally in tanning leather or in manufacturing tanning extracts)..... IV

Textiles (plants engaged principally in making textile machinery, cotton or woolen textiles, or cotton or woolen knit goods)..... IV

Tools (plants engaged principally in making small or hand tools for working wood or metal)..... III

Tin plates (plants engaged principally in manufacturing same)..... III

The term "principally engaged in" means 75 per cent of the product mentioned. In other words a concern must devote at least 75 per cent of its resources to the manufacture of the product specified to secure preference.

This list, compiled by the Priorities Division of the War Industries Board, in co-operation with the Railroad Adminis-

tration, U. S. Shipping Board, War Trade Board, Food Administration, Fuel Administration, War Department, Navy Department, Allied Purchasing Commission and War Labor Policies Board, supersedes all previous lists. It was created by weighing the:

- (a) Intrinsic importance of the product during the war.
- (b) The need for maintaining or stimulating the production.
- (c) The proportion of the industry or plant devoted to war work.

Requirements of the industries named will have precedence over those industries not included in the list. There will be no complete or absolute preference between the four classes, the division being chiefly for the purpose of presenting a composite picture of the relative importance of each industry or plant embraced in each group. It is not intended that the requirements for example of class II will be fully satisfied before the needs of class III or class IV are met.

After the list of individual plants is made public each plant will be expected to file a report not later than the 15th of each month with the secretary of the Priorities Division, covering its activities during the preceding month. Failure to submit this report will cause such plant to be dropped from the preference list.

**War Contracts Delayed by Lack of Facts**

DETROIT, Sept. 10—The awarding of government contracts to concerns in this city and Michigan are being withheld because of negligence of some factory heads in returning the information requested in the questionnaire issued by the state division of the Resources and Conversion section of the War Industries Board.

At the present time the government is attempting to place contracts for large stamping operations and wood-working, but the Board of Commerce headquarters of the national board has not available sufficient details on the only plants which are in position to handle the contracts, and until such additional information is furnished no recommendations will be made to the government.

The great bulk of manufacturers have already filed the information desired, but a few large concerns and numerous smaller ones have not complied in filling out the questionnaires. Further steps in organizing the separate industries to facilitate plant surveys will be taken within a short time. Already the machineshop, stamping, forging and casting industries are organized.

**Ohio State Highways Transport Body**

COLUMBUS, Sept. 10—Organization of the highways transportation situation in Ohio is to be put on a solid basis under the direction of the National Council of Defense. A complete state-wide organization is to be effected for carrying out the work which is being undertaken by the highways transportation committee of the Council of National Defense. The personnel of the new organization in Ohio has not yet been determined upon. There is to be a state highway transport committee of five members. There will also be a state chairman appointed with the approval of the Governor. The state will be divided into five districts, each of which will be under the jurisdiction of one of the five committeemen. These central committeemen will have under them local organizations to be known as district highway transport committees, with a chairman for each county. Headquarters will be at Columbus, and the committee in gen-

eral will work under instructions from Washington. In each large center of the state it is intended to establish return load bureaus.

**Road Builders to Convene in Alpena**

ALPENA, MICH., Sept. 9—Arrangements are being completed by the Michigan State Highway Department and its representatives for the holding of the State Highway Department and Commissioners Road Convention in this city on Sept. 16 and 17. It is expected that the members of the county commissioners and most of the highway commissioners of the townships of thirteen counties will be in attendance.

**Women Workers in Demand**

WASHINGTON, Sept. 7—Increasing demands for women workers is reported from every section of the country. It is stated in one report that it is almost impossible to find women for non-war industries which pay wages lower than those offered by the war industries. The rubber factories in Akron and throughout Ohio are calling for and using considerable numbers of women, creating a shortage in other local industries in that state, according to a report. Growing demands for women for machine shops, munitions and light foundry work are reported. In the South there is a pronounced increased use of women for automobile tire repairing, elevator operating, etc.

**Government to Buy Platinum**

WASHINGTON, Sept. 9—In order to secure sufficient platinum to meet the war needs, the Government has decided to go into the market and purchase jewelry or scraps of the precious metal at the rate of \$105 per ounce. Citizens are asked to send their platinum to Raymond T. Baker, director of the mint. Platinum is used in great quantities for munitions manufacture, and the Government will regard the sale of private jewelry by individuals as a highly patriotic act.

**A Government Employment Service Bureau for Women**

DETROIT, Sept. 10—Four separate employment agencies for female labor have been amalgamated by the formation of the United States Government Employment Service for Women in this city, which has taken control of these bureaus. They are the Collegiate Bureau of Occupations, the Y. W. C. A. Employment Bureau, the Women's Division of the Employers' Association and the National League for Woman's Service. This bureau, which is under the direction of Miss Theresa Haley, aims to unite, coordinate and equalize women labor, and is conducted under the management of the Woman's Division of the Labor Bureau of the United States Government. There are bureaus in all the large cities of the country, with branches in the smaller surrounding towns and cities. It is the aim of these branches to adjust the supply of labor to the demand for it by directing women in localities where labor is plentiful to localities where there is a scarcity.

The bureau is divided into five branches—The Domestic Service Section, the Business Section, the Day Workers' Section, the Especially Trained Workers' Section, and the Factory Labor Section. The Detroit Branch already has branches in Saginaw, Traverse City, Grand Rapids, and Port Huron.

The bureau makes it a point to keep in touch with the civil service needs of the government. Every time an examination is announced civil service notices are also sent to the bureau, which not only inform applicants about these examinations but it advises and suggests as to which examinations are most suitable for the applicant, considering her education and training.

The Women's Division will not be confined to the war industries alone, however, as there is a big demand for woman labor in weaving, clothing and other trades.

ROCKFORD, ILL., Sept. 6—The Bergie National Spark Plug Co. has opened a Pacific Coast branch office in the Monadnock Building, San Francisco. H. G. Smith has been appointed manager.

# Calendar

**ENGINEERING**

Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

**ASSOCIATIONS**

Sept. 19-21—Syracuse, N. Y. Semi-annual meeting of the American Gear Manufacturers' Association.  
Oct. 7-12—Milwaukee. American Foundrymen's Assn. and 5 allied organizations. Milwaukee Auditorium.

**SHOWS**

Sept. 8-20—Greely, Weld Co., Colo. Tractor Show, Central Community Fair.

Sept. 9-14—Milwaukee. Milwaukee Automobile Dealers, Inc. Fourth Annual Wisconsin State Fair. Hart J. Ruddle, Mgr.

Sept. 9-14—Syracuse, N. Y. Tractor demonstration (State Fair). J. Dan Ackerman, Secy.

Sept. 9-15—Madison, Wis. Tractor demonstration (State Fair). O. E. Remy, State Fair Secretary.

Sept. 12-13—Marion, O. Tractor demonstrations, Farm Bureau Associations. M. C. Thomas, County Agricultural Agent.

Sept. 14-21—Chicago. Automotive and Accessories War Exposition. Municipal Pier.

Sept. 19-21—Harrisburg, Pa. Tractor demonstrations, State Fair.

Oct. 1-5—Washington, Ga. (Wilkes Co.) Tractor demonstrations, State Fair.

Oct. 12-19—Atlanta. Tractor demonstrations Eastern State Fair and Automotive Exhibition.

Oct. 14-27—Dallas, Tex., Seventh Annual Texas Automobile Show. Texas State Fair.

Sept. 17-20—Riverhead, L. I. Tractor demonstration (County Fair). Harry Lee, Secy.

Sept. 30-Oct. 4—Trenton, N. J. Tractor demonstration (Trenton Fair). Harry B. Salter, Supt.

Oct. 16-18—Ottawa, Ont., International Plowing Match, Tractor and Farm Machinery Demonstration. Experimental Farm.

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration. State Fair.

Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.

**RACING**

Sept. 21—Sheepshead Bay.  
Oct. 5—Cincinnati. Cincinnati Speedway.



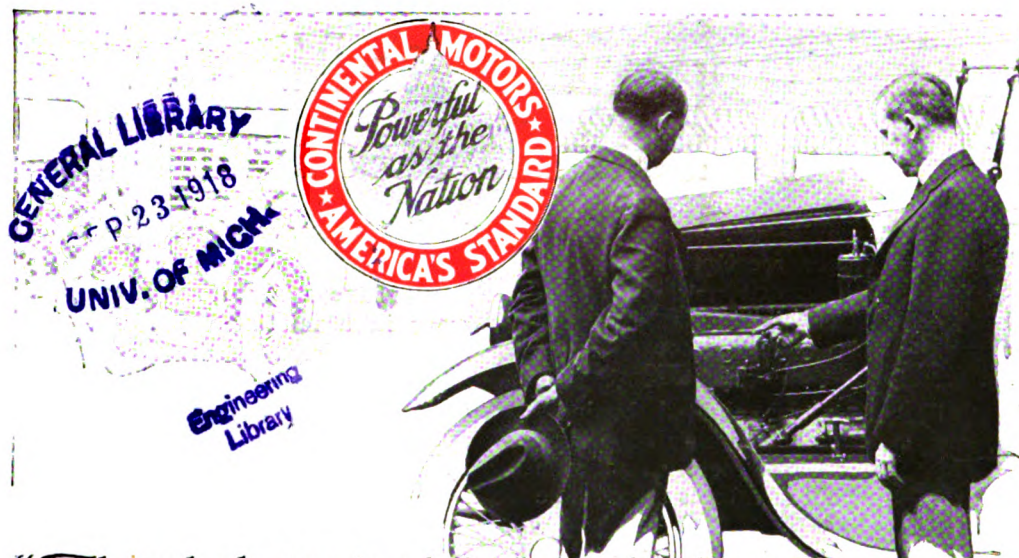
# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

Vol. XXXIX  
No. 12

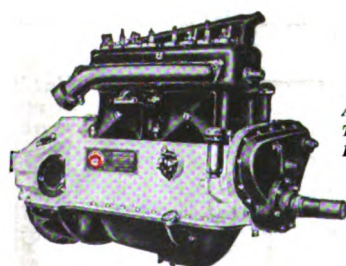
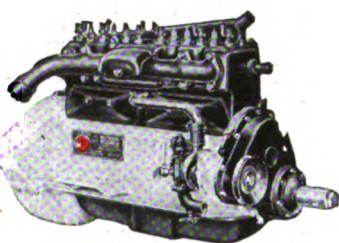
PUBLISHED WEEKLY AT 239 WEST 39th STREET  
NEW YORK, SEPTEMBER 19, 1918

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# MASTER TRUCKS

*Until the War is won, Master Trucks will be sold for service only in essential industries as defined by the War Industries Board*

**Master of the Load on ANY Road**





# AUTOMOTIVE INDUSTRIES

## AUTOMOBILE

VOL. XXXIX

NEW YORK, THURSDAY, SEPTEMBER 19, 1918—CHICAGO

No. 12

## Making War Maps by Camera

### AERIAL PHOTOGRAPHY NOW AN IMPORTANT AID IN SUCCESSFUL MILITARY OPERATIONS

#### British Army Issues Official Instruction Book for the Interpretation of Airplane Photographs

**A**ERIAL photography, a new science, and probably the most important in military operations, is just advancing from infancy. A photograph taken from an airplane is an enigma to those not versed in this science. The British Government, following exhaustive studies and experiments, has issued to its army an official instruction book for the interpretation of airplane photographs. The first instruction book, now available for publication because the photographs are no longer true, is presented here almost in its entirety. It shows that so simple a detail as holding the photograph in the wrong position will completely confuse the observer. For example, a sunken road, with the photograph reversed, becomes an embankment because of the direction of the shadows, which are reversed with the photograph.

More intricate details include the understanding of the different shadows, the lighter and darker shades, the detection of camouflage, location of traps, discovery of lines of communication, ammunition dumps, dummy and genuine batteries, movements of troops, etc. The enemy, for example, frequently selects two or

three large shell holes in no man's land and establishes an outpost there, developing the shell holes into substantial fortifications and opening a line of communication by a narrow path between the shell holes and the front line trenches. An Allied airplane detects these shell holes

by a photograph. The infantry commander is notified. At night a detachment goes over the top and surrounds and surprises the enemy shell hole and outpost, usually returning with prisoners.

Photography from airplanes for reconnaissance purposes was first experimented with by the British service in France late in 1914. Before the war such experiments had not been successful, and aerial photography had been confined to the work of balloons and kites.

The airplane photography difficulties were chiefly from engine vibration. Shortly after the war, with the establishment of trench warfare, balloon and kite photography was found impracticable, and new experiments in airplane photography resulted successfully. The next difficulty was interpretation of the photograph. Oat, wheat and corn fields, barracks, solid



*The right and wrong way to examine a photograph. The photo shows an embankment of slag. Reversed, it has the appearance of an excavation. This is caused entirely by the shadows. Shadows falling away from one give the appearance of an excavation, and falling toward one the impression of a raised object*



## A Conventional Signs for Use on Aeroplane Photographs

Meaning.	Sign.	Instructions.
Machine Gun	MG	
Trench Mortar	○	
Dugout	□	
Concrete Structure	C	
Fortified Shell Hole	F.	
Observation Post	OP	
Wire Entanglements	X X	Crosses, widely spaced shown in front of line of wire
Gap or path in wire	—	A thin line drawn parallel to actual track
Dump	△	
Battery	—	Drawn in front of and parallel to position
Battery A A	♂	
Listening Post	LP	
Turned Cable	—	
Overhead Cable	—	Drawn at intervals alongside the line, just clear of it.
Railway or Trench Tramway	—	
Probable Tank Traps	◇	
New Work	NEW	

NOTE.— The sign to be written clear of the object on the photo, with a detached arrow pointing to it (when necessary)

Conventional signs for use on airplane photographs. By the use of simple signs a photograph can be more quickly and easily marked to show the meaning without confusion

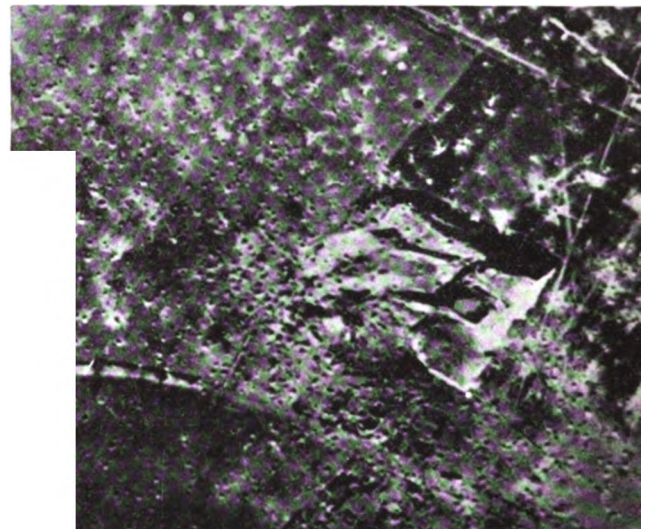
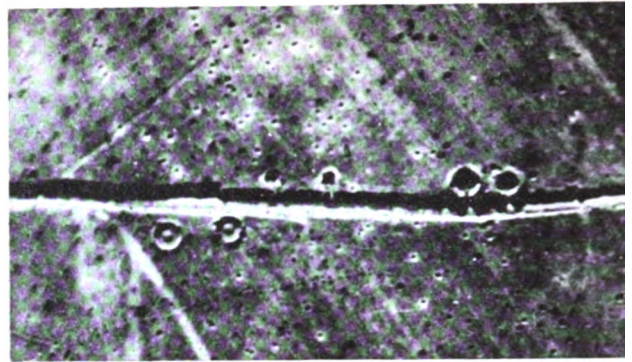
formations of troops, and similar objects, as reflected in airplane photographs, bear no resemblance to their ground appearance, and many experiments were necessary to establish the identity of the different objects reproduced in the photographs.

The accuracy of the photograph is indisputable. One plate can cover a square mile of territory, and the entire maze of detail can be taken in one one-thousandth of a second. It is even possible to take a photograph of a large number of railway trucks on trains at a railway junction from a height of 17,000 feet and secure the exact number of individual trucks from the picture.

Another advantage of the photograph lies in the fact that it reflects the scenes dispassionately, while the impressions of the human observer, who might be excited by working under trying conditions, might be exaggerated. Photographs taken periodically of the sector consist at the same time of a biography and a map. Small changes in the trench construction or in the topographical illustrations which the eye could not detect are immediately apparent.

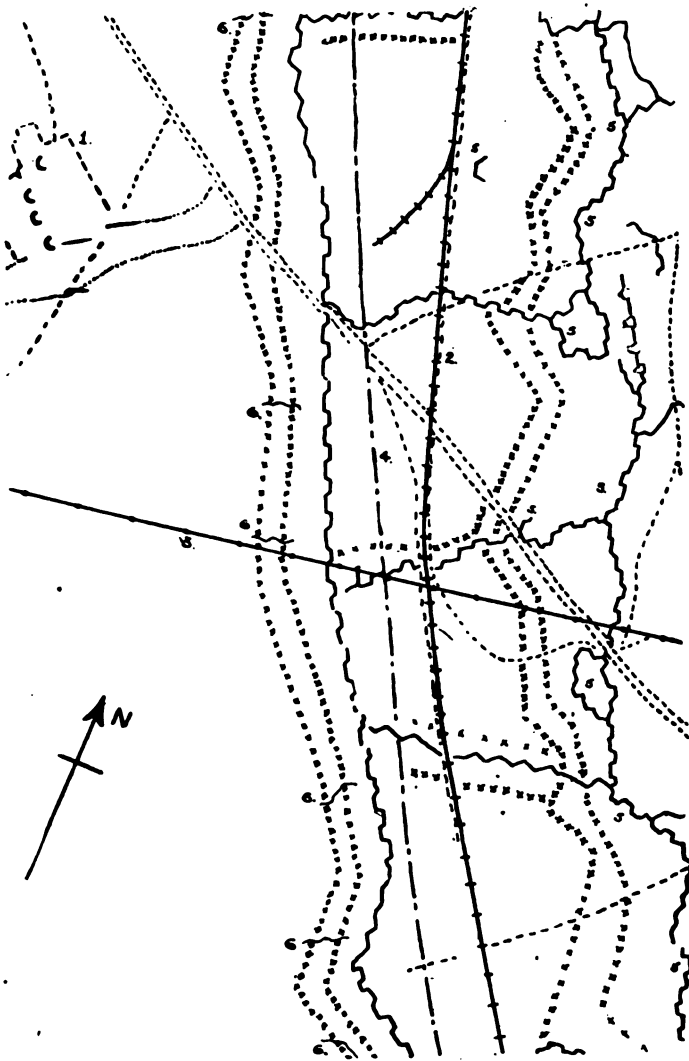
The air photograph is the Sherlock Holmes for camouflage. It often registers the whole history of the construction of an emplacement, showing it prior to, during and following the construction of the camouflage, and marking it as a "tender spot" for artillery fire, following completion.

Two kinds of air photographs are taken, the vertical and the oblique, the former being the most useful for intelligence work and mapping. The oblique photographs are used for the detection of camouflage and to give a correct idea of the land, contours, etc. They are also

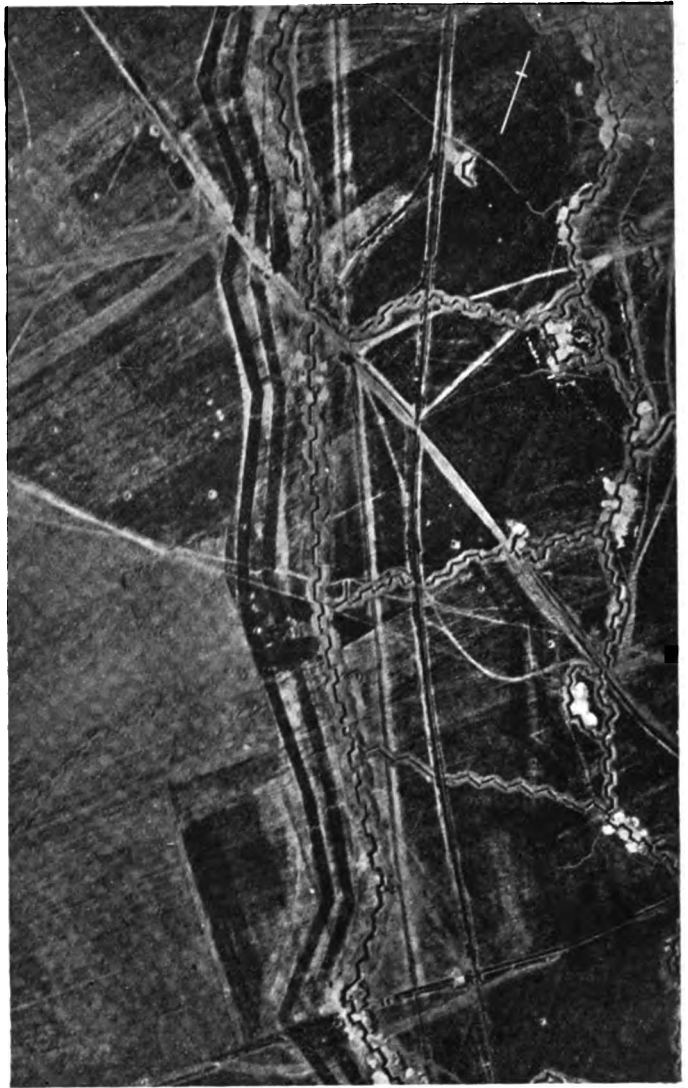


Topographical studies. In all three of these photographs the direction of light is from above. The top picture shows a road banked on one side. A stone quarry shown in the center view. Railway embankments show the existence of railroads, as clearly discernible in the bottom picture

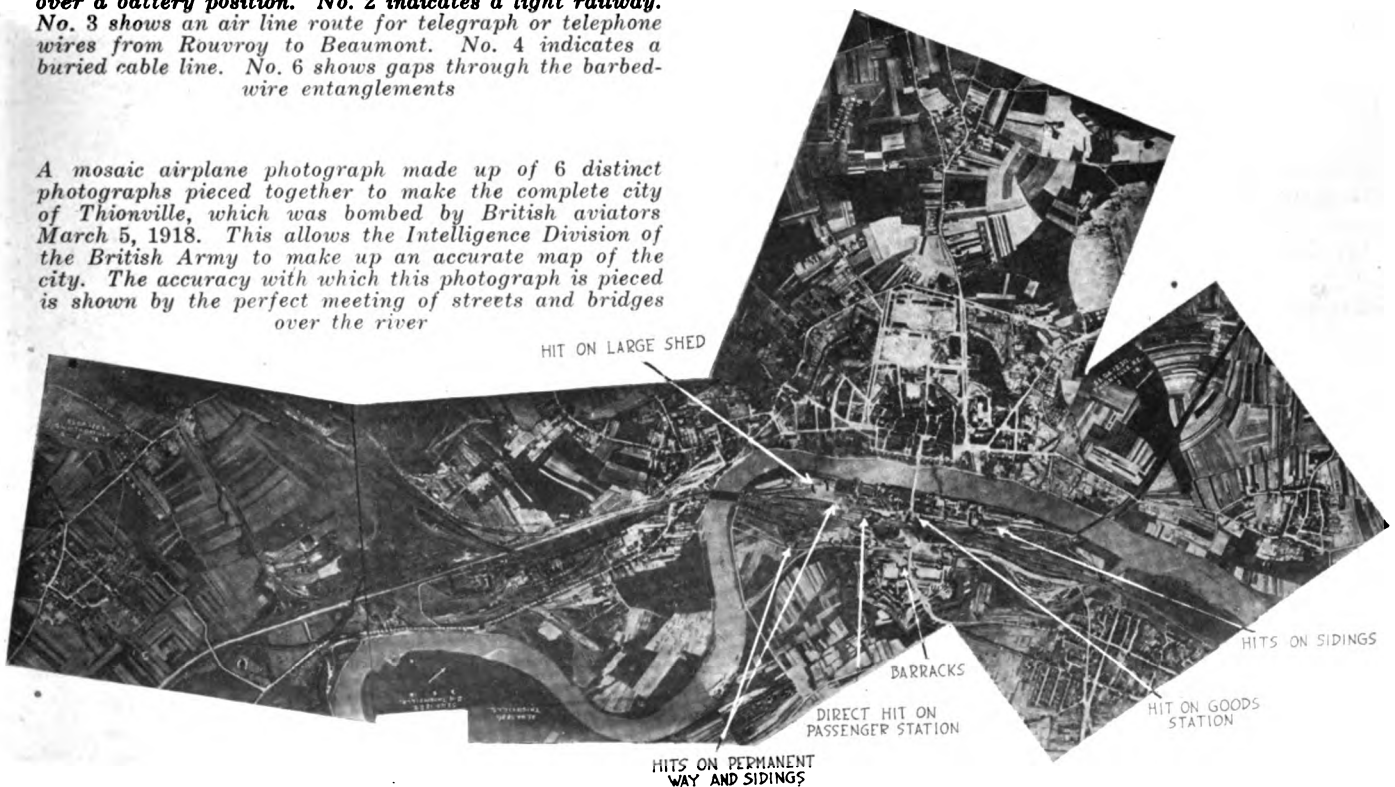
more simple in interpretation, and are used by the experienced infantry and artillery commanders. Mosaic photographs are made by joining a number of vertical photographs at a given locality to make a complete photograph of a city or district. They are usually all taken at the same height and at the same time by a number of planes. In the same way, continuous-line photographs are made by joining strips of overlapped photographs



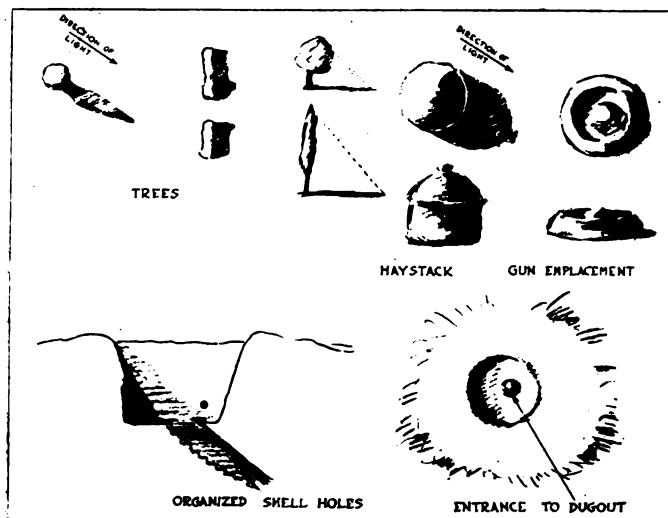
The map and photograph above show trenches under construction on the Droucourt-Queant line occupied by the Germans. Point No. 1 shows possible camouflage netting over a battery position. No. 2 indicates a light railway. No. 3 shows an air line route for telegraph or telephone wires from Rouvroy to Beaumont. No. 4 indicates a buried cable line. No. 6 shows gaps through the barbed-wire entanglements



A mosaic airplane photograph made up of 6 distinct photographs pieced together to make the complete city of Thionville, which was bombed by British aviators March 5, 1918. This allows the Intelligence Division of the British Army to make up an accurate map of the city. The accuracy with which this photograph is pieced is shown by the perfect meeting of streets and bridges over the river



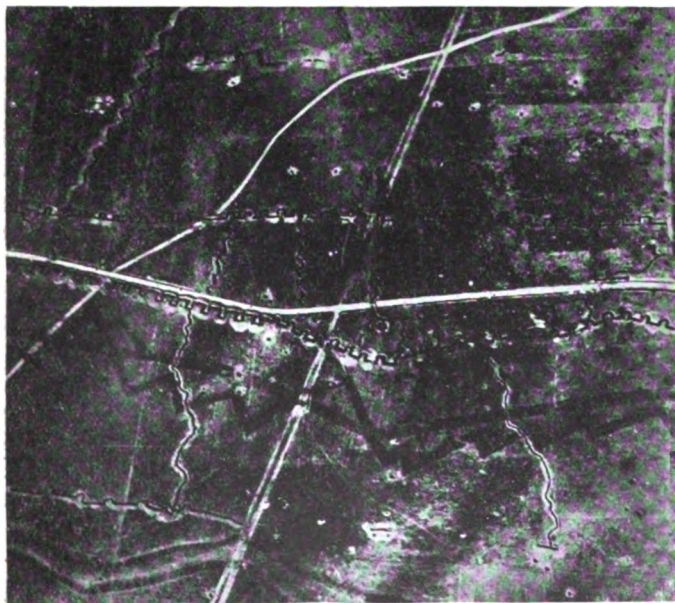




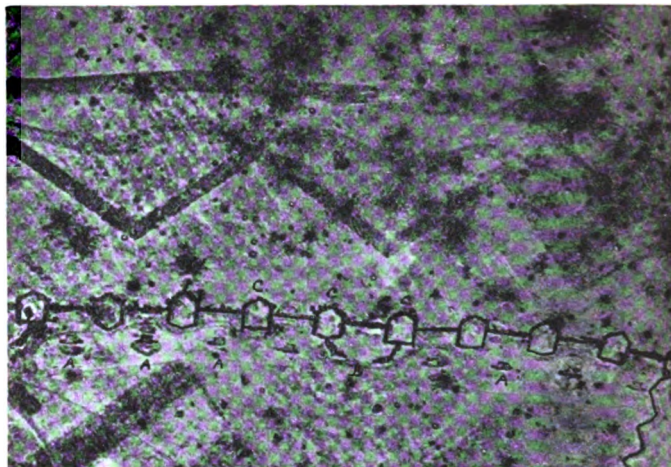
*Shadow diagrams showing the effect of light and shade on trees, haystack, gun emplacement and organized shell hole as viewed from above*

important roads, railways, canals, etc. To secure these, an overlap of about three-sixteenths is worked out in the time intervals between the exposures based on the height and speed of the airplane. Stereograms are much used for detection of camouflage and contours. These are made by taking 2 photographs of the same point at varying intervals, according to the height and speed, and using them in a stereopticon apparatus. For instance, a machine traveling at 60 m.p.h., ground speed, at a height of 1200 ft. would take its second photograph about 2 seconds after the first.

Accurate trench maps are made from the aerial photographs and supplied to the infantry and artillery. In the British Eastern theater of war, where the army was in complete ignorance of the country, maps of the entire district have been made from aerial photographs.

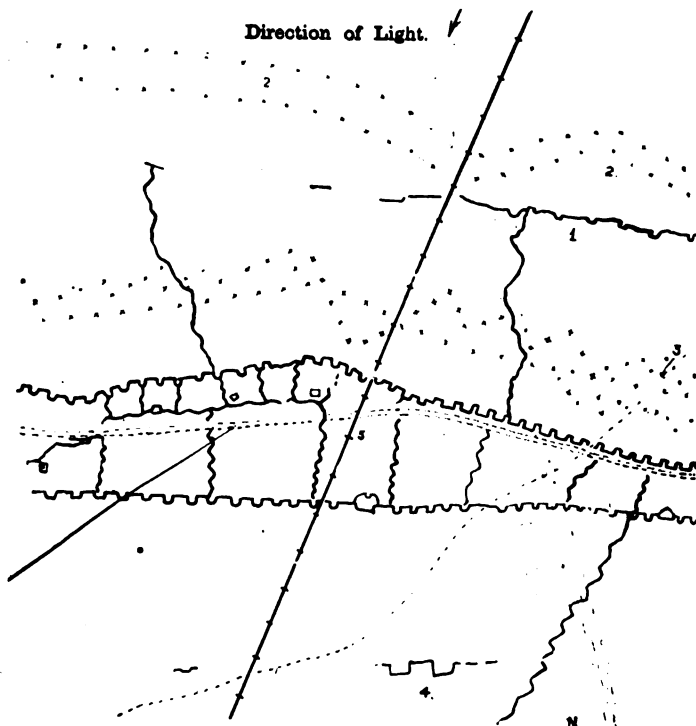


*Trench construction and barbed-wire entanglements. This photograph was taken after the battle of Vimy Ridge, when the enemy was forced to the Oppy-Mericourt line. Barbed-wire entanglements which are shown in the photograph in the first line of trenches are penetrated by saps pushed through the wire for the commencement of the new line, No. 1, where another light protection of wire, No. 2, was erected prior to the digging of the trench. No. 3 shows gaps in the old wire across roads. These gaps have been repaired. No. 4 is another trench commenced in the rear of the position and which when completed will give the enemy four lines of trenches. No. 5 shows a tramway*

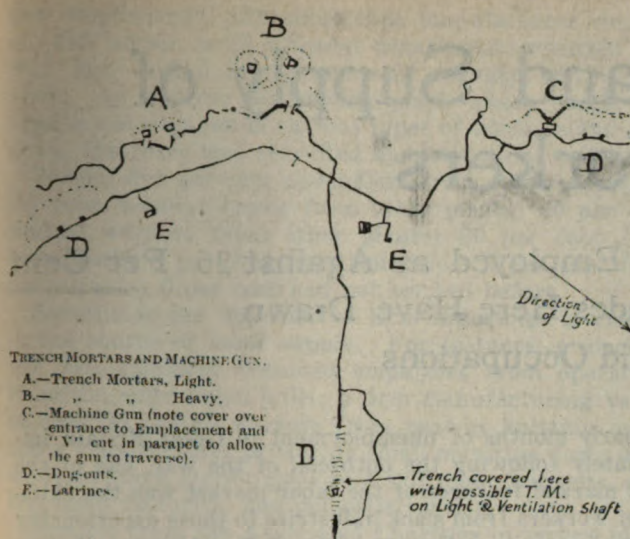


*Machine gun emplacements. This photograph shows a new type of machine gun behind the front trench line on the Oppy-Neuport line. The emplacements A are connected underground to the island traverses C. In the case of B, the machine gun nest communicates with the trench on the other side by an open sap. The machine guns fire from open emplacements over the heads of the infantry in these trenches*

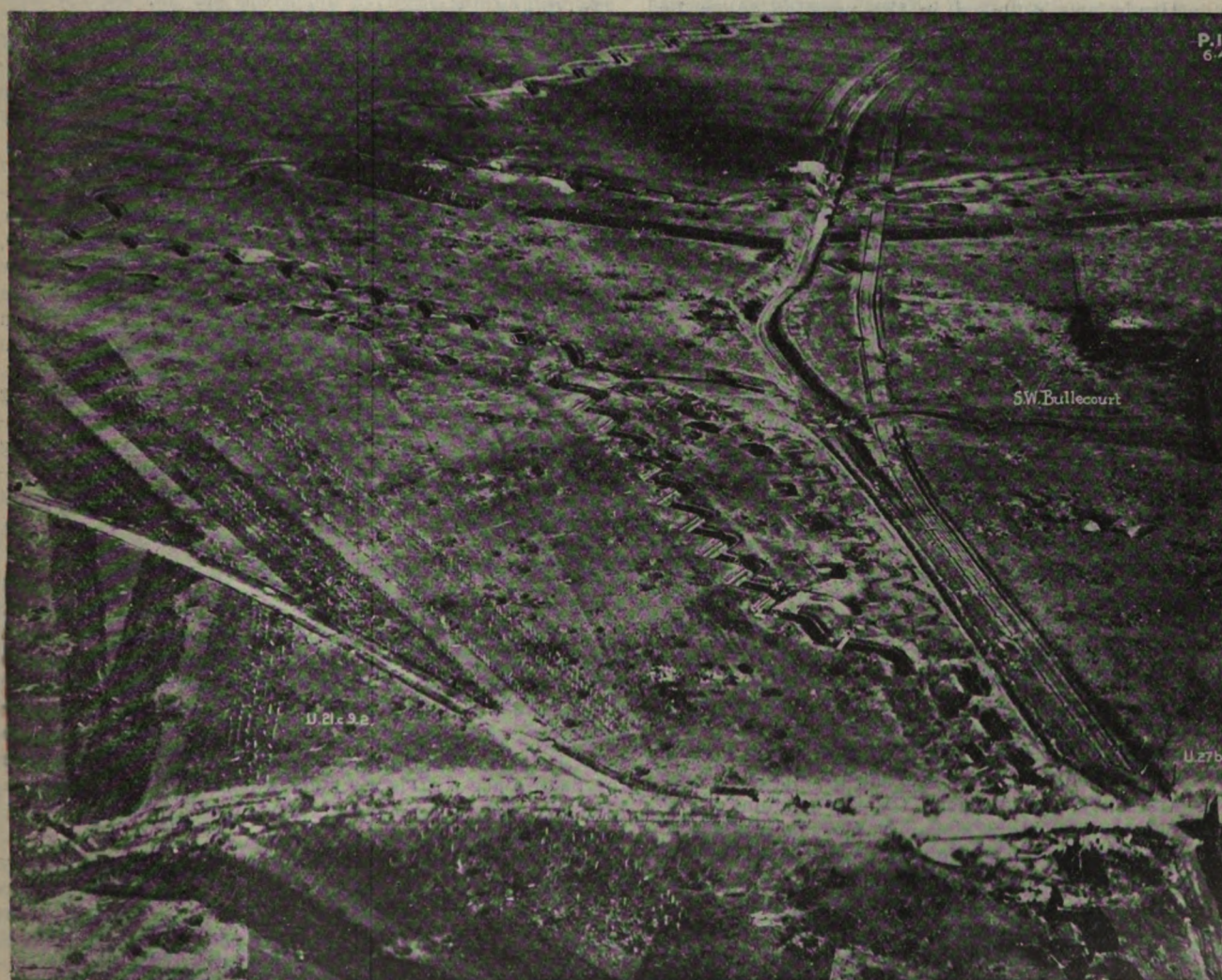
The intelligence department of the army relies importantly on its aerial photographic section for its information. Through these pictures it detects the gaps and passages through barbed-wire nets, the amount of damage done to enemy wire entanglements, machine-gun emplacements and dugouts by artillery fire, and by means of wireless from airplanes directs the artillery fire until it attains perfect marksmanship.







Photograph and outline map drawn from it showing trench mortar and machine gun emplacements



An oblique photograph showing a point at which the Allies are now fighting—the Hindenburg line west of Bullecourt. In front of the front line trenches are barbed-wire entanglements which measure more than one-half mile in width. This particular point is exceptionally well protected, as it is an ammunition station and an important railway center. A sunken road paralleling the railroad is plainly discernible



# The Demand for and Supply of Women Workers\*

Only 8 Per Cent of American Women Now Employed as Against 26 Per Cent in England—So Far Metal Trades Here Have Drawn Chiefly from Poorer Paid Occupations

**D**URING the first year after the United States entered the war the general introduction of women into occupations previously filled by men was discouraged in many quarters. At the beginning of 1918 the United States Secretary of Labor was quoted as expressing the opinion that there was an ample supply of labor both for the army and for industry; that the problem was one of proper adjustment, and that it was the policy of the Labor Administration to prevent the introduction of women into new occupations as long as men were available.

This attitude was reflected in the position taken by many State councils of defense and other official bodies. Private associations interested in safeguarding labor standards were also extremely conservative toward the wider employment of women. At the end of 1917 reports issued by the New York State Industrial Commissioner and by the American Federation of Labor maintained that employment difficulties arose not from a real labor shortage but from defective distribution, due to increased activity in some industries receiving war contracts, and to greatly reduced business in industries not essential for the prosecution of the war. Many manufacturers were of the same opinion.

## Will Require Four Million Workers

To-day, however, the needs of industry are becoming more urgent. The United States Employment Service recently estimated that from 3,000,000 to 4,000,000 workers will be required in essential occupations, including agriculture, during the next twelve months. It is reasonably certain, therefore, that there must be a far-reaching occupational readjustment, which will compel the admission of more and more women workers to industry.

In the United States, the proportion of the female population now employed is approximately 8 per cent, as against 26 per cent in England. To make the number of women employed in the two countries proportionate would mean the addition of 8,152,135 women to the ranks of industry in the United States. While such a radical readjustment as was effected in England may never be necessary, preparations for the gradual introduction of women into industry can be most satisfactorily made now, while the proportion of skilled men is still so high that changes should not seriously interfere with production of materials required for war purposes.

In the discussion of women's employment in occupations new to them it has often been assumed that they came from a class not previously employed. That this would be highly improbable, at least, might be inferred from the experience of other belligerent countries. After

the early months of unemployment in Great Britain immediately following the outbreak of the war, one of the most marked features of the labor market was the shifting of workers from slack industries to those experiencing unusual activity. For example, it is estimated that in Great Britain 400,000 women were drawn from the domestic servant class and from small dressmaking establishments into the war industries, which offered higher wages. Of 1,407 female workers in a French munition factory, in 1915, all but 480 had been previously employed in some wage-earning occupation.

In Canada, where the labor situation is much more comparable to that in the United States, such a shifting from the so-called "women's industries" was also characteristic. The Deputy Minister of Labor for Canada reported that "the movement of woman labor was chiefly from the poorer paid to the better paid industries."

Many employers interrogated in this investigation likewise secured their women workers from other factories, though not necessarily from the same occupations. One manufacturer of elevating and conveying machinery, employing nearly a hundred women, stated that 50 per cent of them were previously doing machine work. An automobile manufacturer who utilizes women chiefly on sewing machines in the trim department, obtained them largely from those doing similar work in other factories. The majority of the winders in a plant manufacturing ignition apparatus had been similarly employed elsewhere. In one establishment, women who are molding and making, carrying and packing cores are largely Belgians who were accustomed to doing heavy manual work in their own country.

## Transferred Between Departments

Some employers did not even go outside their own plants to secure women for new work, but simply transferred them from one department to another. In some establishments, women previously employed as inspectors or assemblers were transferred to machine work. An employer who intends to introduce women on a large scale within a few months reported that he should give the preference to friends and relatives of his employees. This plan has already been successfully tried in several establishments.

In other cases, such transfers were carried out among the male employees so as to avoid introducing women on shop work. For instance, one employer reported it to be his policy to transfer men from clerical to mechanical positions when that could be done, filling the office vacancies thus created with women. He stated that training had developed many inferior clerks into good mechanics.

Frequently, women who have entered the metal trades in the present war-labor emergency came from a great range of occupations not immediately related to their

\*From the Report on Wartime Employment of Women in Metal Trades of the National Industrial Conference.

new employment. An automobile manufacturer employing 423 women in 23 different departments reported that they had seldom been previously engaged on machine work. In another automobile plant where nearly 300 women are engaged in various types of machine and shop work, the force was recruited approximately as follows:

Twenty-five per cent assemblers from other plants; 20 per cent machine hands from other plants; 20 per cent clerical workers from other plants; 20 per cent from housework; 5 per cent from laundries; 5 per cent from restaurants; 5 per cent had not worked before.

Sometimes the influence of local industries is evident in the source of labor supply. For instance, a machine tool establishment obtained employees from operatives in cotton and woolen mills; a firm manufacturing valves secured its female workers from near-by knitting mills; and a manufacturer producing small munition parts drew on department stores, cloak and suit manufacturers, electric lamp factories, and domestic service.

Reports from the Associated Charities in several cities indicate a decided increase in the employment of negro women in many kinds of manufacturing establishments; as yet, this class of female labor has not been extensively utilized in the metal trades and similar industries. In a recently published article the representative of a company manufacturing steamfitters' supplies recommended negro women for the operation of light semi-automatic machines, punch presses and drill presses, at the same time suggesting that least friction will result if they are employed in departments separate from the white workers.

Higher wages were an important factor influencing the shifting of female labor. Thus women formerly in domestic service constitute a considerable proportion of new workers in the metal trades; the shorter hours and other working conditions may have been an added consideration. To some extent this also explains the movement of women from other industries into the metal trades. At the end of 1917 a leading textile journal contained a warning to manufacturers in the cotton and woolen industries that they must improve the surroundings and working conditions in their factories in order to meet the competition of war industries for woman labor, and reduce their turnover.

In 85 establishments reporting for the present investigation, 17.3 per cent of a total of 22,750 women employees were married. Many men who have entered the national service were the only wage earners in their families, and very frequently wives who were employed before their marriage have found themselves obliged to return to work. Employment of an increasing proportion of married women in industry has, however, been one of the striking social changes of the past thirty years.

In England the first instalments of war workers, especially those trained in technical schools, were secured through regular employment channels, through advertising, and through canvassing friends and relatives of those already employed, but the British Government has since drawn on a more educated type. Whether it will be necessary to recruit workers from this source in the United States will obviously depend on the duration and future demands of the war.

# Unmined Petroleum Supply Limited

Seventy Barrels Per Person in United States—Vast Areas of Oil Shales in Reserve  
—Greater Extraction of Values Necessary—Much  
Production Wasted

By Allen Sinsheimer

**W**ASHINGTON, Sept. 17—The unmined supply of petroleum, now available, in the United States is 70 barrels per capita. The presence of extensive deposits of oil shale in this country, however, removes the danger of early physical exhaustion of oil but cannot be considered license for continuation of the present wasteful customs of production and use. There are 7,000,000,000 barrels of petroleum still under ground in the United States, as compared with approximately 3,500,000,000 barrels which have been produced. One-half of the petroleum produced yearly is wrongly used for steam raising. The petroleum consumed in and exported from this country this year exceeds the production in the United States and that imported from Mexico. The cracking process, because of the great demand for gasoline and decreasing supply of petroleum, may be regarded as the hope for the future. Up to this time gasoline has been the main prop to the cost structure of petroleum refining, but the entrance of the United States into the war, with the consequent increased demand for fuel oil, has changed the complexion of the oil situation. And as crude petroleum production has been unable to keep pace with the consumption of fuel oil, serious shortage results even while gasoline is ample for all needs. The automobile

has been the prime factor in developing gasoline production.

These statements, taken from a bulletin issued by the United States National Museum following a comprehensive survey of the petroleum situation by Chester G. Gilbert and Joseph E. Pogue of the Division of Mineral Technology, form the most important details of the report.

The bulletin, which is exceedingly timely, has been prepared to interpret the significant aspects of the petroleum situation, in non-technical language. Following a discussion of the nature, occurrence, origin, distribution, production, transportation and refining, the report takes up the important question of limitation.

## The Extent of the Supply

The proven and prospective oil fields of this country, it says, are broadly known and the petroleum reserves may be estimated within a reasonable margin of error. The accompanying chart, reproduced herewith, shows a production of 350,000,000 barrels in 1917 and a probable production of 575,000,000 barrels in 1930. This chart, it is said, shows that a big fraction of domestic petroleum is gone; whether that fraction is one-third as present knowledge indicates makes no difference in



the consideration demanded by the situation and we face an economic fact that must be reckoned with now.

"It is, of course, very evident," adds the statement, "that the present tendency cannot persist to the point of even approximate exhaustion, because conditions such as price increase, growing imports and others, naturally arising, will serve to relieve the tension and thus spread the remaining supply over a greater number of years. So in spite of its sensational character, the physical exhaustion of the petroleum resource is a theoretical matter of purely academic interest. But of practical importance is the period of economic stress that is ushered in when the resource faces a greater demand than it can fill in the customary manner. That is a period of readjustment to meet the new conditions and arrives far in advance of physical exhaustion."

#### Constant Local Adjustment

Local adjustments are constantly under way even now, says the statement, as petroleum fields reach their production climax and decline, and these fields forecast the history of the resource in its entirety. This can be plainly seen in Fig. 2, shown herewith. Since petroleum resources are not only limited in size but also in ability to sustain the present rate of increase in production, the bulletin continues, and since trucks, tractors, airplanes and passenger cars forecast a still greater demand for gasoline it is probable that this will be one of the important continued products of petroleum and that it must develop intensive production.

The use of fuel oil for steam raising is regarded as a waste, unavoidable at present because of existing facilities necessary and demanding it, but is a practice which must be discontinued in the near future. Over half of the petroleum currently produced is used as fuel for steam raising. Kerosene consumption, although increasing, must be discontinued to meet the lighting demands of rural districts. Lubricating oils can be manufactured from oils distilled from shale and from coal as is now done in those countries lean in petroleum, such as Scotland and Germany. At the present time in this country petroleum is produced and manufactured into products far in advance of lubricating needs, which means that the lubricating portion of the resource is being exhausted at a rate dictated by the demand for oil for power generation. Thus the exhaustion of our principal lubricant resource is being accomplished with much greater dispatch than is justified by true necessity since part of the fuel demand could be filled by means such as coal and hydroelectricity not involving a sacrifice of potential lubricants.

#### Conserving the Supply

The outbreak of the European war in 1914 found the United States petroleum industry suffering from low prices caused by gross overproduction resulting from large yields in Oklahoma. These yields declined in 1915 and this, combined with the general increase in automobile consumption of petroleum products, increased the price. The entrance of the United States into the war with the consequent growing importance of petroleum products as war needs further increased the prices and demand, and the United States is now consuming and exporting more petroleum than she is producing from her own wells and receiving from Mexico. The discrepancy which is growing monthly is covered by a draft upon the petroleum storage in this country, which amounted to 153,000,000 barrels Jan. 1, 1918. This storage cannot be safely reduced below 50,000,000 barrels, which are needed to fill the pipelines and keep the whole industry in operation. Fig.

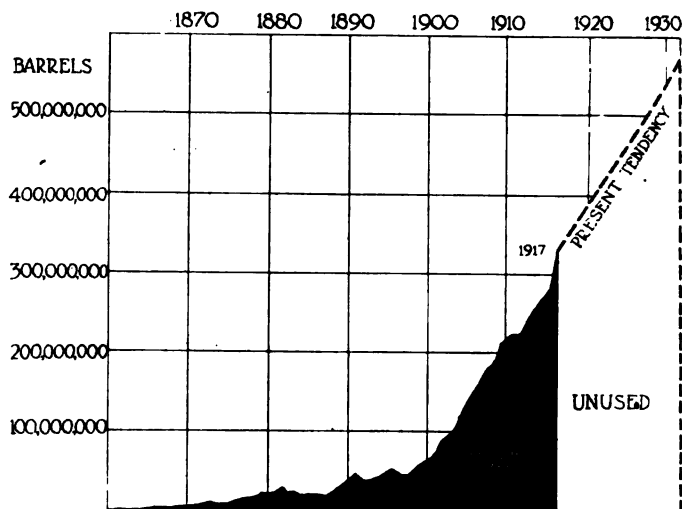


Fig. 1—Chart showing the present tendency of the United States in respect to its unmined reserve of petroleum

3 shows the current petroleum situation. Transportation from Mexico to this country is in such condition that there is scant hope of increasing the supply from that source unless concrete tankers can be quickly constructed.

Discussing the problem itself, the bulletin points out that the enlargement of the resource capacity can be brought about in three ways:

1. By prolonging the life of the unused portion of the domestic resource as it is now known.
2. By developing low grade domestic sources not yet drawn upon.
3. By building up the use of substitutes particularly for gasoline for which there is a heavy growing demand.

#### Production Waste Must Be Eliminated

Prolonging the life of the petroleum reserves can be accomplished by discovery of new oil fields, elimination of wastes in production, greater extraction of values and development of foreign supply sources. There is not much hope for new fields in this country. The petroleum resources are now fairly accurately measured and there is no basis for believing that great areas of oil reserves lie undiscovered. Much can be accomplished by the elimination of production wastes. Present practices allow from 30 per cent to 90 per cent of the oil to remain under ground. An appreciable percentage of that produced is lost by fire and much is dissipated by seeping and evaporation due to inadequate storage facilities. On the average, therefore, it is said, less than 25 per cent of petroleum under ground reaches the pipe line. Subtracting the losses involved in improper and wasteful utilization the recovery factor becomes as low as 10 per cent. Waste connected with oil well drilling is caused by the harmful infiltration of water from water bearing strata and the uncontrolled escape of natural gas encountered in the course of drilling. Frequently there are wastes caused by unexpected gushers when the oil runs rampant over the ground. This often results in fires.

Greater extraction of values, it is recommended, can be accomplished by the extension and further improvement of the cracking methods of distillation which were discussed at length in last week's issue of AUTOMOTIVE INDUSTRIES, through the improvements in the design and efficiency of the internal-combustion engine, through the widening use of the Diesel type of engine,

through gradual deflecting fuel oil from its rôle of a steam-raising understudy to coal, and through a carefully planned program for building up a great oil by-products industry to give multiplications of value to the portion of oil left after energy, light and lubricating values are extracted. The by-product substances manufactured from crude petroleum afford great possibilities for future industrial usage for edibles, synthetic rubber, dyestuffs, etc. The Diesel type of engine, it is said, is the most economical heat-engine, from a thermal standpoint, that has been devised and most nearly approaches theoretical maximum efficiency.

#### Mexican Fields and Our Shale Deposits

Since 1911 this country has been drawing upon the Mexican oil fields at an increasing rate, Mexico supplying 10 per cent of our needs in 1917. The Mexican pools are the richest in the world and are capable of much greater annual production than has yet been taken from them. The Central American region has promising oil districts but none have developed in any way comparable to the Mexican deposits. The Mexican deposits, recommends the bulletin, should not be so wastefully exploited as have been those of the United States.

Within the last 5 years geological explorations have established the existence of vast areas of black shale in Utah, Colorado and Wyoming which are capable of yielding, upon distillation, around 50 gallons of oil, 3000 cu. ft. of gas and 17 lb. of ammonium sulphate. Oil

shale is not supposed to contain petroleum, but applications of heat have caused reactions forming oil resembling petroleum from which, it is thought, products similar to those yielded by petroleum can be obtained. There have also been other oil shale districts found in Nevada, California, Montana, Arizona, Oregon and several other states which, although not so large, give promise of an immense area in the aggregate and represent a potential oil source sufficient to supply this country for hundreds of years.

Because petroleum is not fixed in position and much of the production is won through the efforts of small operators to reach oil quickly there is a ruthless sacrifice and this is one fundamental cause of waste. The gambling character of wildcat drilling leading to a desire for quick returns with little regard for engineering efficiency is another. These must be prohibited. A general constructive economic policy leading to sound development of petroleum industries, discouraging unrestricted competition in production is necessary. Encouragement of the by-product, oil shale development, benzol and alcohol production and the use of more efficient internal combustion engines form the important solutions. The exploration for petroleum as now guided by the principal of gambling, the competitive extraction of petroleum within single reservoirs, the utilization of petroleum in part by the principle of perversion as its usage for steam raising, must all be banned, summarizes the bulletin, if we are to place petroleum resources on a sound basis.

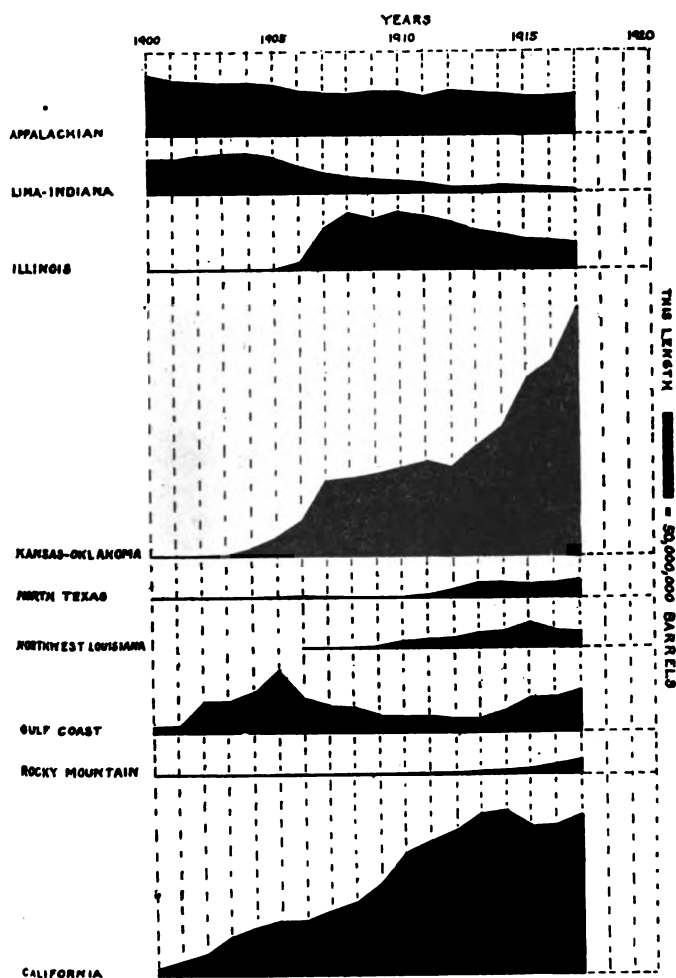


Fig. 2—The relative output of the principal oil fields of the United States from 1900 through 1917. Note the dominant positions held by the Kansas-Oklahoma and California fields. Data from U. S. Geological Survey

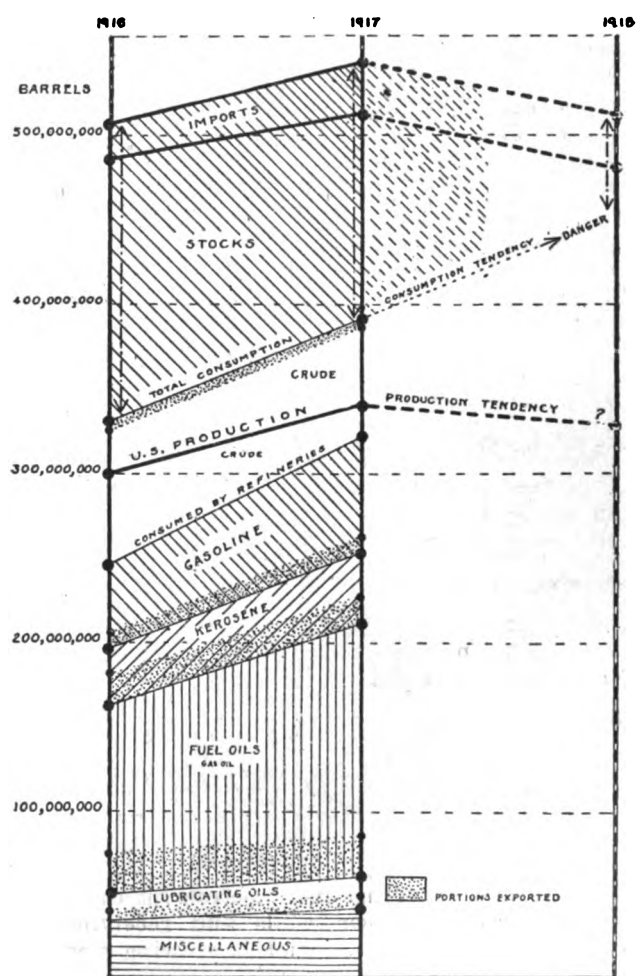
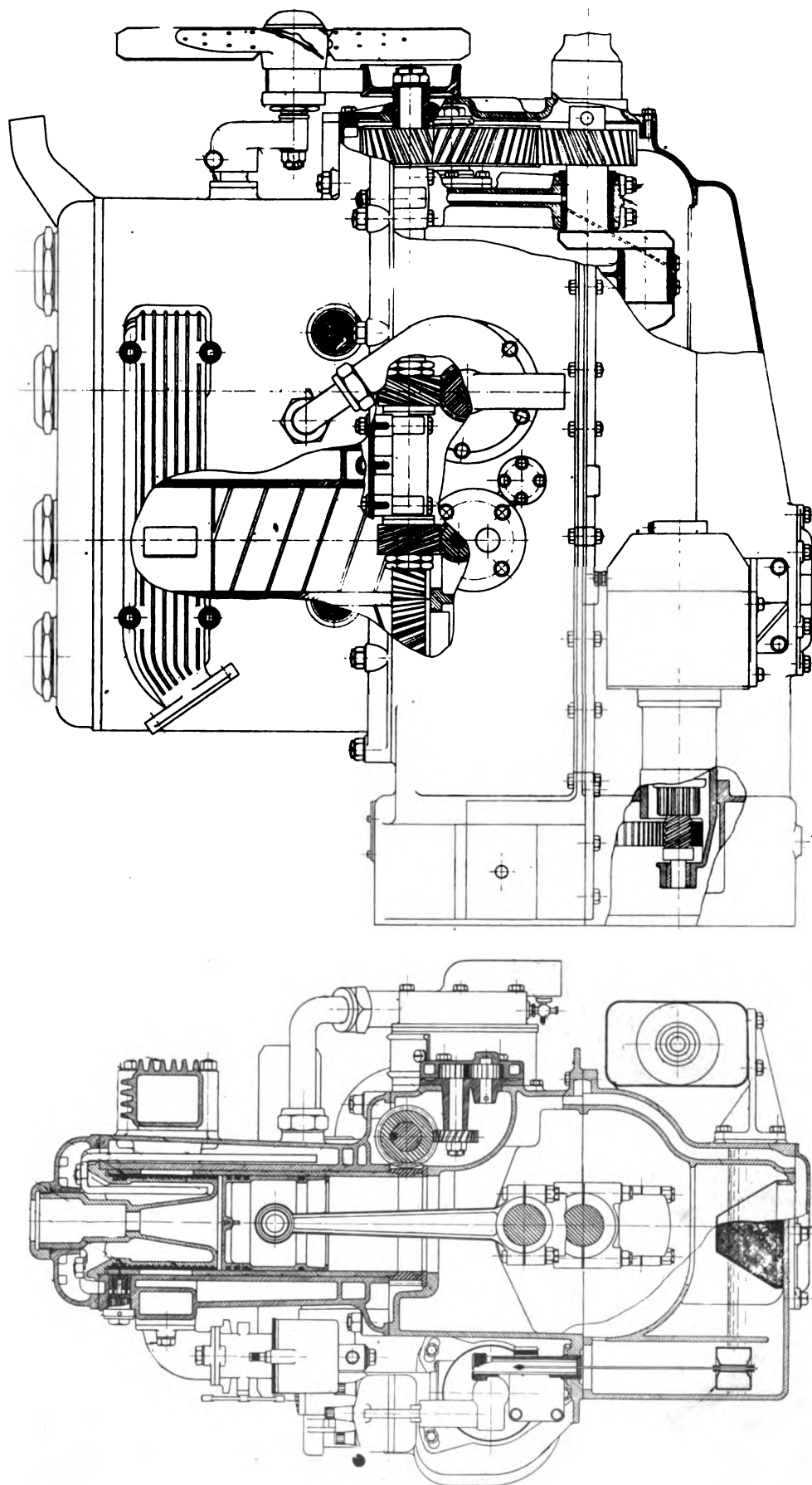


Fig. 3—The current petroleum situation in the United States. Data from U. S. Bureau of Mines, U. S. Geological Survey, Bureau of Foreign and Domestic Commerce and other sources

## Longitudinal and Cross Section of American Sleeve Valve Engine



*This is the latest improved design of this engine, which differs in various details from the engine exhibited at the New York show last winter*



# Tests of a Sleeve Valve Engine

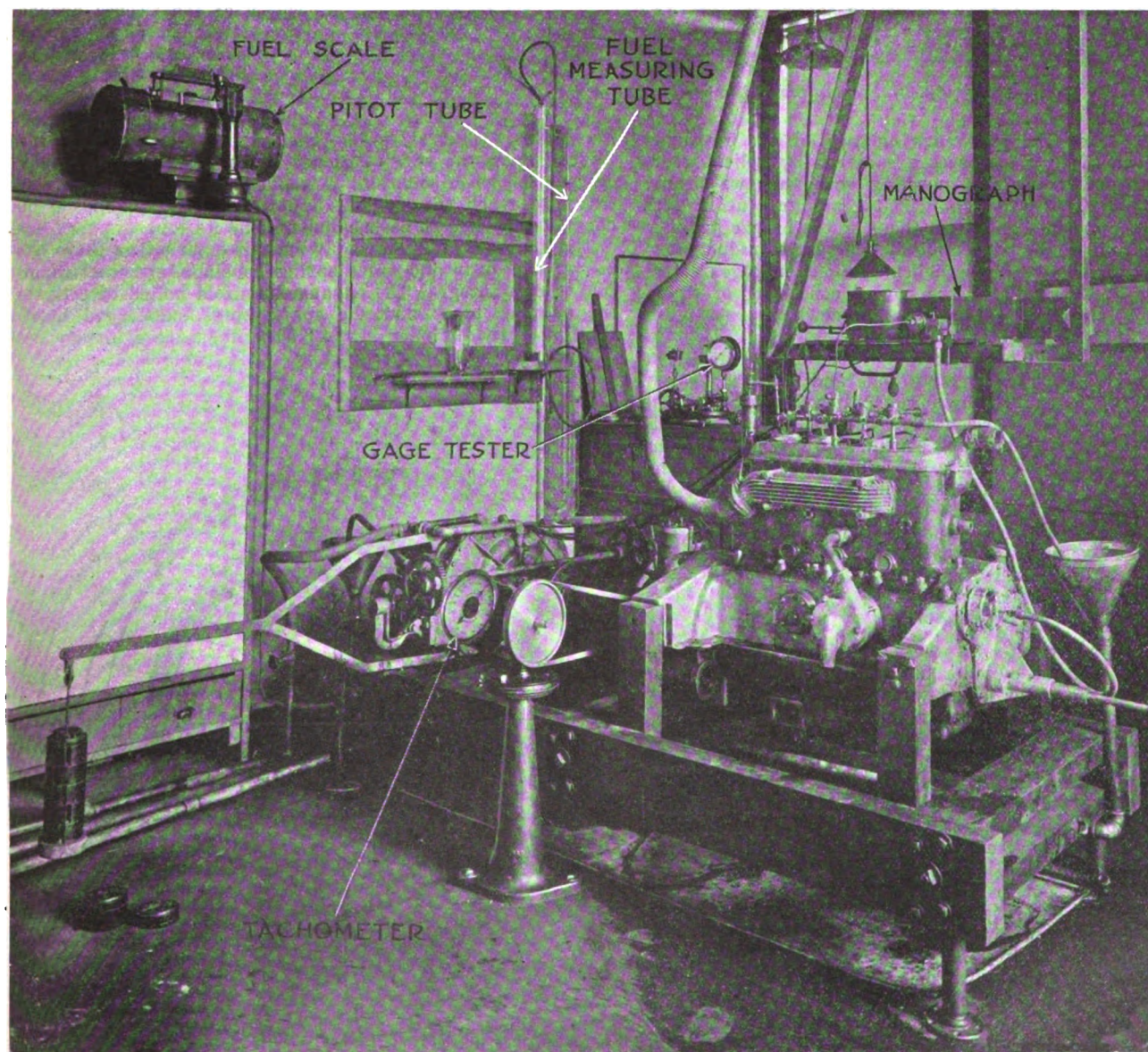
Engine of the American Sleeve Valve Motor Corp. Has a Single Sleeve Rot at Uniform Speed—Manograph Diagram and Horsepower and Torque Curves Show Its Characteristics

A REPRESENTATIVE of AUTOMOTIVE INDUSTRIES recently had occasion to visit the laboratory of the American Sleeve Valve Motor Co., 1926 Broadway, New York, where development work is at present being done on the American sleeve valve engine. This engine was exhibited at the New York show last winter, and a brief description of it appeared in these columns at the time.

It will be remembered that there is a single sleeve in each cylinder between the cylinder wall and the piston which rotates at uniform speed making one revolution to four of the engine crankshaft. This sleeve has two equal-sized ports cut into it, one directly opposite the other, which ports are adapted to register with ports in the cylinder wall and

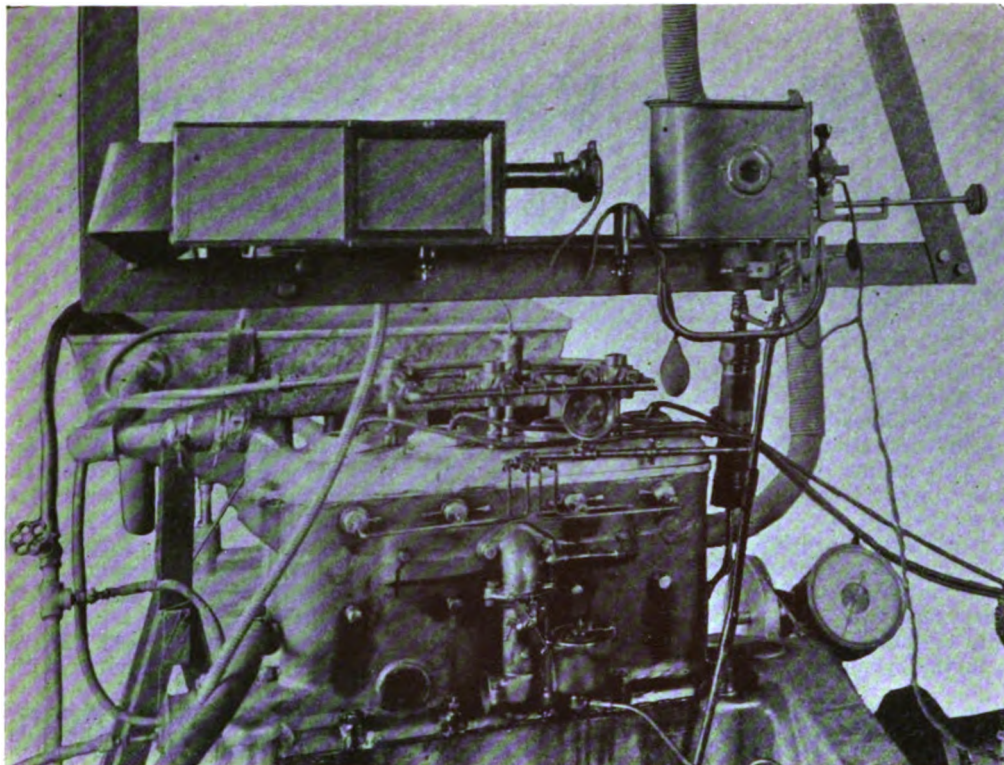
in the extension of the cylinder head down into the thereby performing the inlet and exhaust functions.

The cylinders are of 4 in. bore and 5 in. stroke, piston displacement for the four cylinders of 251.2. These dimensions it will be well to remember in connection with the test results to be given further on. All four cylinders are cast in a block, and there is no water space between each pair of outer cylinders. The revolving sleeves are driven through helical gears at their lower ends, meshing with corresponding helical pinions on a longitudinal shaft. The latter is driven from the crankshaft through a pair of helical spur gears without change in rotative speed. There are only two helical pinions on the longitudinal shaft



Set-up for dynamometer and manograph tests





*Close-up view of the engine, manograph and arc lamp*

mesh with bronze helical gears on two of the revolving sleeves. The other two sleeves are driven by helical gears formed integral with them meshing with the two bronze helical gears. The cast iron helical gears are cut in with teeth of the opposite hand from those of the bronze gears in order to permit of the proper mesh. The entire reduction of 4:1 is effected between the helical pinions and gears, the gear train at the front of the engine consisting of equal-sized driving and driven gears and a somewhat larger intermediate gear.

Little need be said of the construction of such parts as crankcase, crankshaft, connecting rods and pistons, as they do not differ materially from conventional designs. The crankcase is divided horizontally through the crankshaft axis and all three crankshaft bearings are carried by the upper half. The crankshaft is partly balanced by extending the crank arms adjacent to the main bearings an equal distance past the main journal in both directions, and undoubtedly a very rigid crank is produced without incurring the disadvantage of excessive weight by making the central arms unusually thick and boring them out.

#### Separate Head for Each Cylinder

The water jacket extends practically the entire length of the cylinder, and the cylinder block rests on the crankcase by a flange on the water jacket wall rather than the cylinder wall, as the space below the cylinder wall is taken up by the sleeve gear. It is interesting to note that the bronze gears are doweled into the sleeve by means of integral dowels formed with the aid of the oxy-acetylene torch.

A rather interesting form of cylinder head is used, which is separate for each cylinder. It consists of an aluminum casting over which is screwed a steel sleeve. Two longitudinal slots are cut in the latter, quite close together and extending nearly the entire length of the sleeve, one from one end and one from the other. This gives the threaded sleeve a certain flexibility, making it similar to a piston ring. At the upper end of the sleeve the thread is omitted and this end passes over a couple of expansion rings in a single groove in the piston head, which rings exert a pressure against the steel sleeve tending to expand it against the revolving sleeve.

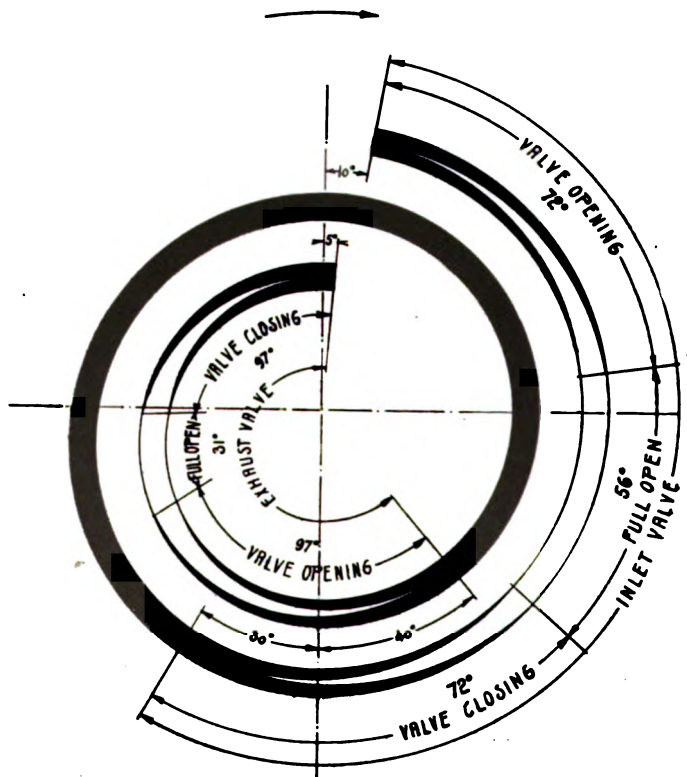
Ports of rectangular shape are accurately cut in the steel sleeve, these being somewhat smaller than the ports cast in the cylinder head and thus determining the exact moments

of the beginning and end of the valve functions. The ports in the revolving sleeve are larger or wider than those in the cylinder wall and cylinder head, with the result that these latter are fully uncovered for a certain period of time. Owing to the fact that the valve sleeve rotates at uniform speed, the valve opening increases rapidly and uniformly from nothing to the maximum, then remains for a while at the maximum and then decreases to zero in the same way as it increased to maximum.

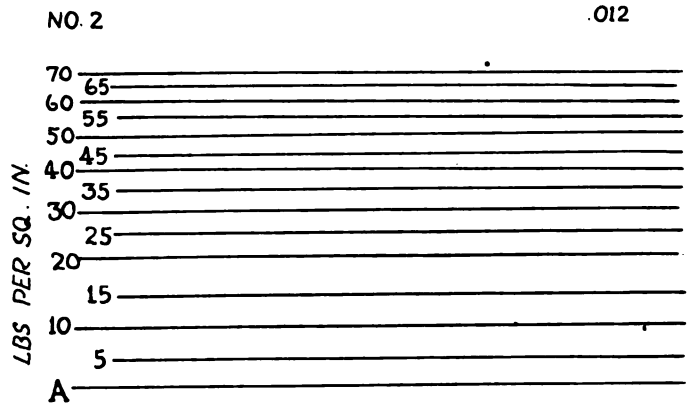
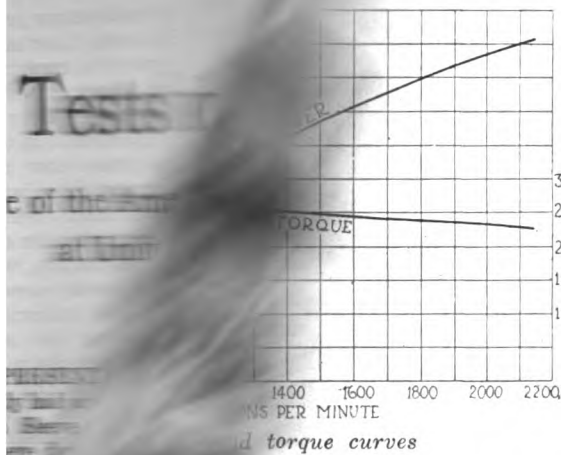
Two important problems connected with the design of an engine of this type are the lubrication of the sleeves and the prevention of leakage of gas from the ports around the valves. These two problems are somewhat connected, for with proper lubrication of the sleeves around the ports there is no danger of gas leakage. It will be seen that the revolving sleeve is cut with helical oil grooves over its whole length below

the ports, which are designed to distribute the oil. But oil from the spray can get on to the revolving sleeve only at the lower end, and it would have a long distance to travel to reach the extreme upper end, hence a special oil head is connected to each cylinder near its top.

The engine is of remarkably smooth exterior, as there are no valve pockets and valve spring housings, the inlet manifold is cast integral, the exhaust manifold bolted directly to the cylinder block and the spark plugs submerged below the top of the cylinder heads. The plugs are evidently not



*Valve timing diagram, showing full opening and partial opening periods*



Calibration chart of manograph diaphragm

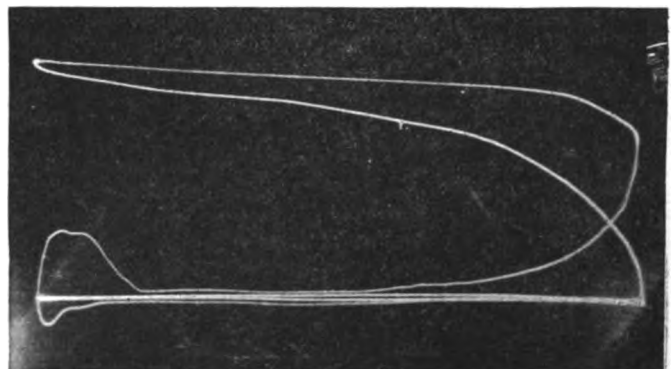
they are so located that they are they should very rarely require

ject to development work during changes in timing and other fea- increase its output and better its H. C. Gibson, who introduced the in this country, has been acting in the American Sleeve Valve Motor rough study of the engine by means of the diagrams taken by him are to insure absolute accuracy in deter- own on the diagrams, the diaphragms calibrated by means of a Schaeffer r. This consists of a small cylinder on which rests a piston supporting a e bore of the cylinder is accurately r square inch on the oil can be readily be made anything desired by merely n the piston or plunger. By admitting agm chamber of the manograph and ob- of the spot of light corresponding to

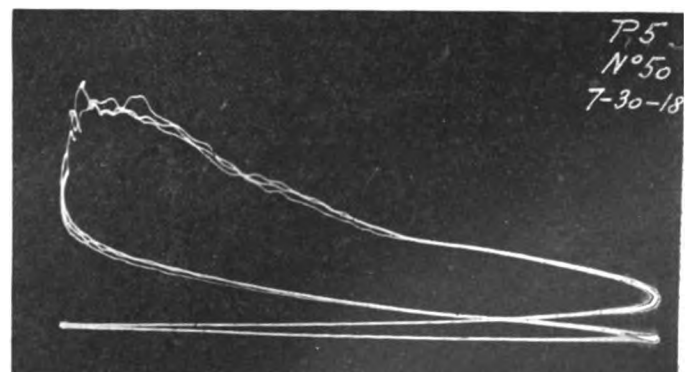
different weights on the plunger of the gage tester, data may be obtained for a calibration chart of different diaphragms. Diaphragms of different gages of metal are used for different tests. For instance, when it is desired to obtain only the compression curve of the engine a diaphragm of lighter gage is used than if the explosion curve is to be traced, and if the exhaust and intake curves are to be obtained only, use is made of a diaphragm of very light material and a "pillow" of metal is placed behind it which limits the amount of its deflection.

Two of the photographs reproduced herewith show the set-up for these tests.

The engine is connected to a Herschell-Spillman hydraulic dynamometer. Fuel is drawn from a tank on a weighing scale supported on a shelf high up on the wall so that gravity feed may be used. The manograph is supported directly above the engine on a frame suspended from the ceiling. It is a single diaphragm instrument, and connection to the different cylinders can be readily made by means of valves. In the view of the complete engine and dynamometer may be clearly seen both the pressure connection and the motion connection to the manograph. Motion is obtained



Without exhaust pipe—Diagrams taken with pillow behind diaphragm—With long exhaust pipe



600 r.p.m.—Full throttle diagrams—1800 r.p.m.

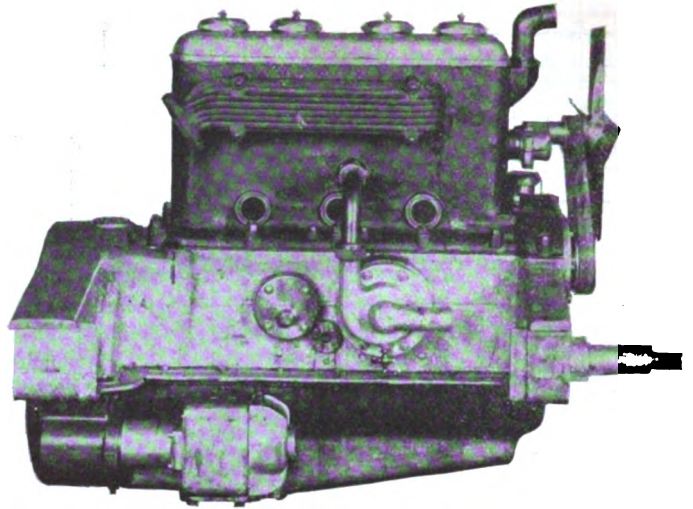


from the end of the valve shaft, which runs at the same speed as the crankshaft and is more accessible than the latter.

Adjacent to the manograph will be seen the electric arc lamp which furnishes, through a pinhole, the spot of light that traces the diagram. Ordinarily the spot of light traces the curve on the mat glass surface of the manograph, the entire diagram standing out clearly, owing to the persistency of vision. But a film pack is attached to the instrument, and a photographic record of the diagram can be obtained with very little trouble.

A number of diagrams obtained from the American sleeve valve engines are reproduced herewith. The first two were taken with a diaphragm only 0.0075 in. thick with a pillow block behind it. This will indicate pressures only up to about 12 lb. per sq. in., as at higher pressures the diaphragm rests against the pillow block. Therefore, the variation of pressure during the exhaust and intake strokes only is recorded. The uppermost, horizontal line is traced during the explosion stroke, the diaphragm lying snug against the pillow block. At the end of the power stroke the pressure drops and comes within the range of the diaphragm. During the return or exhaust stroke the spot of light accurately indicates the variation of pressure in the cylinder. It will be observed that the only noticeable difference between the two diagrams taken with the light diaphragm and pillow block is that one shows a notable increase in pressure at the end of the exhaust stroke while the other does not. What caused this difference was that in the first case the engine exhausted through a long exhaust pipe extending clear across the room, while in the other case it exhausted directly into the atmosphere. In the first case, owing to the overlapping of the exhaust strokes of succeeding cylinders, some of the spent gases from a cylinder just beginning to exhaust are blown back into the cylinder completing its exhaust stroke. The rise in pressure amounts to about 3.5 lb. per sq. in.

Two power diagrams are also shown, of which one was taken at 600 r.p.m. and the other at 1800 r.p.m. The conditions are otherwise substantially the same. It will be noticed that the low-speed diagram is absolutely smooth, while the high-speed diagram shows a wavy formation just before and after the point of ignition. The statement was made by a speaker at an S. A. E. meeting some time ago that the flicker of the manograph light near the point of ignition, which had always been supposed to be due to inertia of the moving parts, was in reality due to complicated chemical



*Exhaust side of American sleeve valve engine*

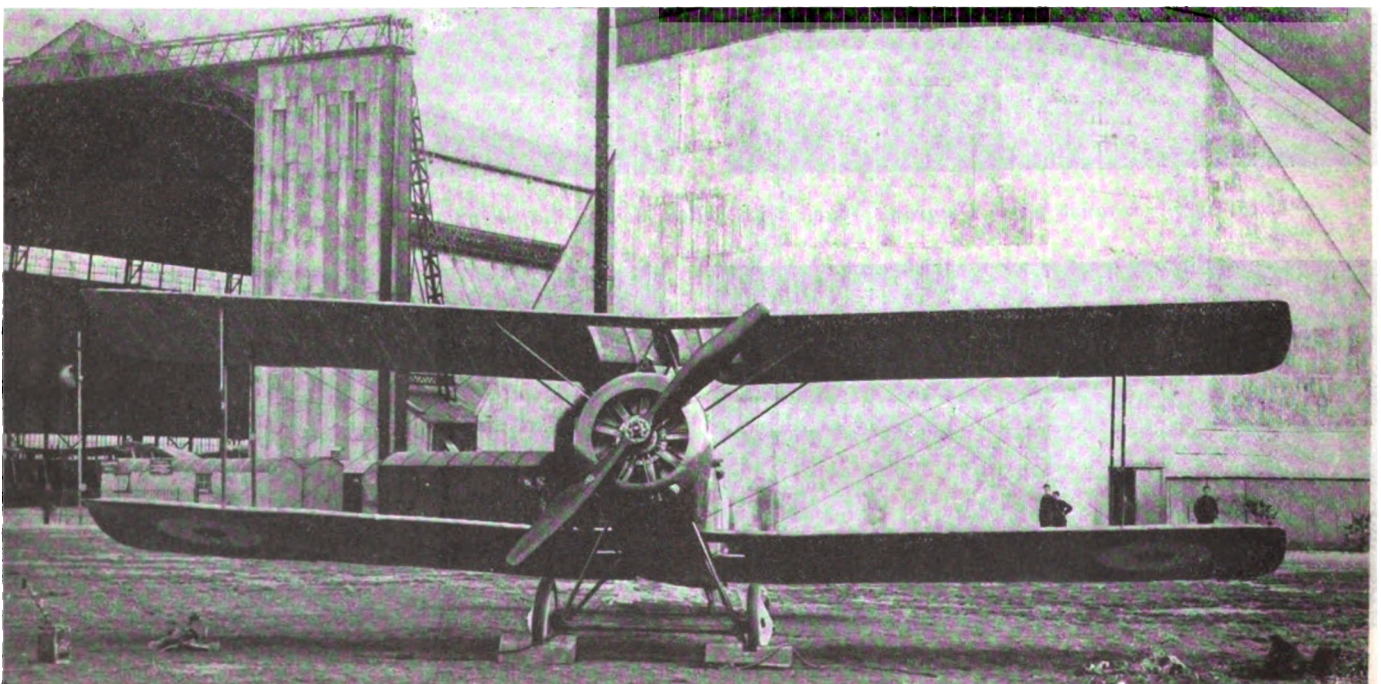
actions during the combustion within the cylinder. This was quite interesting, but it would have been still more interesting if proof had been put forth to substantiate it. If the combustion involved several successive chemical reactions, involving heat liberation at different rates, we would probably have the wavy line also when the engine runs at low speed.

Another point brought out by a comparison of these two diagrams is that at high speed the engine does not get rid of the spent gases nearly as promptly as at low speed. A thing that is more difficult to explain is the more nearly straight compression line in the high-speed diagram.

A horsepower diaphragm of the engine is included in the illustrations. This shows an output of 26 hp. at 1000 r.p.m., corresponding to a brake mean effective pressure of 82 lb. per sq. in., and 50 hp. at 2100 r.p.m., corresponding to a b.m.e.p. of 76 lb. per sq. in. Ignition during these tests was by a Bosch magneto, and the carbureter used was a Zenith.

The engine complete weighs 581 lb. That it is of rugged construction may be seen from the photographs and drawings.

## Sopwith Rhino Two-Seater Fighter



# The Theoretical Indicator Diagram

## A Method of Predetermining the Gas Temperatures and Pressures for Various Points in the Engine Cycles from the Chemical Composition of the Charge and the Physical Properties of the Components

By O. A. Malychévitch, E. S. A., C. M.

**T**HERE has always been an important discrepancy between the temperature and the pressure of the exploding gas in an engine cylinder as obtained by actual measurement and the values arrived at by calculation based on the heat content of the fuel in the charge and the specific heat of its components. In fact, while the theoretical combustion temperature is often given as more than 4000 deg. Fahr., the actual combustion temperature is only about 3000 deg. Fahr. If the theory was complete and took account of every factor affecting the temperature of combustion it should give results comparable with those obtained by measurement. The author of this article endeavors to evolve a theory of combustion that takes into account all of the influences that lower the combustion temperature and to give results in accordance with practical observations.—EDITOR.

**E**NGINES of airplanes, and especially those of racing cars, serve as models on which new improvements are first tried out. If they prove themselves, the improvements are later on embodied in other types. On the other hand, defects in design are also repeated. Nevertheless, rapid progress has been made in the development of high-speed engines for motor cars and airplanes.

The race for the Grand Prix in France in 1906 was won by a Renault car with an engine of 165 mm. bore and 150 mm. stroke, having a piston displacement of 12,850 cc. (785 cu. in.). This engine developed 100 hp. at a maximum car speed of 135 kilometers per hour (84 m.p.h.). In the race of 1914 the Peugeot engine of 92 mm. bore and 169.5 mm. stroke, having a piston displacement of 4500 cc. (275 cu. in.), developed 110 hp. at a car speed of 170 kilometers per hour (106 m.p.h.). It will be observed that, notwithstanding the great decrease in the piston displacement (65 per cent) the Peugeot engine developed greater power and much higher speed than the Renault of 1906.

The increase in the power of the engine is by no means the only progress made during a period of about eight years. All modern cars equipped with high-speed engines are much lighter in weight, run on lighter tires and consume less fuel and lubricating oil.

Admitting that an improvement in the form of the combustion chamber is obtained by placing the valves in the head of the cylinder, that modern carbureters are very efficient, that the quality of steel used enables high stresses to be borne, and that the details of the engine are considerably improved, one marvels that such a great difference should still be possible between the two above-mentioned types of engine. The reason for this difference is not to be found in improvements of separate parts, nor in better performance of the carbureter, but

in the rapid increase in the number of revolutions (i.e., in the linear speed of the piston), and in successful efforts to solve the problems pertaining to the thermodynamical process of motor-car engines. To these two factors is principally due the above-mentioned progress, which enables an engine with decreased piston displacement, and consequently lighter, to produce much greater power.

On the other hand, practical conditions force manufacturers to adopt standard types of engines, and the annual reports of motor car exhibitions show a tendency to limit the number of types of engines and cars, coupled with endeavors to make the types more efficient, more comfortable and economical. The problem of "economical transportation" directs the efforts of engineers to the question of designing a heavy oil-burning engine (Hvid, Scott-Junkers type) for agricultural tractors, trucks and even motor cars and airplanes, and some method must be adopted for developing the best type of engine from the standpoints of durability, flexibility and other desirable qualities.

A method which may be recommended is that of the experimental investigation of thermodynamic processes in the laboratory as well as in the factory, for different kinds of engines. The data obtained, arranged by such an authoritative body as the S. A. E., could be passed to the drawing rooms of the factories, to serve as a basis in the design of engines. Such data as volumetric efficiency, suction, explosion and exhaust temperatures and pressures of engines using different compression ratios, running at different speeds, etc., will serve in laying out the theoretical indicator diagrams. The latter, when compared with the real indicator diagrams of the completed engines, will serve as a check on the calculated temperatures, pressures, heat losses, coefficients, etc.

From a series of indicator diagrams taken from different types of engines, a mean indicator diagram may be constructed which will permit of a more accurate determination of necessary data, including the values of  $n$ ,  $n_c$ ,  $T$  (equation 40 and (equation 9); and of the development of an engine more efficient than any of those experimented with. The writer may repeat what he said in his article "Gear Box Design" in *The Automobile Engineer* for November, 1915, that "the information which is given here has no absolute significance, as it is based purely on the comparative method. This method enables us, by a detailed study of the existing examples, to evolve fresh ones of more perfect type."

In motor car and aviation engines we deal with a working mixture of air and gasoline (naphtha and kerosene in other types of engines) previous to combustion, and with burned gases after combustion. The determination of conditions of the burned gases, that is, the investigation

of the process of burning itself, in the engine cylinder from the moment when the working mixture is drawn in until the moment the spent gases are exhausted from the cylinder, is one of the most important problems. It is necessary to bear in mind the different factors influencing this process.

1. Those most familiar to the designer are: Shape of combustion chamber, cooling, location of spark plugs, valve timing, etc. Problems relating to these factors are mastered by the designer at the present stage of engine development.

2. The factors which are fairly well understood but which, nevertheless, require further investigation and improvement, include the volumetric efficiency, thermal and mechanical efficiency, suction temperature.

A third group of factors influence the burning process and the conditions of the burnt gases. To this group belong

3. Composition of working mixture, composition and specific heat of burned gases, the change of the number of gas molecules.

### Volumetric Efficiency

It is impossible to obtain working conditions that would allow the burned gases to be completely removed from the cylinder and a fresh mixture at 0°C and a pressure of 1 atmosphere to fill the whole volume of the cylinder for the suction stroke.

The realization of such conditions is prevented by the resistance which the mixture encounters in passing through the pipes and valves before it enters the cylinder. This is illustrated by Table I\* containing data of an actual test of a 200-hp. aviation engine, showing the vacuum in the inlet pipe at different speeds of revolution.

TABLE I

R.p.m.	Hp.	Suction in Inlet Pipe	
		Mm. of water	In.
1510	248	240	9.5
1510	234	420	16.5
1450	205	750	29.5
1360	163	1400	55.0

\*Le Moteur a Explosions by Rene Devillers.

The back pressure of the remanent gas in the combustion chamber, the temperature of the fresh mixture and possibly the fact that the inlet and exhaust gases flow in a series of waves and not in a steady stream, tend to keep down the amount of charge entering. The length of the wave depends on the length of the inlet pipe and does not always correspond to the period of the opening and closing of the valves. The closing of one of the valves causes the formation of a reverse wave in the inlet pipe, analogous to the wave of a stream of water inside a pipe which is suddenly stopped by a check. The pressure created in this manner depends on the length of the wave and the velocity of the gas at the moment of closing the valve.

### Values Obtained by Experiment

High speed engines possess a great advantage in this respect, as there is a possibility of making use of the inertia of the gas in the inlet pipe.

The reduced m.e.p. at the maximum engine speed as compared with the m.e.p. at low and medium speeds, prevents to a great extent any dangerous disturbance of gases in the inlet pipe and produces at the same time the necessary filling of the cylinder at the time when the maximum power of the engine is required.

Theoretically the volumetric efficiency (at  $P_0$  and  $T_0$ ) may be as high as  $\eta_v = 0.82$ . In practice, the volumetric efficiency generally does not exceed 65 per cent.

Experiments made by Prof. Riedler with three types of engines gave the following figures:

TABLE II

Engine	R.P.M.	Thermal Efficiency	Volumetric Efficiency
Daimler-Knight . . . . .	1920	20%	69%
96 x 130 . . . . .	(500—2100)	(18.5—21.5)	(88—65)
Daimler-Knight . . . . .	1920	16.57%	58%
101.6 x 129 . . . . .	(500—2100)	(16.0—19.4)	(81—52)
Adler . . . . .	1920	22%	64.5%
86 x 135 . . . . .	(500—2100)	(18.0—22)	(73—62)

### Theoretical Thermal Efficiency

The theoretical thermal efficiency of the four-cycle engine is usually expressed by the formula:

$$\eta_t = 1 - s^{n-1} \quad (1)$$

in which  $s$  = compression ratio, i. e., the ratio

$$\frac{V_h + V_c}{V_c} \text{ (Fig. 2).}$$

$$n = \text{ratio } \frac{C_p}{C_v} = 1.30 - 1.40.$$

$C_p$  = specific heat at constant pressure.

$C_v$  = specific heat at constant volume.

The thermal efficiency depends upon the compression ratio and  $n$ , but does not depend upon the temperature.

In this case the specific heat is supposed to be constant, i. e., there is no loss of heat; the expansion continues during the whole stroke and the charge consists of pure air. These conditions, of course, differ from those of actual practice. The specific heat of the working mixture increases with the increase of temperature;  $C_v$  (specific heat at constant volume) is not constant, but changes so the value of  $n$  changes and the thermal efficiency declines.

This change of specific heat is one of the most important points the designer must deal with.

The working mixture and exhaust gases consist of a number of perfect gases, including  $O_2$ ,  $N_2$ ,  $H_2$  and  $CO$ ; of carbon dioxide ( $CO_2$ ) and of water vapor ( $H_2O$ ). Of all the perfect gases  $CO_2$  exhibits the greatest increase in specific heat with a rise in temperature; of  $H_2O$  the increase of the specific heat is still more rapid, therefore, the presence of  $CO_2$  and  $H_2O$  will change to a great extent the specific heat of the working mixture, diminishing the value of the b.m.e.p. as well as the explosion temperature and pressure. As a result of experiments we assume a linear relation between the specific heat at constant volume and the temperature of the gas.

The maximum temperature of combustion depends on the strength of the mixture (air-gasoline ratio) and on the temperature of the entering charge. The change in the specific heats at high temperatures causes a loss of heat. There is loss of heat to the cylinder jackets, which depends to a certain extent on the number of revolutions of the engine. A high-speed engine has an advantage in this respect as the loss due to cooling is a function of the time, and the reduced time of cooling reduces the percentage of heat loss.

Therefore, the average loss due to the change of specific heat (17 per cent) to the cylinder jacket (16 per cent) and delayed combustion (3 per cent) in such a case amounts to about 36 per cent and the maximum possible thermal efficiencies for different compression ratios are:

Compression ratio	$\eta_t = 1 - s^{n-1}$	Theoretical thermal efficiency
4:1	38.4%	25%
5:1	43.1%	27.6%
6:1	46.6%	30%

It follows from the above table that the theoretical thermal efficiency for a compression ratio of 5 amounts to only 63.5 per cent of the air cycle efficiency (equation 1) although in practice it rarely surpasses 24 per cent (for  $s = 5$ ).



One of the principal aims in designing the engine, is to diminish the weight and increase the power. By reducing the weight of the flywheel, pistons and connecting rods, increasing the compression ratio and modifying the valve timing, we may increase the power, sometimes by 50 per cent, and diminish at the same time the noise and wear. The mechanical efficiency limits the speed of revolution of the engine, and as an increase in speed increases the power it is very important to determine the mechanical efficiency by experiment. The following valuable diagram made by Prof. Walter Fishleigh\* gives the value of mechanical efficiency as 0.62-0.85 for a 6-cylinder,  $4\frac{1}{2} \times 5\frac{1}{4}$ -in. engine at 640, 1,000 and 1,350 r.p.m. (Fig. 1).

The remaining factor of group 2, the inlet temperature, we will consider together with group 3 factors.

Coming now to the determination of the necessary data for constructing the theoretical indicator diagram,† we must first analyze the combustion process itself.

Prof. W. E. Grinevetzky of the Moscow Technical Institute, in his editorial supplement to the Russian translation (1907) of Güldner's Internal Combustion Engine, using the kilogrammolecule (kg.mol.) for the working mixture and burnt gases and taking as a base the molecular mean specific heat of gases, developed the formula for calculating the explosion temperature. The writer has applied the suggestion of Prof. Grinevetzky in calculating and constructing the theoretical indicator diagram of an engine, which gives sufficient knowledge of the relation of all factors of the working process and serves afterwards as valuable material for comparison with the real indicator diagram. Therefore, we will express the amount of the working mixture and burnt gases in kg. mol., taking as a unit the number of kilograms equal to the molecular weight of the gas.‡ By Avogadro's law, equal volumes of all gases at the same pressure (density) and temperature, contain the same number of molecules, i. e.,

$$1 \text{ gr. mol. of gas} = 22.330 \text{ liters.}$$

$$1 \text{ kg. mol. of gas} = 22330.00 \text{ liters.}$$

Such a unit contains a given number of molecules for equal volumes of all gases. The use of such a unit is very practical and identical to the measurement of volume.

The amount of air required to burn one kilogram of fuel, in kg. mol., is  $A/28.89$ , where 28.89 is the weight of a kg. mol. of air (this is also the molecular weight of air). The total number of kg. mol. of working mixture previous to combustion is

$$\frac{A}{28.89} + G$$

where  $G$  is the number of kg. mol. of the evaporated part of fuel, which may be considered as equal to zero, because the quantity of evaporated fuel drawn into the cylinder before the combustion may be taken as negligible. Therefore, we may say, that the total number of kg. mol. of working mixture will be:

$$\frac{A}{28.89}$$

Besides the fresh working mixture drawn into the cylinder

\*From a paper on Heat Balance Tests of an Automobile Engine, read at S. A. E. Meeting.

†The theoretical indicator diagram of the process AEZC (Fig. 2) compression and expansion follow the lines AC and EZ according to the equations  $Pv^{\gamma} = \text{const.}$ , i. e., polytropic.

‡A given body may be divided both chemically and mechanically. The infinitesimally small particles of an elementary material that can be divided no further either mechanically or chemically, are known as atoms. It is assumed that in any given material these atoms are closely associated in certain groups, and such smallest possible atom groups into which the material can be subdivided without affecting its chemical constitution, are called molecules. In other words, a molecule is the smallest weight necessary to enable a substance to maintain its identity, while the atom is the smallest conceivable weight with which the chemical elements form combinations.

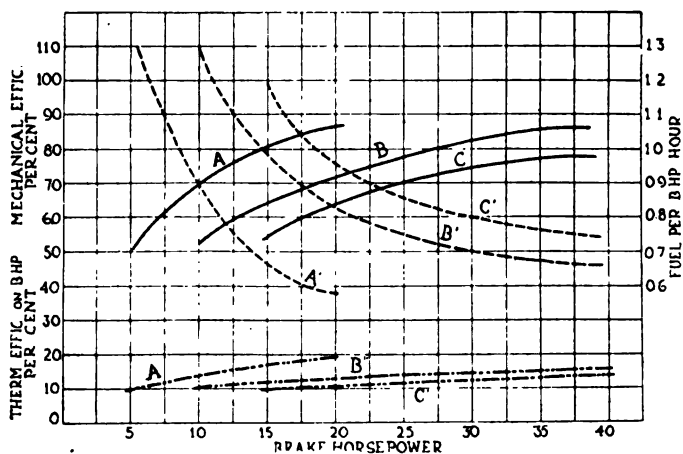


Fig. 1—Mechanical and thermal efficiencies at three different speeds

Engine 6 cyl.  $4\frac{1}{2} \times 5\frac{1}{4}$ " L head type

A, A', A"—Mech. eff., fuel cons. and b.h.p. therm. eff. at 640 r.p.m.  
B, B', B"—" " " " " " 1000 r.p.m.  
C, C', C"—" " " " " " 1350 r.p.m.

der, there is a certain quantity of burnt gases remaining from the previous explosion.

Assume that  $\psi$  is the ratio of the number of kg. mol. of remanent gases to the working mixture, or the ratio of their volumes at equal pressure. Hence the total number of kg. mol. of gases in the cylinder previous to combustion is

$$\frac{A}{28.89} (1 + \psi) \quad (2)$$

Knowing the values of  $A$  and  $\psi$ , we may determine the quantity of gas previous to the combustion, and from the reactions of the combustion, we find the quantity and the composition of the burnt gases.

The working mixture and exhaust gases consist of perfect gases (di-atomic), including oxygen, nitrogen, hydrogen and carbon monoxide; of carbon dioxide and water vapor.

As the specific heats of the different gases are affected differently with an increase in temperature, let  $K_1$ ,  $K_2$ , and  $K_3$  be the numbers of kg. mol. of these three components of burnt gases obtained from 1 kg. of fuel. We assume a linear relation between the specific heat at constant volume and the temperature of the gas, and base our calculations on the mean specific heat of gases for changes from 0° abs. to the given temperature.

The molecular mean specific heat at constant volume may be represented by the following equations:

$$\left. \begin{array}{l} \text{For perfect gases} \dots\dots C_{v_1} = 4,625 + 0.00053 T \\ \text{For CO}_2 \dots\dots\dots C_{v_2} = 6,774 + 0.00189 T \\ \text{For H}_2\text{O} \dots\dots\dots C_{v_3} = 6,855 + 0.00116 T \end{array} \right\} (3)^*$$

The specific heat of masses of burnt gases from 1 kg. of fuel will be (equation 3).

$$C_{mv} = K_1 \times C_{v_1} + K_2 \times C_{v_2} + K_3 \times C_{v_3} \quad (4)$$

Substituting in equation (4) the value of  $C_{v_1}$ ,  $C_{v_2}$ ,  $C_{v_3}$  from equation (3) and  $K_1$ ,  $K_2$ ,  $K_3$ , we obtain the form of equation

$$C_{mv} = L + MT \quad (5)$$

As besides the working mixture in the cylinder there were some dead gases (equation 2) the total specific heat—

\*At the constant pressure:  
for perfect gases  $\dots\dots C_{p_1} = 6,600 + 0.00053 T$   
for CO<sub>2</sub>  $\dots\dots\dots C_{p_2} = 8,749 + 0.00189 T$   
for H<sub>2</sub>O  $\dots\dots\dots C_{p_3} = 8,830 + 0.00116 T$   
 $C_{mp} = K_1 \times C_{p_1} + K_2 \times C_{p_2} + K_3 \times C_{p_3} \dots\dots 4A$



# The Pfalz Single-Seater Fighter\*

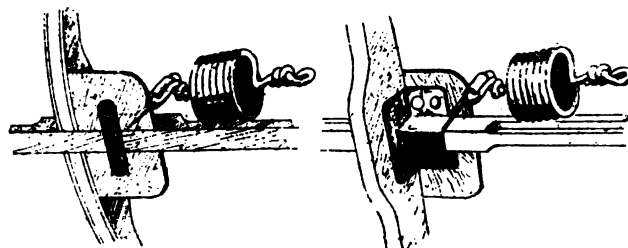
## PART III

### Seating Arrangement—Aileron, Elevator, and Rudder Controls— Landing Gear

THE seating accommodation of the Pfalz does not present any special features, except, perhaps, that the pilot's cockpit is quite roomy considering the area of the cross section at this point. This is, of course, a consequence of the peculiar body construction, which, for a given cross section, leaves more space inside than is possible when employing the girder type fuselage with rectangular main structure and the fairings added afterwards. Thus, in the case of a circular cross section, for a diameter of 3 ft. the inscribed square is only about 2 ft., while with the monocoque construction the whole circle is available for the accommodation of the pilot. This is another way of saying that the cross sectional area of a body of rounded section can be kept smaller with monocoque construction than with girder-cum-fairing construction, resulting in lower head resistance.

The seating itself is of the usual type. The front edge of the seat is supported on the sloping former, while the rear of the seat rests on a transverse member supported on a small false former slightly farther aft. Needless to say, the pilot is equipped with a safety belt, which in the Pfalz is in the form of webbing, attached as shown in the illustration, to the longerons through a short length of coil spring.

\*From *Flight*.

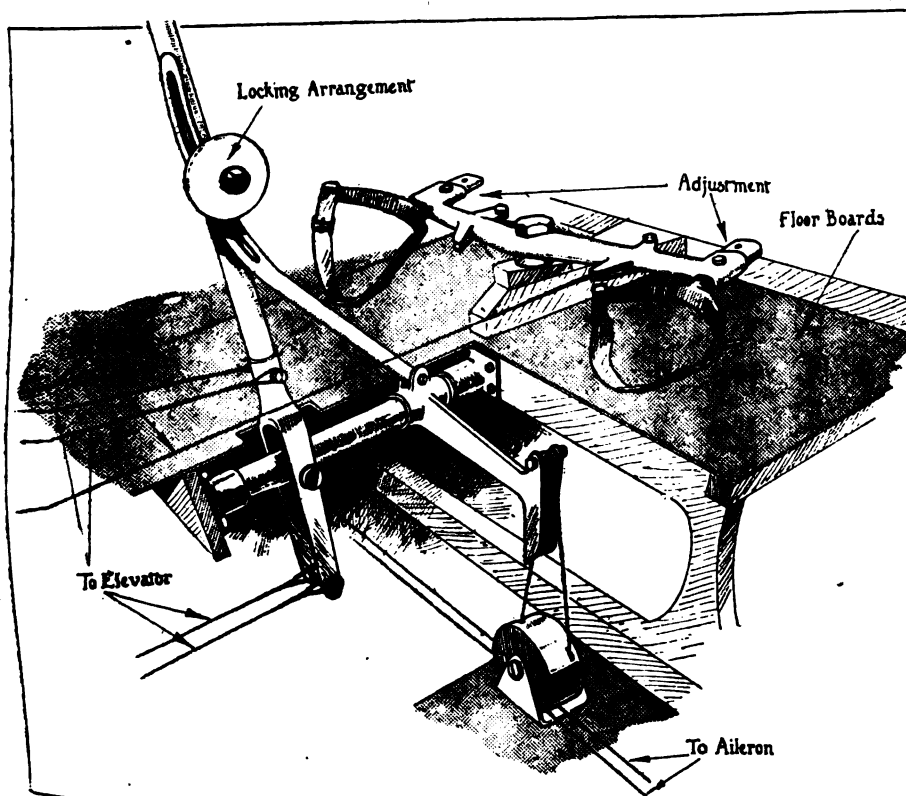


Sketches of safety belt attachment

The Pfalz controls are shown in one of the sketches. A tubular control lever, forked at its lower end, is attached to a longitudinal rocking-shaft, which carries at its front end the transverse cranks for the aileron controls. In connection with these it should be remembered that ailerons are fitted to the top plane only, hence two cables pass from each end of the crank and around pulleys, one of them being what might be termed the positive cable, running through the lower plane, over pulleys, and to the aileron crank; the other being the return or equalizing cable running across the body through the opposite lower plane, over a pulley, and to the opposite aileron.

As is now general practice, means are provided for locking the elevator in any desired position. In the Pfalz (see cut) the collar carrying the aileron control cranks has welded to it a vertical forked lug, a bolt through which forms the pivot for a hinged stay rod, terminating at the top in a flat, curved, slotted strip, which may be locked in any position by means of a locking disc of aluminum. At its upper end the control column has welded to it two handles, bound with cord, of which the left is rotatable and operates the throttle, much after the fashion of a motorcycle. Centrally placed are two triggers operating the two synchronized machine guns through Bowden cables. A sketch is shown of the handle. This sketch, it may be pointed out, has been drawn from the port side in order to better show the twisting handle, while the general sketch of the controls is drawn as seen from the starboard side.

The rudder bar of the Pfalz presents some rather unusual features. Thus the rudder cables are anchored to forked lugs on the front of the foot bar, through which they pass, and issue from the rear of the bar through



Perspective drawing of Pfalz controls

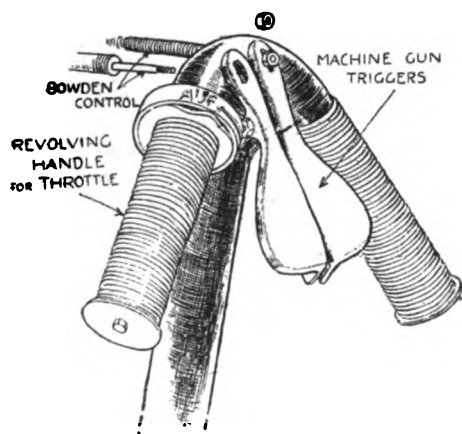


channel section guides which act, when the foot bar is moved to the extremity of its travel, as quadrants for the cables. The object of this rather complicated arrangement is not clear, unless it has been done in order to get the forked lugs working in compression instead of in tension. The foot rests are in the form of flat forks inserted in sockets in the foot bar and provided with adjustment for length to suit individual pilots.

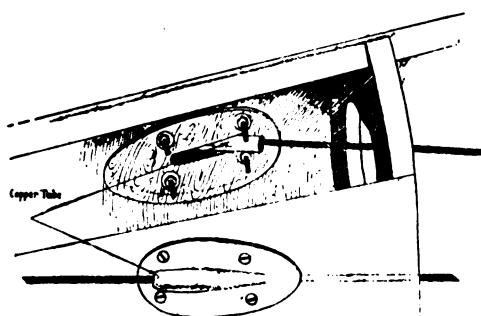
Where the rudder and elevator cables issue from the interior of the body they pass through small sheet steel plates carrying a steel tube fitted with a copper tube line to protect the cables against wear.

### Engine a Mercedes 160

The engine, a 160-hp. Mercedes, is mounted in the nose of the body on two longitudinal bearers supported by four main formers. The details of the mounting do not call for any comment, and the general arrangement of the engine mounting will be sufficiently clear from illustrations in previous instalments. The main fuel tank is carried in the bottom of the body, resting on the spar roots of the lower plane built into the body as a permanent fixture. The usual hand-operated pressure pump and an engine-driven pump are provided for forcing the gasoline from the main tank up into the service tank built into the top plane. The oil tank is carried by the side of the engine. The nose of the machine is rounded off, and terminates in a "spinner" fitted over the propeller boss, thus forming a very smooth entry for the air. Near the nose of the machine there are two scoops, that on the port side carrying air into the engine housing, while the scoop on the starboard side has a tube running to an opening in the crankcase, which is ventilated by this means. These features, as well as the neat inspection doors provided in convenient places on the front part of the body, are illustrated herewith.



Control handles of the Pfalz. The left-hand handle is rotatable and operates the throttle through a Bowden wire



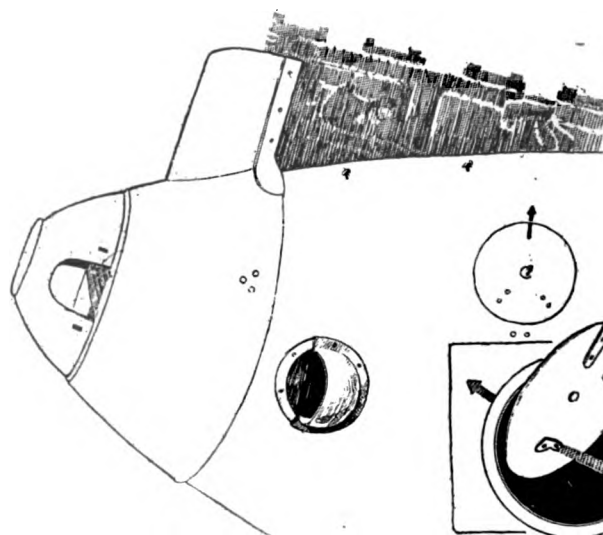
Guide tubes for the rudder and elevator control cables

The undercarriage is of the Vee type, with stream line section steel tube. The struts look somewhat spidery, being of rather small dimensions as regards section. The major axis of the section is 1.89 in., and maximum thickness of the strut, occurring fairly back, is 1.18 in. The fineness ratio is therefore low. The attachment of the chassis struts to the fuselage is of interest. The rear struts are bolted (see cut) to an I section steel bracket built into the wing root of the body. Thus the landing shocks are transmitted through this strut through the bracket to the fixed rear spar of the fuselage, and to the sloping former surrounding the pilot's seat. The upper ends of the front struts are welded to elongated base plates of heavy gage, which serve as lugs for the chassis bracing cables. In order to distribute landing shocks over a larger area a steel plate is passed underneath the bottom of the body, so that the whole bottom part of the fuselage is attached to the struts in the loop of this strap.

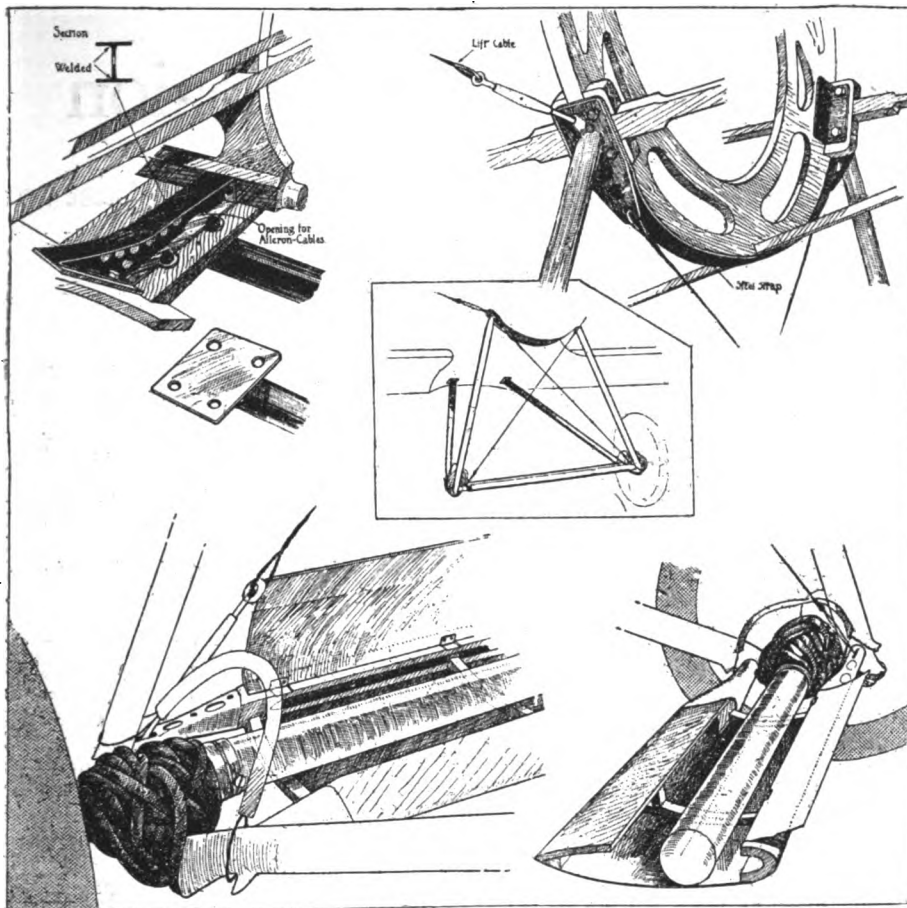
### Landing Gear Cross-Braced

The apices of the chassis Vees are connected by cross struts, one in front and one behind the axle. In fact, it is hardly correct to term the rear a strut, as it consists of short lengths of solid tapered to fit the steel socket attaching it to the fuselage struts, the remainder of its length being made up of a thin strip of wood forming the top surface of the landing edge, while its bottom surface is in the form of a sheet of three-ply passing under the axle to the cross strut. The latter is a wood strut spindled in a "D" section, and tapered at the ends to fit the fuselage steel sockets which connect it by means of bolts to the chassis struts. The top of the stream-line casing of the axle thus formed is a hinged lid of aluminum, which, as the axle moves up and down when the machine is landing along the ground, opens and closes, lying snugly against the rear cross strut when the fuselage is relieved of its load as the machine leaves the ground, thus forming a good stream-line section with it, it is presumed, a fairly low head resistance. Cross bracing the chassis is in the form of stout stranded cable. As in the case of wing cables, no stream lining has been attempted. This feature is fairly typical of German machines of every design.

The shock absorbers are in the form of cords



Sketch showing nose of the Pfalz body, with spinner, air scoop and inspection door.



General view and details of Pfalz landing gear

as regards outward appearance, might easily be mistaken for rubber cord, but which on closer examination are found to be spiral springs, one inside the other, enclosed in a woven cover similar to those employed for covering stranded rubber cords. These springs are wrapped around the apex of the chassis Vee and around the axle, and are prevented from slipping up along the chassis struts by lugs welded to the struts. Two lugs higher up serve as anchorage for the short loop of stranded cable which limits the travel of the axle. This length of cable is enclosed in a cover to protect it against wear. The tubular axle is a fairly large diameter—2.16 in., to be exact; but we have not been able to ascertain of what gage the tube is made. The details of the under-carriage are shown in the perspective sketches herewith.

## An Instrument for Testing Permanent Magnets

THE magnet-meter, marketed by Herman A. Holz, Metropolitan Tower, New York City, is an instrument designed for testing permanent magnets of horseshoe or U shape for their total flux and for their coercive force. Flux and coercive force tests may also be made with the well-known instrument known as the permeameter, but the latter is not designed for, and cannot be satisfactorily employed in, determining whether or not magnetized shapes satisfy definite requirements.

A diagrammatic illustration of the magnet-meter is shown herewith. The principle of operation may be briefly described as follows:

A coil capable of rotary movement, to which is attached a pointer, traversing a calibrated scale, is supported between two specially shaped iron pole pieces. This movable system and scale are enclosed in an air-tight housing. The pole pieces are extended through the housing into contact faces

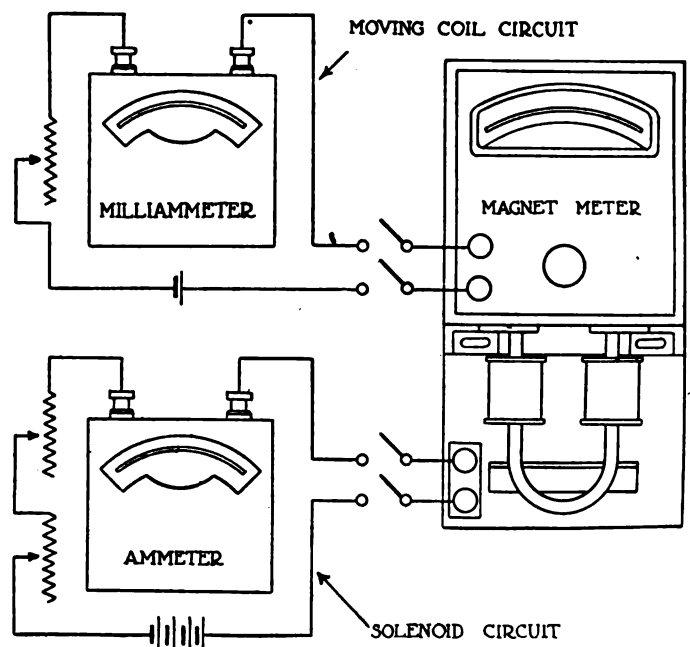
or plates, to which the polar portions of the magnet under test are applied. When a definite current is allowed to flow in the moving coil, a deflection of the pointer occurs which is proportional to the flux in the magnet applied to the contact faces.

In measuring the coercive force of the magnet, two adjustable solenoids are employed, which are located in front of the contact faces so as to encircle the respective legs of the test magnet. If current is allowed to flow in the proper direction through the windings of these solenoids, when the pointer is deflected in reading the flux, the deflection may be reduced to zero by regulating the current. The value of the current flowing when there is no flux is a direct measure of the coercive force.

Measurement of the flux does not affect the magnetization of the magnet under test, and this measurement therefore may be applied to every magnet in a lot. On the other hand, the measurement of the coercive force involves demagnetization of the specimen; and the latter has to be remagnetized after the test. In consequence the coercive force test would be applied only to a number of selected specimens.

Current for the moving coil is supplied from a dry cell and the current for the solenoids from a 6 or 12-volt storage battery. Contact shoes are provided to permit of ample contact between the polar portions of the test magnet and the contact plates, in

cases where the ends of the magnets are finished. No bushings are required to adjust the instrument for testing different sizes of magnets. The standard apparatus accommodates magnets of horseshoe type of any section of material up to 17/32 in. in thickness and 2 in. in width, with a minimum gap of 1 11/16 in. The price of the complete outfit, including the magnet-meter, milli-ammeter, ammeter, three rear staffs and two switches, is \$450. The instrument should be of interest particularly to magneto manufacturers.



Magnet-meter outfit

# The Nuttall Tractor Transmission

Gives Two Forward Speeds and Reverse—Enclosed in Well Ribbed Cast Iron Housing—May Be Readily Adapted to Different Designs of Tractors

**A** WELL designed transmission for agricultural tractors is manufactured by the Nuttall Gear Co. of Pittsburgh, Pa. While the transmission is produced in only one size, various changes are made in the design to adapt it to different types of tractors. The transmission is inclosed in a substantial, well-ribbed cast iron housing, so that the shafts are rigidly supported without the whole gear being unduly heavy.

The Nuttall transmission affords two forward speeds and one reverse, speed changes being effected by shifting gears laterally into mesh. The transmission comprises, in addition to the gearing for changing the speed and direction of motion, a power take off for the belt drive and a jack shaft with differential, the whole being inclosed in the cast iron housing referred to. All of the gears are made of forged steel, hardened and ground. All shafts are forged steel, hardened and ground, and all are mounted on flexible roller bearings.

The case in which the gears and differential are carried is a standardized unit, which it is seldom necessary to change in order to adapt the transmission to any particular tractor. The only parts which are somewhat different in transmissions made for different tractors are the bull pinion shaft and the housings which support them, the power shaft, and its housing.

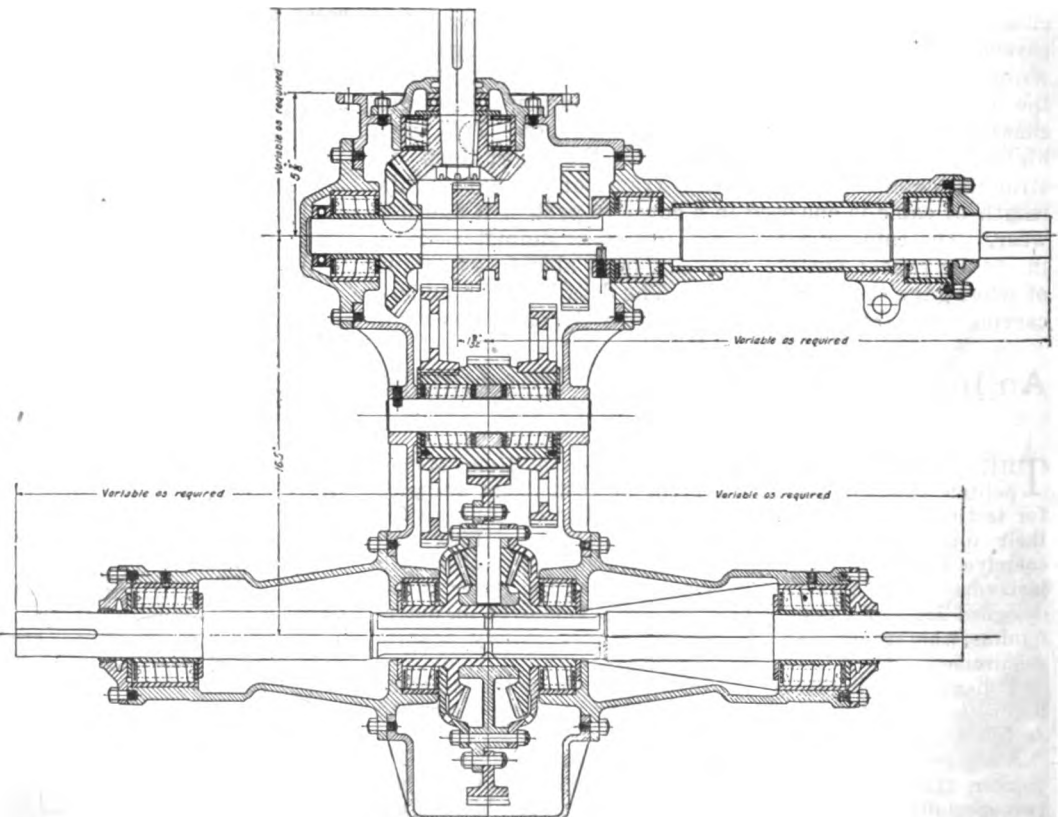
The Nuttall transmission may be used with either a longitudinally or a transversely mounted engine, and the two constructions are illustrated herewith. In one case a short shaft extends into the transmission housing from the front, and carries the bevel pinion, meshing with another bevel pinion on the splined shaft, whereas in the other case the splined shaft extends entirely through the housing and is provided at its outer end with a sprocket wheel, or connected directly to the engine, as the case may be. With either type of engine the transmission may be mounted either in a horizontal plane or in an inclined plane. It is possible to provide the front end of the case with a bell housing, which may be connected directly to the engine bell housing, thus making of the engine and transmission a unit power plant. This arrangement is particularly desirable where a disk clutch is used, as this makes absolute rigidity necessary.

Although designed for 3-4 plow tractors, which are generally equipped with engines of 15-30 hp. ratings, the Nuttall transmission is claimed to be well able to transmit 42

hp. at 800 r.p.m. of the engine. Its average weight is 500 lb. The bearings which carry the power shaft are interchangeable end for end, which permits of the power shaft extension being placed on either the right hand or the left hand side. Where the front drive arrangement is used, that is, with a longitudinally mounted engine, slight variations in speed are possible, which are obtained by changing the number of teeth in the bevel gear and pinion. The design also permits of placing the bevel gear on either the right hand or left hand side of the bevel pinion, thus permitting the use of either an internal or external bull gear.

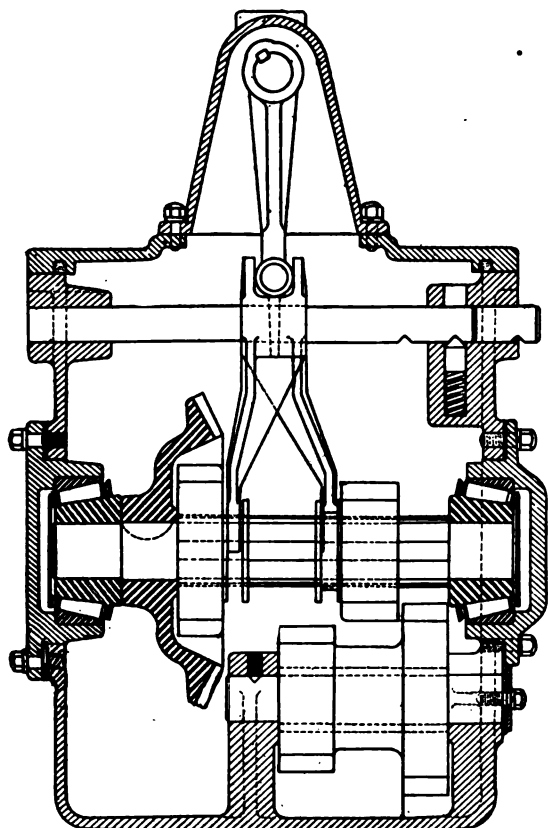
Some tractors have single wheel drives, and these do not require a differential gear. In this case only one bull pinion shaft is used, to which is keyed the main driving gear, and the differential gears are omitted. In the case of a chain drive, sprockets are used in place of bull pinions, but the transmission is mounted the same as for the gear drive.

In the design of the Nuttall transmission, efforts have been made to distribute the load due to gear action among the different bearings as nearly equally as possible, so that no bearings shall be subjected to an excessive load. The shifting mechanism, which works on the selective principle, is provided with a safety lock, making it impossible to have both sets of gears in mesh at the same time. For mounting the transmission on the frame, the housings of the jack shaft are provided with lugs, which can be bolted to the frame, and there is also a lug on the outboard bearing of the power take off shaft.



Standard Nuttall transmission for bull gear drive

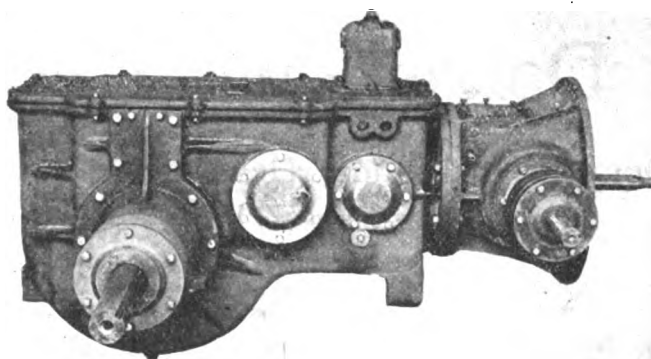




*Vertical section through new Nuttall transmission*

Where the engine is mounted cross-wise on the frame, the housings for the jacketshaft on opposite side of the transmission housing are made of unequal lengths, so that the transmission comes close to one side member of the frame. The splined shaft of the transmission is then directly connected to the clutch shaft in line with the crank shaft.

Where the transmission is mounted at an angle fore and aft, or when the tractor is on a grade, there is a tendency for all the oil to flow to the lower end of the case. To prevent this partition walls are cast in the bottom of the case, which hold the oil under each set of gears.



*Side view of new Nuttall transmission and rear axle*

Quite recently the Nuttall Co. has completed a new tractor gearset intended for tractors pulling three or four plows. The gearset is a live axle design suitable for wheels up to 50 in. in diameter. It gives a gear ratio of 51.8 to 1 on low gear and 36.5 to 1 on high gear. With 50 in. rear wheels this gives a low speed of 2.4 m.p.h. and a high speed of 3.5 m.p.h.

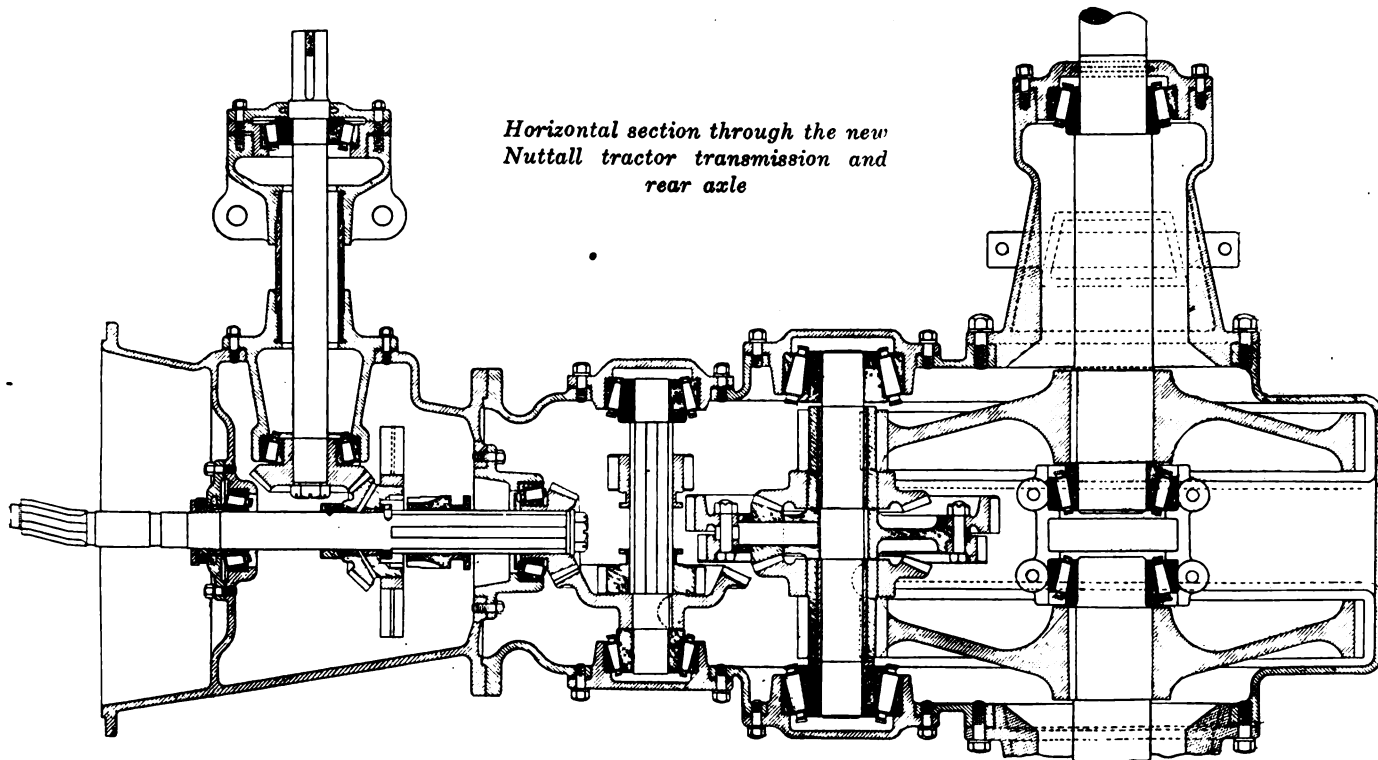
The company is not yet completely tooled up for production on this new job, but in 60 days should be starting production and by Jan. 1 should have an output of 10 per day.

The gearset is a compact design in two parts, the transmission, which embraces the differential and rear axle drive shafts, and the forward end, which has a separate housing enclosing the bevel gears for driving the belt pulley. This separate portion bolts on the forward end of the gear box and has a bell housing end for bolting to the engine crankcase.

All gears are forged, including the large gears on the inner ends of the axle drive shafts, which are hydraulic forgings of 40-50 carbon steel.

The set complete weighs 1385 lbs. and affords three reductions. All shafts are carried on Timken bearings. The set of bevels driving the belt pulley are locked to the longitudinal shaft by a sliding clutch. The pulley shaft, together with its two Timken bearings, is a unit bolting direct into the side of the forward housing. The forward shaft of the gearset is splined and carries the two live gears, the differential being on the secondary shaft which transmits through two large gears on the divided rear axle. These drive shafts are  $3\frac{1}{4}$  in. in diameter.

*Horizontal section through the new Nuttall tractor transmission and rear axle*



# Dorris Two-Ton Truck Model K-4

Detachable Cylinder Head Doing Away with Valve Cages, One of the New Features—Three-Point Suspension Used Throughout—  
Final Drive Through Worm Gear

A NEW 2-ton truck model of the Dorris Motor Car Co., St. Louis, Mo., has reached the production stage. The Dorris company has been building 2-ton trucks since 1911, and, like its previous trucks and passenger cars, the new truck has a valve-in-the-head engine.

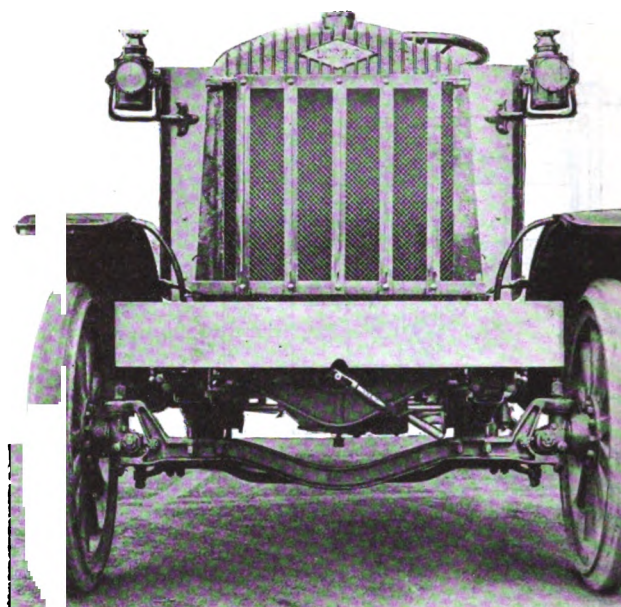
What appears to be the principal improvement of the new engine is a detachable cylinder head, which affords greater valve accessibility and eliminates valve cages. With the valve seats directly in the cylinder head, the water can circulate all around them and thus insure adequate cooling of the valves under all operating conditions.

The new engine has a cylinder bore of  $4\frac{1}{4}$  in. and a stroke of  $5\frac{1}{2}$  in. This is equivalent to 312 cubic inches piston displacement and to a N. A. C. C. rating of 28.9 hp. On the block the engine is said to develop 38 hp. at 1090 r.p.m. It shows a maximum torque of 175 lb.-ft. One of the notable features of the engine is its five-bearing crankshaft. This has a diameter of  $2\frac{1}{4}$  in. Of the main bearings the four forward ones are 2 in. long each, while the rear is  $2\frac{9}{16}$  in. long. The connecting rod bearings also are 2 in. long. All bearings are of the bronze-backed nickel babbitt type and are  $\frac{3}{16}$  in. thick. The same as the crankshaft, the camshaft is supported on five bearings, and therefore is very rigidly mounted.

## Aluminum Crankcase

The crankcase is cast of Lynite aluminum alloy and is formed with five heavy ribs to support the main bearings. This design lends itself to a very rigid construction, and it also facilitates adjustment of the bearings. The lower half, which forms the oil well and contains the oil screen, is also cast of aluminum alloy. Helical gears serve for driving the camshaft from the crankshaft, and these are of an exceptional width of face ( $1\frac{1}{2}$  in.). The valves, located in the cylinder head, have a clear diameter of  $1\frac{1}{8}$  in. and a lift of  $\frac{11}{32}$  in. They are made of tungsten steel. To insure positive valve action and at the same time smooth seating under extraordinary conditions of motor load, each valve is provided with two springs.

Lubrication is by force feed to all of the main bearings and to the connecting rod bearings, the crankshaft being drilled diagonally for this purpose. A continuous oil bath



Front view of Dorris truck

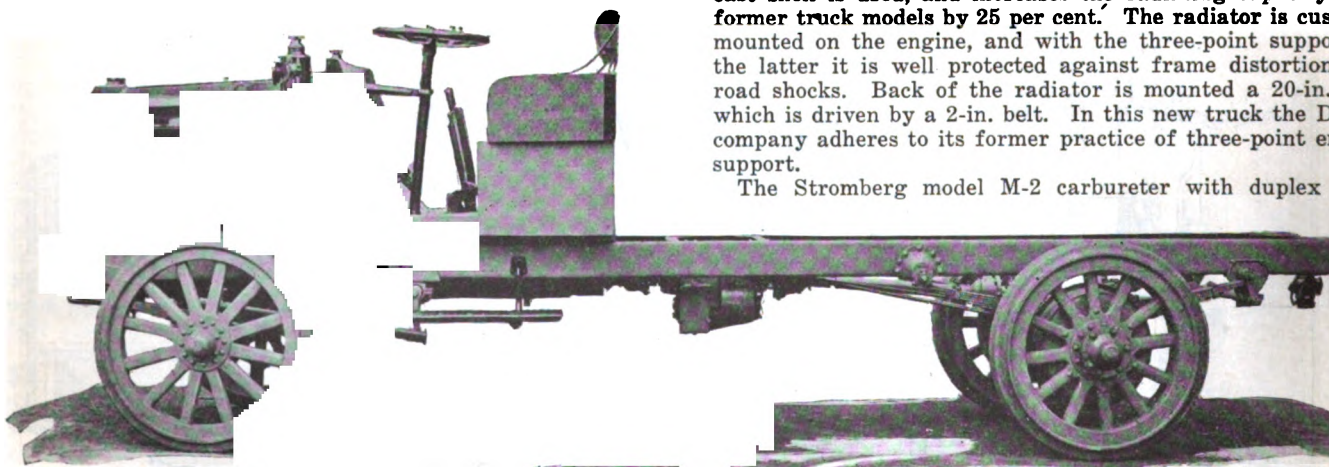
is provided for the valve mechanism and timing gears. The oil bath also serves to lubricate the spherical pivot supports of the push rods, which latter are adjustable by removing the pressed steel housing covering the rocker arm mechanism.

After experimenting with a variety of engine governors the Dorris company, in its new K-4 model, has incorporated a governor of its own design, which is built integral with the engine. It is completely enclosed, adjustable and seal tight, besides which it is claimed to give perfect governing and to be trouble proof. The engine speed is governed at 1090 r.p.m., which corresponds to a truck speed of 15 m.p.h.

## Three-Point Support for Engine and Gearset

A radiator of the vertical flanged-tube type with a cast shell is used, and increases the radiating capacity of former truck models by 25 per cent. The radiator is customarily mounted on the engine, and with the three-point support the latter it is well protected against frame distortion under road shocks. Back of the radiator is mounted a 20-in. flywheel which is driven by a 2-in. belt. In this new truck the Dorris company adheres to its former practice of three-point engine support.

The Stromberg model M-2 carburetor with duplex



Side view of Dorris 2-ton truck chassis

control and U tube is fitted. In connection with this carbureter is used a hot spot manifold, and easy starting and high fuel economy are claimed.

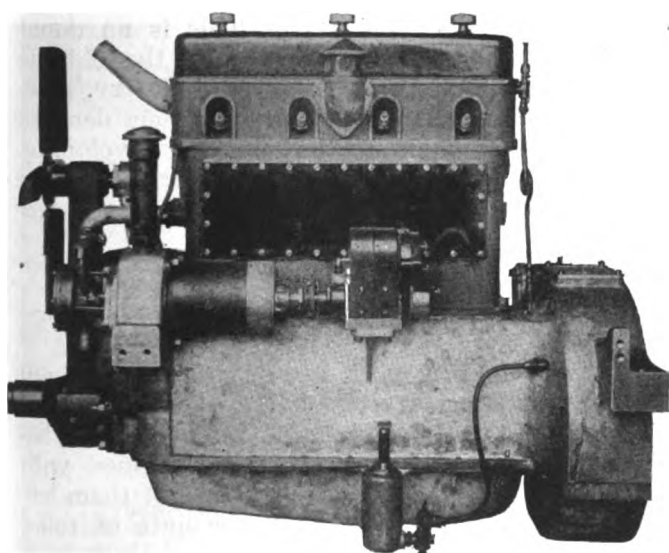
The clutch is of dry-disk type, and is built into a unit with the engine. It comprises seven disks, and affords a smooth, easy clutch action, together with a positive drive under all load conditions. The gear box is of the four-speed type, and is mounted separately amidships, one of the advantages of this mounting being unusual accessibility. Like the engine, the gear box has a three-point support, whereby it is protected from all frame distortion. The gears are made of 3½-in. nickel steel, and the whole transmission is enclosed in an oil-tight case.

From the gear box the power is transmitted to the rear axle through tubular drive shafts, fitted with large Spicer universal joints, the drive being so arranged that when the truck carries a complete load the various elements are in alignment.

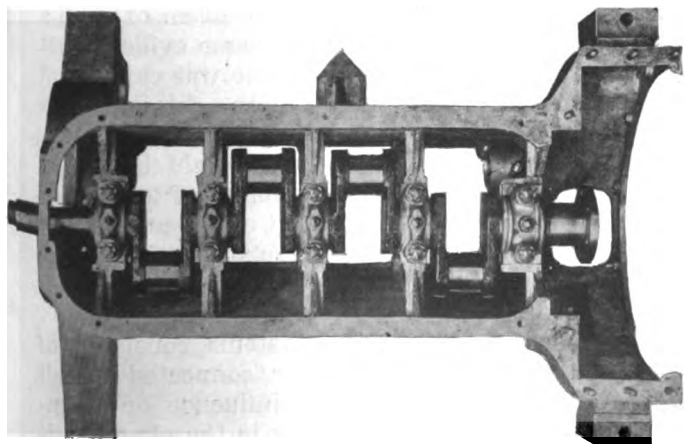
### Pressed Steel Frame

The frame is built up of cold pressed steel channels, made from hot-rolled stock, these channels having a section 6 in. deep with 2½-in. flanges of ¼ in. thickness. The front axle is a drop forging of I-beam cross section, and the steering knuckles are mounted on Timken roller bearings. The rear axle is provided with the Timken-David Brown worm drive, and is completely enclosed in a reinforced pressed steel housing.

Left hand drive and center control are features of the new truck. In addition to the hand lever for throttle control, there is a foot accelerator. All control levers and pedals are of extra size and strength. The steering gear is of the worm and double nut type, which can be adjusted for wear.



*Engine of the Dorris 2-ton truck*



*Five-bearing crankcase*

Chrome vanadium steel springs are fitted, the front springs being 42 in. long by 2½ in. wide, and the rear springs 56 in. long by 3 in. wide. In the rear springs the second leaf is wrapped around the spring eye, insuring rigid construction and eliminating to a large extent all danger of spring breakage. The driving thrust and torque reaction are both taken to the rear springs, and a number of parts and their weight are thus eliminated.

### Equipment

The regular equipment furnished with the Dorris model K-4 comprises an oil pressure gage, a shaft-driven speedometer, oil side and tail lamps, driver's seat with Marshall spring construction, foot-operated horn, jack and complete set of tools.

If it is desired by the customer, an electric starting and lighting equipment may be readily installed, provision being made by the Dorris company for a Westinghouse 2-unit starting and lighting system with Bendix drive, in connection with a Willard storage battery. The battery furnished is of unusually large capacity.

The weight of the chassis complete is 5200 lb., and the chassis is furnished in two lengths of wheelbase, 144 in. and 162 in. The Dorris company is concentrating on this one model, for which it believes there is a large field, as the truck is of sufficiently rugged construction to permit of carrying as much as three tons under certain favorable conditions, and it is not too heavy to make its use advantageous where only one to one and one-half tons of pay-load have to be hauled.

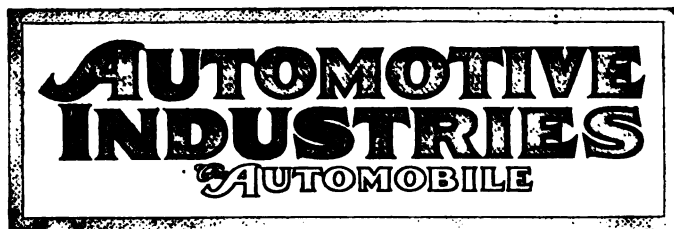
### Experiments on Heat Dissipation

EXPERIMENTS have been made by the Engineering Department of the National Physical Laboratory on the effect of surface roughness on the heat transmitted from hot bodies to fluids going over them. The results of experiment for determining the heat transmission to water from the internal surfaces of brass pipes, smoothed and rough, showed that with the amount of roughening obtained the heat transmission per unit surface per degree difference of temperature between the metal and water for the smooth pipe could be increased in the ratio of about 2.5 to 1 for the same mean velocity of flow. It was obvious that if improvement of this order could be made in surfaces of air-cooled engines and radiators, considerable economy in material could be effected in aeroplane engine design. To test this out, a series of copper flanges of the form and distribution commonly adopted in air-cooled engines were fixed to a cylinder of the engine and set up in a wind channel. An electric current from a storage battery was then circulated through the flanges, and from measurements of the current and resistance it was possible to obtain the temperature of the flanges and the heat dissipated. The flanges were first tested in their ordinary smooth condition, and were then roughened by means of corrugated steel dies. In these experiments the roughening appeared to produce practically no effect on the heat transmission, this result indicating that the convection to the rough and smooth surfaces was approximately the same in each case.

### Investigation of Woods for Struts

TESTS have been made by the British Advisory Committee for Aeronautics on half-sized stream line struts, in order to compare the values of different kinds of wood for this purpose. Each strut was tested with an axial end load, and by the use of compound knife edges each end of the strut was free to take up any angle or position then under test. The modulus of elasticity for each material was found by a bending test, and this value was used to calculate the critical load to cause indefinite bending, according to the Euler theory for a simple strut. The agreement between these critical loads calculated from the dimensions of the strut and the modulus of elasticity of the material and the observed loads causing failure was remarkably good, indicating that the end constraint obtained with the special device adopted was negligible.





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## Tractor Standards Urgently Needed

NOW that serious attempts are being made to specialize in the manufacture of tractor parts, there is urgent need for further standardization. We fully realize that it is impossible to work out the fundamental problems of tractor design at the conference table, but much can be done to facilitate the manufacture of tractors designed in accordance with the present state of the art.

A point in question is the width of engine supports. Manufacturers of tractor transmissions must provide a shaft for the belt pulley, with a suitable housing and outboard bearing. If there were certain standard widths of engine supports, each covering a considerable range of engine power, the manufacturer of the transmission could make the pulley shaft a given length and be tolerably certain that it would fit practically every tractor frame. At the present time the engine makers have no standards to work to, and the widths between supports

range in a large number of steps between 18¾ and 26 in. There seems to be no reason why three sizes, say, 18, 22 and 26 in., would not serve all purposes. The former would not serve all purposes. The former would be used for the smaller and the latter for the most powerful engines, and all engines of substantially the same horsepower rating would have the same width at the supports.

It is this state of affairs that is holding back specialized development of tractor units. At present a great many tractor concerns are turning out tractors only in small numbers, and if the parts maker has to design his castings, etc., especially for each make of tractor, much of the advantage of specialized manufacture is lost.

Another subject which requires further attention is that of bell housings. These have been standardized for automobile engines, but owing to the greater strain on the housings of an unsprung machine, and especially on those housings which also form the supporting framework of the tractor, these standard housings have proved to be of inadequate strength. It is necessary for tractor purposes to use larger bolts than are provided for by the present standard, and they should be further removed from the inside edge of the flange.

The S. A. E. has made a beginning in tractor standardization, but so far little of any real consequence has been accomplished. This is no doubt due, in part, to a certain apathy of the old-line tractor manufacturers. The tractor industry, however, is entering a new stage, and a strong demand for standardization in certain lines is developing. The business of parts concerns is directly affected by standardization, and they will help the movement along in every possible way.

## Farm Lighting Outfits

THE farm-lighting outfit is a natural development of the electrical equipment for automobiles. It is true that farm-lighting outfits were proposed before automobiles generally became equipped with starting and lighting systems, but most of them left much to be desired from the viewpoints of reliability and economy.

The automobile electric system constitutes really a complete electric lighting and power plant, automatic in operation, and after the problem of such a system had been fully solved it became evident that the farm-lighting-outfit problem also was capable of a satisfactory solution. Many of the details of the farm outfit, of course, would differ essentially from those of the automobile system. Weight is not an important factor, but the economy of operation must certainly be better than that of the automobile system, which in spite of being relatively inefficient does not waste much energy because very little is actually used.

The earliest farm-lighting systems consisted of slow-speed stationary gas engines, connected by belt to the generator. Automobile influence on farm-lighting outfit design may be seen in the almost universal adoption of high-speed engines for these out-

fits—not strictly high speed in an automobile sense, but certainly high speed as compared with the old-style stationary gas engine. In fact, the speed of the engine has been brought up to a point where the engine can be direct-connected to the generator without the necessity of making the latter of inordinate size.

The advantage of a direct-connected unit over a belt-driven one is apparent. Not only is the need for a belt done away with, but the amount of floor space required is greatly reduced. In fact, where a belt-driven outfit requires a whole room, the direct-connected outfit may be placed in one corner of a room.

Engines of electric farm-lighting outfits are regulated for constant speed, usually by means of a throttle governor, and the problem of voltage control therefore is quite a simple one. On the other hand, certain safeguards must be provided to protect the battery against abuse. The farmer at certain seasons of the year is very much occupied with his field work and unless the outfit is so worked out that it pretty nearly takes care of itself, it is apt to prove unsatisfactory.

## What the Law Requires Is Not Enough

**W**HEN it comes to things which the law requires in the way of plant design and equipment, just meeting the legal requirements is, more often than not, less than what the wise and prudent manufacturer will do and not by any means all that he should do now.

What the law specifies is usually a minimum and at best it is a compromise between necessity and desirability. It is something that can be worked out in all cases and therefore not all that can be done to good advantage in most.

We are thinking now more particularly of health and safety provisions and can say, while the thought is with us, that the fact that there are such laws is, in a way, a sad commentary on our intelligence. From a more enlightened point of view they might seem like compulsory measures calculated to make us profit through the benefits which they insure. But be that as it may, the point of our present argument is that the material benefits to be derived from a liberal and intelligent provision of the things which the law prescribes fully warrant the investment and make it good business in most cases to meet the law and go it several better.

It has been repeatedly demonstrated that production is stimulated to a large extent by the very things which it has been found necessary to incorporate into law. It has been shown conclusively that the health of the worker is a matter of monetary importance to his employer. We may well quote again "Without health there is no energy, without energy there is no output," and we can add the obvious conclusion that without output there are no profits.

The newer thought is that the responsibility—and

owing to the great world need for efficiency in production methods it is to-day regarded as a responsibility—of the employer is concerned not only with the conditions under which the worker works, but with the physical condition of the man himself as well.

What the law requires in health and safety provisions is not enough to-day, either from the point of view of the manufacturer or of the country as a whole.

## Putting Our Colleges on War Service Basis

**D**URING the past year a striking metamorphosis has taken place in our college life. Even before the United States entered the war, many students left college to become ambulance drivers, and when this country became a belligerent so many volunteered for service and later were taken by the draft that some institutions were forced to close their doors for want of students and others faced an almost equally critical situation. While some of the older institutions are largely supported by endowment funds, the majority of our colleges are dependent upon tuition fees for their support, and with the decline in attendance their income dwindled away.

It is of the utmost importance to the nation that its institutions of higher education should be maintained through the period of the war, and the arrangement which has just been made, whereby the Government takes over the colleges and uses them for training men used in various capacities in connection with war work, is, therefore, to be hailed with approval.

In view of the immense amount of engineering work required at this time, much of which is of an entirely new character, intensive engineering training is quite essential, and under the new arrangement it will be given to those men in the draft who show most aptitude for such training. It is understood that the students will be picked mainly from the new class between the ages of 18 and 21, which embraces the usual range of age for entering college.

It is to be presumed that owing to the selective methods the student material will be of a better grade than normally, and the intensely practical nature of the courses to be offered should lead to results that will prove of great value to the nation.

Engineering is, of course, only one of the branches of instruction to be given during the war period. The colleges will also prepare men for infantry, artillery and machine-gunnery, naval and medical work. In fact, the Students' Army Training Corps, as the body of men enrolled in the Government's college courses will be known, will form a source of supply of skilled men from which all the various branches of our fighting and auxiliary forces can meet their requirements. As regards the class of service, the personal preference of the students are to be considered.

# □ Latest News of the

## Detroit Factories on War Work

### Passenger Car Manufacturers in That District Average 75% on Munitions

DETROIT, Sept. 17—War work is steadily increasing in volume in this territory and production of passenger cars is gradually diminishing. Speaking generally all passenger car manufacturers are 75 per cent on war work. While some have entirely suspended the manufacture of passenger cars, others are still engaged to 50 per cent of their facilities on commercial production. Many, however, although working on a very decided curtailment program, have a small percentage of war work in their plants. All the larger companies are in excess of 75 per cent on war work.

The Toledo plant of the Willys-Overland, Inc., is on a 75 per cent basis, while both the Elyria and Elmira plants devote 80 per cent of their facilities to government work. From a daily production of 425 cars in June, the output of the Willys-Overland has decreased to 200 cars a day. The plant is engaged in making gun carriages and shells, and recently received an order for 3000 Liberty 8's, for which it is tooling up.

The Saxon Motor Car Co.'s plant is devoting 25 per cent of its facilities to building trucks with the resulting reduction in passenger car production of 50 per cent since June. The company has a present output of twenty-five passenger cars daily. Paige, Reo and Maxwell are on a 75 per cent, Columbia Motors 60 per cent, Dodge about 90 per cent and Harroun 50 per cent war work basis.

General Motors Corp. and Chevrolet are on a 65 to 75 per cent war basis and orders for the Government are said to aggregate \$125,000,000. The Oakland Motor Car Co. is the only unit of the General Motors that has no war work. The General Motors Truck Co. is devoting almost its entire plant to war work, about 90 per cent of its facilities being engaged directly on trucks for the Government.

Willys-Overland, Inc., war orders are reported to aggregate more than \$50,000,000, and those of the Maxwell Co. are equally as great.

While both the Ford and Packard plants are on 100 per cent war basis, the plants of the Dort Motor Car Co. and King are working only on commercial production at the present time, the latter company having finished its contract for Government ambulances a short time ago.

The commercial production of passenger cars of the following companies averages 25 daily: Dort, Hudson, Paige and Saxon. The King output is four and the Columbia seven. The Scripps-Booth Corp. has reduced its production 50 per cent since July; it now builds 20 cars a day.

### Studebaker to Stop Production

SOUTH BEND, IND., Sept. 18—Special Telegram—Production of Studebaker passenger cars will stop as soon as the present stock of materials has been worked up. This announcement was made to 150 Studebaker dealers who gathered here to-day to get an outline of the company's relations in regard to them. Jan. 1, 1919, is the date set for the termination of passenger car work, from which time on the concern will concentrate on 100 per cent war work. The company is erecting some 300 homes in this city for workers to be employed in the shell plant, which also will be in operation about the first of the year. The continued rendering of Studebaker service was regarded as essential, and the furnishing of parts and replacements will be carried on as heretofore through the customary channels. The company's intentions are to give Studebaker owners the best of service.

### Hackett Suspends Operations

JACKSON, Sept. 11—The Hackett Motor Car Co., owing to difficulties in procuring materials to maintain production, has suspended operations.

### Jobbers Abandon Fall Convention

CHICAGO, Sept. 19—Special Telegram.—The National Association of Automobile Accessory Jobbers has called off its fall convention. This was to have been held in Medinah Temple, opening Oct. 28 and closing Nov. 2. The abandonment of the convention follows the decision not to hold the automotive equipment exhibition which was scheduled for the same building during the holding of the convention.

### Wolfe Leaves Goodyear

AKRON, OHIO, Sept. 17—William S. Wolfe, formerly assistant chief experiment engineer of the Goodyear Tire & Rubber Co., has entered the service of the maintenance division of the Motor Transport Corps.

### Dayton Wright Co. Builds 1000 Airplanes

DAYTON, Sept. 16—The Dayton Wright Aeroplane Co. has built its thousandth airplane. Six thousand operatives are now employed in the plant.

## New Labor Service Created

### Plans Drafted for Organizing a Training and Dilution Section

WASHINGTON, Sept. 17—The Department of Labor authorizes the following:

In order to stimulate production of war supplies through the organized training of workers, to increase the competency of wage-earners and to point out ways for rendering the existing supply sufficient through dilution, the Department of Labor has drafted plans for the organization of the Training and Dilution Service.

These plans have been made after a survey of the general industrial situation. Consideration has been given existing facilities for training workmen, and a study has been made of the supply and demand for skilled workers. Incidental to the stimulation of production is the protection of wage-earners against exploitation through unnecessary dilution of labor, guarding of established trade customs and standards against needless relaxation, and, where these trade customs and standards have been relaxed, the provision of means for restoring just standards.

This service will assist all departments of the government. In addition, it will help many industries to secure more and better trained workers, when such help will benefit war production. It will also suggest improvements in training methods relating to processes, occupations and trades; will propose to factories improvements in organization that will increase output through better working conditions; will draft plans so that manufacturers may train workers, and will organize and conduct such courses of instruction. This work will be done either directly or in co-operation with the Federal Board for Vocational Education, and with state and municipal school authorities.

In order to render more effective the work of the Training and Dilution Service, a close connection is being perfected between it and the production departments of the government (Ordnance, Quartermaster's, Air Service, Navy Department and others), so as to secure prompt action when war contractors are in special difficulties which may be relieved through the training of workers. District Superintendents of Training are being appointed.

Whenever a contractor applies for help in questions of labor, this superintendent will be instructed to visit the plant. After a consideration of the conditions at that plant, and if conditions are favorable, the superintendent will organize for the employer a special training department, select competent trainers from his regular force of instructors, or suggest competent instructors from lists which the Training and Dilution Service is compiling.

Educational facilities for the instruction of employment managers have been maintained during the past few months at several universities, the first having been offered by the University of Rochester. The United States Employment Service of the Department of Labor has assisted in financing these courses in employment management; and the Director of Training and Dilution has acted with the committee in general charge of the instruction. These courses are deemed so important that both the Training and Dilution Service and the Employment Service hope to increase the number of courses now offered.

In the Dilution Service a section on "Needs and Supply" will study sources of new labor and its applicability to industries, co-oper-



# Automotive Industries □

## Car Factory Labor Disturbed

### Seek Ruling Regarding Essentiality of the Work—The Revised Regulations

WASHINGTON, Sept. 18—Following the recent draft registration many of the passenger car factory employees hastened to leave this industry for others more directly termed war work, and to prevent disaster to the industry, Hugh Chalmers, representing the manufacturers, has been in Washington this week taking up this matter.

He attempted to have the passenger car placed on the preference list, at least until the end of the year. For various reasons the War Industries Board decided against this. It was, however, explained that the preference list is no absolute guide to the District Boards, which have complete power to decide individual cases and the status of individual industries.

It was further stated that the preference list does not guide the "work or fight" order but is merely used to determine deferred classification for occupational reasons.

In other words the men entitled to deferred classification because of reasons other than occupational will not be drafted under the "work or fight" rule unless they enter under the five classes which Provost Marshal-General Crowder named last spring and which included such occupations as clerks in mercantile establishments, persons engaged in sports, etc.

As a result it is advised and will be suggested in a letter by the N. A. C. C. to the manufacturers that every manufacturer should make an affidavit to the District Board to the effect that he manufacture passenger cars, trucks or both, that he has specified war work in his plant, if this is so; and he is advised to say that it is absolutely necessary to keep certain employes for work on passenger car production until the inventories are balanced as per the agreement between the N. A. C. C. and the War Industries Board.

It is also suggested that the individual employee who is essential should make an application for deferred classification and file it with the Board together with affidavit of his company and a copy of the agreement of August 24 between the N. A. C. C. and the War Industries Board.

It is believed that since the manufacturers must be allowed to continue, to fabricate the materials on hand and complete production or suffer great financial

injury, that the District Boards will heed the pleas. These Boards are governed largely by the decisions of an Advisory Board which investigates the merits of the different industrial exemption claims and which are comprised of a member nominated by the Department of Labor, one by the Department of Agriculture and one by the District Board.

Following is an extract from the revised selective service regulations which explains in detail the consideration given the preference lists issued by the War Industries Board and the methods of determining industrial exemption:

District boards are charged with the duty of selecting the individuals whose engagement in industry, including agriculture, or whose occupations or employments are such as to require their continued service in civil life rather than in the army.

In order to provide for the necessary adjustments between the necessities of the military establishment and the requirements of the industries, occupations, and employments, including agriculture, found to be necessary to the maintenance of the military establishment, the effective operation of the military forces, and the maintenance of the national interest during the emergency, there shall be appointed by each district board three persons to be known as industrial advisers to the district board.

One such person for each district board shall be nominated by the Department of Labor, one by the Department of Agriculture, and one by each district board, who shall thereupon be appointed by the respective district boards.

Whenever, in the discretion of the President, more than three such industrial advisers are required by a district board, the President may call upon the Department of Labor, or the Department of Agriculture, or the district board to nominate such additional industrial advisers, who shall thereupon be appointed by such district board.

Such industrial advisers so appointed by each district board shall not in any sense be members of such district board, shall have no right to vote at any meetings thereof, and shall have and exercise only the rights, duties, powers, and functions herein specifically given.

Such advisers shall have the right to furnish all pertinent information to the district board and may attend meetings of the board upon request of the board to which they are attached.

Such advisers may place before the district board at its meetings, or at such other time as the board may request, all facts and information in their possession as to the preference lists issued by the Priorities Division of the War Industries Board. Such lists shall not be regarded as binding upon the district board in its conclusions as to whether or not any particular industry, occupation, or employment, including agriculture, is a necessary industry, occupation, or employment within the meaning of the law and regulations, nor shall such lists prevent the district board from holding as necessary any industry, occupation or employment, including agriculture, not contained therein. Such preference lists and other facts and information in the possession of such advisers will supplement the information in the possession of the district boards and will also be used to assist the district boards in dealing with specific cases.

### Investigate Tin Stocks

WASHINGTON, Sept. 18—The War Trade Board has requested concerns in this country to make statements of the tin plate held in stock for exportation to foreign buyers or for sale to exporters who have orders from foreign buyers.

## Senate Favors Air Department

### Recommends Passage of Bill Creating Secretary of Aeronautics—Amendments

WASHINGTON, Sept. 18—The Senate bill to create an executive Government department to be known as the Department of Aeronautics and for the appointment of a Secretary of Aeronautics was reported favorably to the Senate by the Committee on Military Affairs yesterday. Several amendments were filed and it was recommended that the Senate pass the bill.

Following is the original bill and the report containing the amendments and recommendation:

### Text of the Bill

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that there is hereby created for the period of the present war and for one year thereafter an executive department in the Government of the United States to be known as the Department of Aeronautics, the head of which shall be designated the Secretary of Aeronautics, who shall be appointed by the President and confirmed by the Senate. He shall be a member of the Cabinet and shall receive a salary of \$12,000 a year. The Secretary of Aeronautics shall have direct and complete control of all matters pertaining to the designing, purchase, manufacture, and production of aircraft and aircraft equipment intended for use of the Army, the Navy and the Marine Corps of the United States.

That the department shall also have an Assistant Secretary, who shall be appointed by the President and confirmed by the Senate, who shall receive a salary of \$5,000 a year; and such other officers and employees as may be found necessary for the proper and efficient transaction of the business of the department.

That the unexpended balance of such appropriations as may have hitherto been made for the purchase and manufacture of aircraft and aircraft equipment and all appropriations which may hereafter be made for such purpose shall be available for the purposes of the department.

### REPORT

The Committee on Military Affairs, to whom was referred the bill (S. 4852) to create an executive department in the government to be known as the department of aeronautics, and for the appointment of a secretary of aeronautics and an assistant secretary, and providing for appropriations for said department, having had the same under consideration, report it back to the Senate with the recommendation that it pass with the following amendments:

On page 1, line 9, strike out the words "shall be a member of the Cabinet," and

(Continued on page 516)

## New York Approves Anti-Glare Devices

Bulbs of Prescribed Candlepower Must Be Used to Comply with State Law

ALBANY, N. Y., Sept. 16—Secretary of State Francis M. Hugo has made public the names of 45 anti-glare devices which have been tested according to the provisions of the New York headlamp law and which are approved for use in New York State. However, it is essential, in order to comply with the requirements of the law, that they be used with headlamp bulbs of prescribed candlepower, and, in some cases, that headlamps be properly tilted. In the case of 20 devices, lamps need not be tilted.

The law under which these tests were made undoubtedly represents the first attempt of any state legislature to attack the headlamp glare problem in a scientific manner. Prior to the drawing of the law, the Secretary of State's office consulted with representatives of the Society of Automotive Engineers and the Society of Illuminating Engineers in an effort to obtain some basis upon which to determine the nature of glare and the best remedial measures. In consequence, a measure was drawn which prescribed that:

1—The candlepower of headlamps must be at least 1200 at a distance of 200 ft. in front of the car and at a point between the roadway and 42 in. above it.

2—The candlepower must not exceed 2400 at a distance of 100 ft. in front of the car and at a point 60 in. (or any higher) above the road.

3—The candlepower must not exceed 800 at a distance of 100 ft. in front of and 7 ft. to the center of the car at a point 60 in. above the road.

The devices which have been approved have been determined by tests to come within the requirements of the law when used with bulbs of a prescribed candlepower. In using these devices, Secretary Hugo suggests that dealers and owners:

1—See that the right candlepower bulb is used.

2—See that lenses are properly placed and not twisted; that the top side is at the top and that the front is outward.

3—See that the tilt is correct. To do this have the car on a level surface in front of a wall or some suitable vertical surface, 30 ft. or more distant. Remove the front glasses or devices and by means of focusing adjustments move the bulb back and forward until the beam of the smallest diameter is obtained on the wall. By measuring the height of the center of the beam from the ground and comparing that with the height of the center of the headlamps from the ground, the tilt can be ascertained and adjusted as required.

4—See that the bulb is properly adjusted with respect to the focus of the reflector with the controlling device in place. Do this by observing the beam pattern on the wall.

Herewith is the list of approved devices.

The term "B Lamp" in the accompany-

ing table refers to the usual Tungsten headlamp bulb. The term "C Lamp" refers to the gas-filled headlamp bulb.

### Urge Higher "Gas" Price for Canada

OTTAWA, Sept. 10—That an order-in-council fixing the retail price of gasoline in Ontario and the West is advisable, is a statement made in a report by R. J. McFall, High Cost of Living Commissioner, to Hon. T. W. Crothers, Minister of Labor, on the cost of gasoline, made public to-day. McFall suggests a ruling which would establish 36 cents as a maximum retail price in Ontario, 43 cents in Saskatchewan and 45 cents in Alberta. No changes are suggested in the wholesale price of gasoline, it being noted that the cost of imported gasoline has increased from 5/6 of a cent to 1½ cents a gallon because of increased freight rates and other causes.

### Mason Rubber Co. Gets War Order

KENT, OHIO, Sept. 14—The Mason Rubber Co. has been awarded a Government order for \$100,000 worth of gas masks and raincoats and it is anticipated that further war orders will be received.

## Gasoline Shortage in Argentina

75 Per Cent of Automotive Vehicles Laid Up in Storage Owing to Lack of Fuel

BUENOS AIRES, Aug. 15—There is practically a complete stoppage of the use of automobiles in Argentina, due to shortage of gasoline. Not only is gasoline selling at an exorbitant price but the actual lack of it is so great that conservative estimates say that 75 per cent of the automobiles are laid up and in storage in consequence.

This situation is acting very much to the detriment of the sale of American motor trucks, tires, accessories, automobiles and motorcycles. This is the winter season and bad roads always stop a percentage of cars from being used while the rainy season is on, but this year the situation is more acute than ever before in the history of the American automobile in Argentina.

Large distributors of American acces-

### Automobile Lenses and Devices Approved by New York State

Devices	Beam Horizontal		Beam Tilted		Tilt, Ft. per 100 Feet.
	B Lamp.	C Lamp.	B Lamp.	C Lamp.	
Bausch & Lomb.....	..	..	17	15	3
Conaphore, clear.....	17	13	24	20	1
Conaphore, noviol.....	17	13	24	20	1
Controllite.....	18	20	..	..	..
Clamert.....	18	15	..	..	..
Culver, radio.....	17	17	20	20	1
Coreylite.....	24	24	..	..	..
Crew-Levick, Fractor.....	20	11	24	20	1
Dillon.....	10	..	..	..	..
Dwellelight.....	10	..	..	..	..
Enlow, prism dimmer.....	16	14	22	20	3
Hein, dimmer.....	24	24	..	..	..
Holophane.....	18	16	22	20	1
Legal level light.....	..	..	17	20	2
Lee Knight lens.....	11	13	18	24	1½-2*
Lenalite.....	19	16	22	20	1
Liberty.....	17	21	..	..	..
Letts.....	..	..	24	24	2½
Legalite.....	..	..	17	20	3
Mac-Kno-Glare, bulbs.....	20	..	..	..	1
Mac-Kno-Glare, caps.....	..	..	20	21	1½
McKee.....	11	15	17	21	1
More-Lite, clear.....	10	..	..	..	..
Macbeth.....	21	24	..	..	..
Nu-Ray.....	11	10	17	15	1
No-Glare-On, bulb.....	10	..	..	..	..
Non-Glare, lens.....	..	..	17	20	4
Non-Glare, shade.....	24	24	..	..	..
Osgood.....	15	15	20	20	1
Ormliston.....	24	24	..	..	..
Prismolite.....	13	12	20	20	2
Primolite.....	19	25	..	..	..
Raydex.....	..	..	22	20	1½
Right.....	11	13	19	21	3
Sun-Ray.....	10	14	17	20	1
Saferlite, diffusing.....	10	..	..	..	..
Saferlite, deflector.....	..	..	17	20	3
Stryker, deflector.....	17	..	24	..	¾
Shaler, roadlighter.....	21	24	..	..	..
Stop-Glare lens.....	10	..	..	..	..
Stewart.....	12	..	..	..	..
Suess rib lens.....	..	..	17	14	3
Victoria, non-glare bulb.....	18	10	..	..	..
Warner.....	10	..	..	..	..
Webb Multifrax.....	..	..	17	17	3

\*Manufacturer's adjustment.

sories, tires, etc., in Argentina declare that unless the present acute situation is alleviated promptly the results will be very damaging to the future of the American motor car and its accessories so far as their sale in Argentina is concerned.

The world war has given American commerce its first opportunity to obtain on a large scale a foothold in the Argentine market, and it behooves America to remove any obstacle that may prevent that foothold from gaining a solid foundation that will not give way under the powerful competition that is bound to come when the war is over.

#### Consumption of Gasoline Exceeds Production

WASHINGTON, D. C., Sept. 14—We are at present using 3000 bbls. of gasoline daily more than we are producing, according to Fuel Administrator Garfield, who has presented statistics to the Senate following the resolution introduced by Senator Lodge.

The figures, which were compiled by the Oil Division of the Bureau of Statistics, indicate a reserve supply for about 30 days. Mr. Garfield attributes the constantly diminishing stocks on hand to the heavy war demand.

Since April 1, when production was highest, there has been a decrease in reserves of 4,119,000 bbls. of oil. Since April there has been a daily deficit of 6000 bbls., which would indicate a deficit for the year of approximately 2,000,000 bbls. It is stated that stocks of crude oil are constantly declining and kerosene and fuel oil supplies are unsatisfactory, all of which bears an intimate relation to the gasoline problem. Following are the statistics covering stocks of gasoline in the East:

#### EAST OF CALIFORNIA

	Barrels.
Gasoline and naphtha stocks, 1918—	
Jan 1.....	8,400,000
April 1 (high point).....	11,000,000
Aug. 1.....	7,800,000
Decline in stocks.....	3,200,000
Estimated daily production and consumption:	
Approximate daily consumption—	Barrels.
Domestic.....	160,000
Export.....	34,000
Total daily consumption.....	194,000
Approximate daily production.....	191,000
Average daily deficit.....	3,000
(Probable result for year ending Dec. 31, 1918.)	

#### Wisconsin Branch of N. A. D. A. Formed

MILWAUKEE, Sept. 14—A Wisconsin branch of the National Automobile Dealers' Association was organized on a temporary basis at a meeting of State dealers which followed a luncheon tendered by the Milwaukee Automobile Dealers' Association at the Milwaukee Athletic Club on Sept. 11. Another meeting will be held in about a month, at which a permanent organization will be effected. Officers will be elected at that time. In the meantime, an organization committee consisting of one representative dealer from each of the twenty-one counties in Wisconsin will do local promotion work and conduct a membership campaign.

## A Balloon Target for Aviators

Released in the Air and Used Like a Punching Bag by the Flier

WASHINGTON, Sept. 16—A target resembling a cylindrical shaped balloon has been devised as a float target for airplane gunners. It is released in the air and is said to be to the airplane quite like the punching bag is to the boxer.

The new target is taken aloft by a cable attached to an airplane through the bottom of the fuselage and wound on a windlass. At 5000 feet it is released and allowed to float free. The airplane dives at the target, runs from it and uses every stunt, the barrel roll, the Immelmann turn, the side slip, nose dive and tail spin, while shooting at it. The target is at the mercy of the air currents and, being light in weight, twists and turns in every direction and manner, making it as tricky as a Boche opponent. Service ammunition is used by the gunner. This target practise is engaged in over uninhabited areas.

This form of target was devised by the instructors of the gunnery school at Rockwell Field, California, which is under the Division of Military Aeronautics.

## Automobile Trade in Shanghai, China

By R. W. Davis

SHANGHAI, CHINA, July 31—There are probably about 2000 automobiles of various kinds in Shanghai, all of which are used for utilitarian purposes. This is a goodly number when you think that the farthest point you can reach from Shanghai with an automobile is 8 miles from the center of the town. This road condition applies to nearly all cities in China, and consequently the use of the automobile is restricted to the conveyance of owners from the residential portions of Shanghai to their offices, an average distance of 2 to 3 miles. As China is very little affected by the war, any influence on the automobile industry that might be attributed to the war must be ignored, so far as conditions here are concerned. Native labor is so cheap that it is doubtful whether motor trucks or farm tractors could compete with it either in road transportation or agricultural work. There are a few motor trucks in Shanghai used for such purposes as electric cable repairing, fire department work, etc.

One of the greatest drawbacks in connection with American makers of automobiles for the Chinese field is their failure to provide handbooks or manuals giving every detail relating to the car and its operation. There are very few motor experts in China who have time to give instructions to buyers, the consequence being that the standard of driving and

caring for an automobile is very low. I would estimate that 75 per cent of the cars are driven by Chinese chauffeurs who are entirely ignorant of such niceties as proper breaking, gear-shifting, etc. The American automobile manufacturer who takes the trouble to have a book of instructions translated into Chinese for the use of chauffeurs would enjoy considerable advantage over others, apart from the direct advertising value which would come from such.

#### Federal Rubber Co. Makes 1000 Gas Masks a Day

MILWAUKEE, Sept. 16—The Federal Rubber Co. has reached a production of more than 1000 gas masks a day. Between 100 and 125 women are engaged in this department of the work and as soon as more help becomes available the number will be increased to at least 400. Throughout other departments of the plant, more than 300 women are now employed, they having taken the places of men who have entered the service. Another notable development of the war is that the Federal plant now employs twenty-five deaf mutes in the woodworking shop and rubber departments.

#### Safety Congress Meets at St. Louis

ST. LOUIS, Sept. 16—The seventh annual safety congress of the National Safety Council opened at the Hotel Statler to-day. The Automotive Section meets Friday. The program follows:

- 1—Report of Chairman.
- 2—Report of Secretary.
- 3—Reports of Committees.
- 4—Addresses:
  - Machine Shop Layouts and Their Relation to Safety, by C. A. Briggs, Safety Engineer, Willys-Overland Co.
  - Safety in Punch Press Operation, by W. W. Roach, Safety Department, Dodge Brothers.
  - Necessity of Inspection for Overloaded Floors, by D. R. Livingston, Supt. Safety Division Reo Motor Co.
  - Selling Safety to Employees, J. J. Lynch, Chevrolet Motor Co.
  - Gasoline in the Industries, When Used as a Solvent, by R. A. Shaw, Safety Department, Ford Motor Co.

#### Women Operating Farm Tractors in England

LONDON, Sept. 2—Women are proving very satisfactory and are rapidly replacing men in the operation of farm tractors in England. An official statement recently issued by the Food Production Department says that women are doing excellent work. It also reports that the Government has supplied on hire to farmers 4100 tractors and has arranged for the direct sale to farmers of more than 2000 more machines.

#### Kenly on Army-Navy Board

WASHINGTON, Sept. 14—Major General William L. Kenly, director of military aeronautics, has been detailed by the President as a member of the Joint Army and Navy Board of Aeronautic Cognizance, vice Major General George O. Squier, chief signal officer, relieved.



## Reopen Air Service for Induction

Both Mechanics and Officers Needed as Pilots, Armorers, Observers and Balloonists

WASHINGTON, Sept. 18—The Air Service has been reopened for induction of mechanics and of candidates seeking commissions as pilots, armorers, observers and balloonists, irrespective of status in the draft. Candidates are sought for this service, which has been closed for the past 6 months, because of its rapid and huge growth.

Twenty-nine flying fields have been completed in this country. More than 1200 deHaviland planes, 6000 Liberty engines, parts for the first heavy night bombers, 6600 training planes and 12,500 training engines have been completed and necessitate the increase of both the commissioned and enlisted personnel in order to maintain full strength in this country and continue the necessary flow overseas. There is fast movement overseas of air squadrons, planes, engines and material for American aerodromes, fields and assembly plants in France and England, according to a statement issued here to-day by the War Department.

The Air Service is to-day 160 times what it was at the outbreak of the war. On April 6, 1917, it numbered 1100 enlisted men regardless of cadets in training and officers as compared to 147,434 enlisted men on Aug. 1, 1918. Civilians have not been allowed to qualify as pilots since March, 1918. During last fall and the early winter 6600 prospective flyers, accepted by the examining boards, had been built up and has since been gradually drawn upon as the Service grew. In addition many of the enlisted men have been allowed to train for commissions.

Applicants may apply at the Aviation Examining Boards. The age limits for flyers are 18 to 30 years, inclusive, with preference to those under 25, and for balloonists from 18 to 45. The examining boards are located at:

Atlanta.....	Georgia School of Technology
Boston.....	739 Boylston St.
Chicago.....	230 East Ohio St.
Dallas.....	Camp Dick
Fort Sill, Okla.....	Post Field
Los Angeles.....	Marsh-Strong Bldg.
Minneapolis.....	University of Minnesota
New York.....	104 Broad St.
San Antonio.....	Fort Sam Houston
San Francisco.....	55 New Montgomery St.
St. Louis.....	525 South Euclid Ave.
Washington.....	Bldg. D, Floor 1, Wing 2
Canal Zone.....	Camp Sherman

The call for mechanics opens the Service to men anxious not only for active field work but also for the service for which their training best fits them. Skilled men only are wanted. Those accepted will be sent to a Concentration Depot, trade tested, given special intensive training in airplane mechanics and then organized into airplane crews and squadrons, some for duty here, others for duty overseas, with good opportunity

for advancement, since four-fifths of the men are promoted above the grade of private.

### Believe Electric Tax Unfair

WASHINGTON, Sept. 18—Electric truck manufacturers have filed a letter with the Ways and Means Committee asking for reconsideration of the proposed tax of \$5 per horsepower and 50 cents per 100 lb. weight. The manufacturers believe that this rate is too high. One objection has been that it is considerably higher than gasoline-driven trucks, on which the tax ranges from \$10 for 23 hp., \$20 on 30 hp., \$30 on 40 hp. to \$50 over 40 hp. Congressmen have answered this by saying that when the 2 cents per gal. tax is included, the gasoline-driven trucks pay an even higher tax than the electric trucks. This works out, for example, with a 5-ton 6-hp. electric truck weighing 5000 lb. paying a tax of \$30 on horsepower and \$25 on weight, or a total of \$55, as compared with a 5-ton gasoline truck of 40 hp. paying \$30 tax and consuming, say 10 gal. of gasoline a day, a daily tax of 20 cents, or \$60 a year. The electric makers do not believe this comparison is a just one. They state that there is a discrimination against electric trucks.

### Liberty Tractor Co. Organizes

The Liberty Tractor Corp., Detroit, has been organized with a capitalization of \$100,000. The incorporators are: Frank H. Farnham, John O'Donnell and Ignatius Mirkovich.

### Senate Favors Air Department

(Continued from page 513)

On page 1, line 12, strike out the word "and," and after the word "production" insert "and operation."

On page 2 add as a new section to the bill the following:

"Sec. 4. The President is hereby authorized to establish the necessary subordinate bureaus for the conduct of the operation of the department of aeronautics and to transfer to said department such functions, powers, and duties now vested by law in other departments of the government pertaining to the air service and such personnel necessary for its operation."

### New Labor Service Created

(Continued from page 512)

ating especially in this work with the Woman in Industry Service and other policy bureaus of the Labor Department, so as to maintain the unity of the government's labor policy.

Advice from the Working Conditions Service, of the Department of Labor, will be sought regarding industrial standards. At the same time the facilities of the Employment Service and of its Women's Division will be utilized in obtaining information as to the needs and the supply of labor. In return, the Training and Dilution Service will be able to assist the Employment Service in meeting the demand for skilled workers, which make up about 70 per cent of the labor calls of employers.

A section on "Industrial Hygiene," of the Training and Dilution Service, will be established to inquire into the conditions and suitability of particular factories for dilution.

Among the more difficult problems now confronting the Training and Dilution Service is the "following-up" of workers who have received training in order to assure proper surroundings for health, morals and efficient utilization of their ability. Another problem is that of the wastage of manpower. The Training and Dilution Service will study such problems as these with a view to pointing out methods that will minimize waste in industry due to overmanning.

## Mexican Mines Need Many Trucks

Admitted Duty Free at Present—Required to Replace Railroads Destroyed

MONTEREY, MEX., Sept. 9—Several of the larger mining companies of Mexico have placed orders for motor trucks recently. Shipments of trucks are beginning to arrive in Mexico for these concerns as well as for use of manufacturing plants in the City of Mexico. The irregularity of railroad traffic is necessitating the substitution of motor truck hauling wherever possible. In discussing the subject of Mexico as a market for motor trucks H. M. Gillespie, sales manager of the Southern Motor Co. of El Paso, who is familiar with conditions in this country, said:

"There is a great future for the truck industry in Mexico as soon as trade is again opened up with the United States under former international conditions of trade. Now that mining is picking up again, there is a greater demand for trucks than before the Mexican revolution, because many miles of railroad have been destroyed as well as thousands of cars. It is impossible for mine operators to get the ore to the smelters by rail as formerly and they must do it quickly. They have no time to wait until a railroad is rebuilt.

"Therefore trucks are in demand. At present trucks are admitted to Mexico free of duty, which greatly encourages the business. With a return to the old relations with our Mexican neighbors, as well as further settlement of internal conditions in Mexico, the truck trade in Mexico will quickly assume gigantic proportions."

### Curtailment of Non-War Industries

WASHINGTON, Sept. 12—The War Industries Board has arranged for the co-operation of the various State Councils of Defense in the matter of curtailing various non-war industries. The State Councils will make investigations and recommendations, and while these recommendations will not be final, they will play an important part in the decisions rendered by the board. The State Councils will investigate and report general non-war construction, but they will not enter into the undertakings of the War Department, Navy Department, Emergency Fleet Corp., Bureau of Industrial Housing and Transportation, United States Housing Corp. or the following civilian enterprises:

Repairs of or extensions to existing buildings involving an aggregate cost not exceeding \$2,500.

Roadways, buildings and other structures undertaken by the United States Railroad Administration.

Mines producing coal, metals and ferroalloy minerals.

Public highway improvements and street pavements which have been approved by the United States Highways Council.

Building projects not mentioned above will require special written permits from the Priorities Division of the War Industries Board. Any one contemplating a building which he believes to be in the public interest, or otherwise essential under the existing emergency conditions, should make a full statement of the facts in writing under oath, and present it to the Local Council of Defense, which will in turn take it up with the War Industries Board.

### Store Door Delivery for Philadelphia

PHILADELPHIA, Sept. 12—Covering delivery in this city of less than carload freight lots, the railroads, according to federal plan, in co-operation with the Chamber of Commerce, are putting into effect a "store door" delivery system. Consignees will have only 24 hr. in which to remove freight after it arrives. Failing in this, the freight will be loaded on motor trucks and delivered to the consignee at his expense for the hauling.

The Pennsylvania Railroad, under a new plan, whereby the city is divided into 14 shipping zones, will take all shipments consigned to the western destinations, as Harrisburg and beyond; the Reading, to the north and northwest, and the Baltimore & Ohio, to the south.

### Hupp Surplus \$1,176,262.50

DETROIT, Sept. 14—Net profits of the Hupp Motor Car Corp. for the fiscal year ending June 30 were \$836,691.30. Surplus fund was \$1,176,262.50 compared with \$431,124.30 for the same period last year. Total assets were \$8,939,789.91. Current assets showed cash on hand of \$731,165.70; accounts receivable less all doubtful accounts, \$762,877.94; bills receivable, \$12,764.35. Inventories based on cost totaled \$1,834,786.09, with securities, including Liberty bonds, aggregating \$173,860.36. The company had no outstanding bills payable. Accounts not due totaled \$749,645.52, tax reserve, \$279,971.28, and reserve customer deposits were \$215,910.61. A copy of the balance sheet follows:

ASSETS	
Plant Assets:	
Land .....	\$98,656.62
Buildings .....	866,242.41
Machinery .....	407,096.69
Factory equipment.....	414,995.53
Special tools, jigs, and patterns for current Models "Net".....	170,868.55
Furniture and fixtures.....	54,210.69
	\$2,012,070.49
Less reserve for depreciation.....	435,647.70
Total property investment.....	\$1,576,422.79
Note: The land, buildings, machinery and equipment were appraised by the American Appraisal Co. as of Dec. 31, 1916, as having a sound value of \$762,740.09 more than the value as shown on the books.	
Current Assets:	
Cash .....	\$731,165.70
Accounts Receivable:	
For cars protected by B/L drafts .....	\$476,221.89
For parts protected by B/L drafts and customers' deposits .....	180,089.21
Sundry debtors .....	106,566.84
	\$762,877.94
Less reserve for doubtful accounts .....	27,590.89
Bills receivable .....	12,764.35
Inventories at cost:	
Raw and worked material and supplies .....	1,516,619.14
Work in process.....	260,345.85
Finished cars .....	57,821.10
	1,834,786.09

## Truck Builders Get Preferential List

### War Industries Board Lists Approximately 70 Industries and Over 6,000 Plants

WASHINGTON, Sept. 14—The National Automobile Chamber of Commerce has written to motor truck manufacturers announcing that the War Industries Board has issued a preferential list of industries which will be sent to them in a few days. The letter, which indicates the basis to be adopted for the classification of essential uses of trucks and the matter of deferred classification under the draft law, follows:

#### To Motor Truck Manufacturers:

1. The War Industries Board has issued a preference list of industries. This list includes approximately 70 industries and more than 6000 individual plants which are being added to from time to time.
2. A list of these industries will be sent you within a few days, and the list of 6000 individual plants can be seen in the custody of the local draft board or the representative of the U. S. Labor Bureau in your city.
3. The final revised list of industries, which is to be a guide for truck sales, we hope to forward within a few days.
4. Among the individual plants are or will be listed the approved manufacturers of motor trucks who have filed pledges and applications for places on the preference list. Necessary employees of such companies will be considered in essential work.
5. Manufacturers of passenger cars are being handled in another manner by the War Industries Board. They are being given certain priority for materials to match up their stocks of materials on hand under a curtailment program.
6. This list of industries and the 6000 individual plants will be the guide for essential uses for trucks, as agreed with the War Industries Board. This list may be used as a basis, but where any question arises as to the essential use of a truck, the matter should be referred for definite ruling to the Automotive Products Section of the War Industries Board, for submission to the Priorities Division.
7. This new preference list will not bind the district draft boards in allowing deferred classification under the draft law. Persons seeking deferred classification, whether they are employers or employees, will submit to the draft board whether they are so essential to industry that they should remain out of

military service. The draft boards will determine what industries are necessary and what employees are necessary to the maintenance of such industries.

8. The real purpose of the master key preferential list of industries is not to operate as an embargo against other industries not named, but "to defer the requirements of all other industries and plants until those on the preferential list shall have been satisfied."

9. Industries have been grouped into four classes. The classes differ in degree of necessity as vital elements in the prosecution of the war.

### Skilled Workers Still Critically Short

WASHINGTON, Sept. 14—Transfers of machinists and other skilled workmen from non-war work to war production through the United States Employment Service is increasing steadily, according to a statement made by the Department of Labor. The Employment Service has sent a number of examiners throughout the country to recruit skilled workers at non-war plants by patriotic appeals. The examiners comprise machinists, boiler makers and sheet metal workers.

The shortage of skilled labor in the war industry is considered critical. It is said that even if the non-war industries give up their entire organizations of skilled workers it is doubtful if the supply will meet the demand. It is estimated that not more than 25 per cent of the machinists in the country are still engaged in non-war work, and that some of these are unable to move to war industries centers because of family and other primary considerations.

The following skilled workers are most sorely needed in the order named: Machinists, boiler makers, riveters, chippers, calkers, molders, structural iron workers and coppersmiths.

### Glenn L. Martin Tests First Plane

CLEVELAND, Sept. 14—The first plane produced by the Glenn L. Martin Co. has been completed and has flown from Cleveland to Dayton for experimental tests with a crew of four men.

Investments in securities:	
Preferred stock purchased for retirement (in Treasury) .....	\$99,710.36
Investment in stock, Detroit Shell Co. ....	50,000.00
Investment in sundry securities .....	400.00
Investment in Liberty Loan Bonds .....	23,750.00
	173,860.36
Deferred charges, prepaid insurance and taxes.....	3,487,863.55
Goodwill, trade names, etc.....	16,582.64
	3,858,920.93
	\$8,939,789.91

LIABILITIES	
Capital Stock Issued:	
Preferred stock .....	\$1,307,900.00
Common stock .....	5,192,100.00
	\$6,500,000.00
Surplus:	
Surplus, June 30, 1917.....	\$431,124.20
Net profits, June 30, 1917 to June 30, 1918.....	\$836,691.30
Preferred dividends paid June 30, 1917, to June 30, 1918 .....	91,553.00
	745,138.30
Transferred to surplus.....	745,138.30
Surplus, June 30, 1918.....	\$1,176,262.50
Current Liabilities:	
Bills payable .....	None
Current accounts payable (not due) .....	749,645.52
Reserve for accrued taxes and interest.....	297,971.28
Reserve for customers' deposits and redemption of service coupons .....	215,910.61
	\$8,939,789.91

## Highway Labor Problems Under Jurisdiction of Chapin

WASHINGTON, Sept. 14—All labor problems coming under the United States Employment Service and which are in connection with highway utilization will be referred to the Highways Transport Committee of the Council of National Defense, which is headed by R. D. Chapin, chairman.

The committee will adjust all problems of labor as connected with transport activity, either power or horse drawn. This new additional work for the Highways Transport Committee is the result of a letter received from J. B. Densmore, Director General of the United States Employment Service, as follows:

The U. S. Employment Service recognizes the war-time need for making the most effective and efficient utilization of our highways as a means of strengthening and increasing our transportation resources, and especially is acquainted with the valuable direction given by the Highways Transport Committees to this problem.

We are also convinced that tonnage capacity of our highways transport resources can be greatly increased by applying all possible vehicles, horses and labor in line with national policies promulgated by you and, naturally, in transportation that vitally aids in accomplishing our war program.

We therefore desire to effect any adjustment of labor employed in any phase of highways transport activity, relating to either power or horse-drawn vehicles, in co-operation with your national organization, relying on your State Highways Transport Committees to furnish the facts regarding essential highways transport activity with which they are intimately familiar and on which our state and local labor department officers may base their necessary orders.

We are therefore transmitting instructions to our representatives, advising them that all matters touching or in any way affecting highways transport operations are to be dealt with on the advice of your organization.

### Seven Aviation Deaths

WASHINGTON, Sept. 14—Seven deaths resulted from aviation accidents in training at flying fields in this country for the week ended Sept. 7, 1918. This number represents one fatality for every 1469 hr. flown, or 117,520 miles of air travel. Following is the summary:

Barron Field, Everman, Texas.....	2
Kelly Field, San Antonio.....	2
Mather Field, Sacramento.....	2
Tallaferro Field, Fort Worth.....	1
Total.....	7

### Reo Prepares for Apprentice Course

LANSING, Sept. 14—The Reo Motor Car Co. is making preparations for the establishment of an apprenticeship course which will be opened early in October. John H. Amiss, for 7 years superintendent of the Lima Consolidated Schools, Howe, Ind., has been engaged as educational director. Shop mathematics, layout work, blueprint and mechanical drawing will be some of the studies taught in the class room. The course, as now mapped out, will require 3 years to

finish, the apprentice receiving at the end of this time a certificate which vouches for his skill as a mechanic. The age limit of the applicant has been set at from 16 to 19 years. The apprentice course is not confined to boys whose fathers may be Reo employees, but covers all applicants and is not as exclusive as the old course. Machines for instruction are being installed as well as benches and other equipment for the students' use. There are now fifteen applications filed for entrance, and when the school is in full swing the company will have at least 200 apprentices enlisted in the course.

### Girls in Cadillac Service Department

BOSTON, Sept. 14—Young women have been added to the mechanical department of the Cadillac Automobile Co. by Manager Albion L. Danforth. After giving the matter some thought, having put girls to work in the salesrooms where they proved efficient, he decided to try them in the service department. The first girl was put to work in the stock room supplying parts to customers. She did the work so well that the vacancy in service sales department caused by the draft was filled with another young woman. She proved very valuable and fitted into the position nicely, where she determines cash and credit transactions from her credit file at the time a job order is written, and keeps a record of all the movements of cars through the various departments of the building as well as answering numerous telephone calls. And the customers seem to like dealing with the young women, who are courteous and intelligent. Others will fill places made vacant from time to time.

### Massachusetts Pumps 100% Perfect

BOSTON, Sept. 14—The Massachusetts State Department of Standards has just finished an investigation of the gasoline pumps throughout the state to determine if motorists were receiving full measure these days. This is the second year an investigation was held, last year many pumps being found defective. By means of cars in which specially constructed glass tanks were placed, with measurements carefully marked, it was possible to drive up to any roadside pump, buy gasoline and in a minute determine whether it was perfect or imperfect. The department permits a variation of 6 cu. in., or about 5 table-spoons, in 5 gal.

This year Thure Hanson, director of standards, has announced that there has been a marked improvement, and that it may be said that the pumps in Massachusetts are practically 100 per cent perfect.

### Overland Gets Curtiss Engine Contract

WASHINGTON, Sept. 12—The Willys-Overland Co. has received a contract for 1500 Curtiss O. X.-5 airplane engines of the 8-cylinder type, to be used in training planes.

## Liberty-Engined Caproni Makes Climbing Record

NEW YORK CITY, Sept. 14—The Caproni bombing plane, fitted with three navy type, low-compression Liberty engines, has been getting tuned up for its official Government test, and this week has established some new climbing records for a bombing plane of this type, which has a capacity for carrying approximately 4000 lb. of bomb load. In its climbing test on Sept. 9 the Caproni climbed 3000 meters, or over 9000 ft., in 16 min. with a full load of gasoline and four men. This is a better climbing performance than this plane has ever made before, and is a new record for climbing with planes of this capacity.

### More Trucks in Massachusetts

BOSTON, Sept. 14—Taking Massachusetts registrations for Jan. 1 to Sept. 1 this year, and comparing them with the figures for the total of 1917, they show that of the increased machines registered this year for every passenger car listed there were registered 1 3/5 trucks, or 16 trucks for every 10 cars.

Last year there were registered in Massachusetts 148,266 cars. Up to Sept. 1 this year there were 151,818 cars listed, or 3552 more than the entire 1917 figures. For the 12 months of 1917 there were 26,008 commercial vehicles listed, and for the first 8 months of this year there were 31,649 registered, or a gain of 5641. That is 2089 more commercial vehicles than passenger cars.

If a comparison is made between the first 8 months of 1917 and the same period of this year the figures are 136,417 and 151,818 cars respectively and 24,025 and 31,649 trucks. That was 15,401 cars gained and 7624 trucks. However, if it were not for the big truck gain this year, representing some 32 per cent to 11 per cent for cars, the total registration for 1918 up to date would have fallen below the figures for the entire year of 1917.

### Road Oil for Army Camps

WASHINGTON, Sept. 12—The Fuel and Forage Division of the Quartermaster Corps will purchase 903,000 gal. of road oil for the Construction Division, for use at fifteen camps and cantonments in this country. This road oil is to be used to lay the dust around camp hospitals and upon drill grounds. About 10,000 tank cars will be required to deliver this quantity.

### Housing and Transportation

WASHINGTON, Sept. 14—Housing and transportation conditions have become so congested in some cities where war supplies are being manufactured that the General Staff has cautioned the purchasing agencies of the War Department to consider local conditions before placing contracts.



In each of the 60 congested cities the Bureau of Industrial Housing of the Labor Department has found it necessary to expend federal appropriations to relieve housing and transportation shortage.

In some cities the congestion is so great that the use of beds in three daily shifts has become imperative. This has created an exceedingly high labor turnover, delaying the completion of war work and increasing its cost.

It is not the intention to cut off new orders entirely from these districts but to regulate them. Where new plants require additional labor power or new structures or facilities are needed it will be the disposition of the General Staff to discourage such increases in these cities and to develop them elsewhere. The following cities are suffering from serious housing shortage:

Aberdeen, Md.	New Castle, Del.
Alliance, Ohio.	New London, Conn.
Alton, Ill.	New Orleans, La.
Bath, Maine.	Newport, R. I.
Bayonne, N. J.	Newport News, Va.
Bethlehem, Pa.	Niagara Falls, N. Y.
Bridgeport, Conn.	Niles, Ohio.
Butler, Pa.	Norfolk, Va.
Camden, N. J.	Pensacola, Fla.
Charleston, S. C.	Perth Amboy, N. J.
Charleston, W. Va.	South Amboy, N. J.
Chester, Pa.	Philadelphia, Pa.
Davenport, Ia.	Phillipsburg, N. J.
Dayton, Ohio.	Portsmouth, N. H.
Derby, Conn.	Portsmouth, Va.
Easton, Pa.	Puget Sound, Wash.
Eddystone, Pa.	Quincy, Mass.
Elizabeth, N. J.	Rock Island, Ill.
Erie, Pa.	Seattle, Wash.
Florence, Ala.	Sharon, Pa.
Hammond, Ind.	Sheffield, Ala.
Indiana Harbor, Ind.	Mariner's Harbor,
Jersey City, N. J.	Staten Island, N. Y.
Gary, Ill.	Tacony, Pa.
East Chicago, Ill.	Troy, N. Y.
Lowell, Mass.	Utica, N. Y.
Middletown, Ohio.	Warren, Ohio.
Milton, Pa.	Waterbury, Conn.
Moline, Ill.	Watertown, Mass.
Newark, N. J.	Watertown, N. Y.
New Brunswick, N. J.	

#### New Departure Mfg. Co. to Hold Field Day

BRISTOL, CONN., Sept. 16.—The New Departure Mfg. Co. will hold its annual field day, which will include an inspection of the plant, a sheep barbecue, a ball game, sports, a golf handicap, etc., on Sept. 21-22. The company's slogan is "We wish to conserve for ourselves and our help a spirit of good will and optimism, a pleasant place in which to live and work and an establishment to which our boys now at the front may return. In all else we Hooverize."

#### Goodyear Company Salvages \$3,000,000 in Year

AKRON, Sept. 11.—The Goodyear Tire & Rubber made in 1 year a salvage of \$3,000,000 worth of materials that might have been wasted were it not for the co-operation of its 20,000 workmen. This is a larger amount than the output of finished product of 98 per cent of the country's manufacturing concerns.

## Latin America Big Automotive Buyer

### Exports from New York Alone Total Over \$7,500,000 in Seven Months

NEW YORK, Sept. 16.—An analysis of the exports of passenger cars, trucks and parts to the various Latin-American republics for the seven months ending July, 1918, discloses some interesting figures, and indicates that, despite limited shipping facilities, manufacturers are not neglecting the opportunities offered by South and Central America, Cuba, etc.

During these seven months 5243 passenger cars, valued at \$4,771,654; 419 trucks, valued at \$751,222, and automotive parts, valued at \$2,020,696, were shipped from the port of New York alone, the aggregate value being \$7,543,572. Obviously the total exports to Latin America from the U. S. A. are considerably greater, as shipments have been made from a dozen or more different ports.

During the period under review Chile leads in passenger car purchases, partly for the reason that returning nitrate ships offer plenty of freight accommodations. A glance at the truck column suggests that there are good opportunities for the development of business in practically all the republics, more particularly as Latin-American business and finances are in a very flourishing condition and there is a general speeding-up of commerce to meet war demands.

#### Missouri River Boats Stop

KANSAS CITY, Sept. 14.—Navigation of the Missouri River between St. Louis and Kansas City was suspended for the winter, on Sept. 3, when a steamer with two barges arrived at Kansas City on its last summer trip. The equipment has been taken over by the federal authorities, and it will be used on the Missis-

sippi below St. Louis. The barges have brought many motor cars to Kansas City this summer and much stock for accessory dealers. All traffic trucks distributed from the Kansas City branch have been brought from St. Louis on the barges, in shipments of six to nine. The trucks are run onto the roofs of the barges at St. Louis, and run from the barges onto the wharves at Kansas City; here they are filled with gasoline, and taken to the distributing headquarters under their own power. The river shipment has saved some freight expense, but has been most economical in its saving of labor in loading into freight cars. There has also been a marked advantage in time, the river shipments reaching destination within 5 days of leaving factory, while by railroad the shipments would have consumed from a week to a month.

#### New York Routes Cars and Trucks

NEW YORK, Sept. 16.—The New York Police Department has adopted a new system of routing passenger cars and commercial vehicles through the principal streets of the city. The plan has been adopted to eliminate confusion and reduce congestion. The order restricts 22 thoroughfares, chiefly the main north and south avenues, to passenger or commercial traffic, 10 being exclusively for passenger cars and 12 for motor trucks. Motor trucks will be prevented from using the streets designated for the use of passenger cars, though their drivers may make deliveries or collections of merchandise on those streets by entering them at the nearest intersecting street.

#### International Harvester Merger Ratified

NEW YORK, Sept. 16.—The Internal Harvester Co. of New Jersey and the International Harvester Corp. have been merged and the two companies will be continued as the Internal Harvester Co. The capital is \$60,000,000 preferred and \$80,000,000 common.

#### EXPORTS OF AUTOMOBILES, TRUCKS AND PARTS FROM NEW YORK TO LATIN-AMERICAN COUNTRIES DURING SEVEN MONTHS ENDING JULY, 1918

	Cars		Trucks		Value of Parts
	Number	Value	Number	Value	
Argentina .....	770	\$779,302	33	\$32,921	\$986,790.
Bolivia .....	10	14,052	2	9,000	2,342.
Brazil .....	814	588,093	30	31,814	138,973
Chile .....	1,071	1,320,156	46	54,373	228,664
Colombia .....	95	66,715	1	600	17,770.
Costa Rica .....	41	20,100	..	..	871
Cuba .....	430	470,268	174	398,774	329,446
Ecuador .....	54	57,882	..	..	4,356
Guatemala .....	5	8,099	1	322	2,307
Hayti .....	74	40,430	7	7,589	15,198
Honduras .....	18	14,927	..	..	4,626
Mexico .....	147	135,940	32	72,710	48,381
Nicaragua .....	23	15,875	..	..	733
Panama .....	45	36,343	26	17,631	25,816
Paraguay .....	1	2,500	1	875	768
Peru .....	389	448,244	46	96,113	53,250
Salvador .....	22	28,678	..	..	3,731
Santo Domingo .....	127	92,451	6	3,600	16,158
Uruguay .....	1,034	577,825	9	9,000	108,424
Venezuela .....	83	53,769	5	15,900	32,101
	5,243	\$4,771,654	419	\$751,222	\$2,020,696

## 413,000 Bbl. Gasoline Saved

### Two Gasless Sundays Add Materially to Reserve for Overseas Shipments

WASHINGTON, Sept. 16—Four hundred and thirteen thousand barrels of gasoline were saved by the observance of the first two voluntary motorless Sundays, according to the Fuel Administration. The Administration kept no records, but secured figures from the oil industries which took a count from 2 o'clock to 4 o'clock Saturday, Aug. 31, Sunday, Sept. 1, and Sunday, Sept. 8. In each instance there was an increased reduction on the second Sunday in the percentage of cars used. Illinois leads with counts of 20,000, Aug. 31, and 108 on Sept. 8, a reduction of 99 per cent. Reduction in every state exceeded 75 per cent. The Fuel Administration states that the gasoline saved has added materially to the reserves available for overseas shipments, for use in tanks, trucks and airplanes at the front. In answer to the question if gasolineless Sundays will be extended to include the territory west of the Mississippi, the Fuel Administration says it does not seem necessary, although it is possible. They are now canvassing the territory to determine the ability of the refiners to care for the West and at the same time provide the necessary gasoline at the Atlantic seaboard. If they cannot provide both demands the country west of the Mississippi will also be called upon to forego Sunday motoring temporarily.

#### Briscoe Corp. Adds to Plant

JACKSON, MICH., Sept. 14—The Briscoe Motor Corp. is erecting two additional buildings for the manufacture of war material. These measure 200 x 200 and 90 x 100 ft. respectively.

#### Government to Pay Cash

WASHINGTON, Sept. 18—All supply bureaus of the War Department will, hereafter, whenever possible, take advantage of cash discounts for the prompt payment of bills. Instructions to do so have just been issued by the General Staff. Contractors who have followed the custom of granting cash discounts to the public will be required to state in their proposals the amounts they will allow the Government for prompt payment of their bills. Where it has not been the custom to give fixed cash discounts the Government will request contractors to state how much they will allow for prompt payment. These discounts will be considered by contracting officers when making awards.

That the Government may be sure of such discounts in the future it is provided in the instructions that all materials and supplies shall, in so far as possible, be inspected and accepted by the Government at the point of manufacture or

origin. The Inspecting Officer is ordered to see that the proper vouchers are sent through promptly with the Government bill of lading attached, to the Contracting officer so that the bill may be paid within the specified time during which discounts will be allowed.

#### Truck Sales Directors to Form National Association

MILWAUKEE, Sept. 16—A national association of sales directors of American motor truck manufacturers probably will be permanently founded this week at a meeting to be held in Detroit, as the result of a conference attended by representatives of ten of the largest commercial vehicle factories of the country, which was held in Milwaukee during the past week. The Milwaukee conference was called upon the initiative of William H. Reese, advertising and sales manager of the Sterling Motor Truck Co., which entertained the representatives for two days. A temporary organization was formed and each delegate was appointed a committee of one to solicit the attendance of one other sales manager for the Detroit meeting this week. The purpose of the organization is to plan ahead for the time when not so much of the capacity of truck factories is required for Government work and the industry is better able to produce vehicles for ordinary commercial channels in sufficient quantities to meet the demand. Another aim is to insure a proper distribution of the trucks now available for commercial purposes to the end that each truck sold may be placed where it will do the most good.

## July Truck Exports Very Small

### Figures Indicate Our Export Trade in Motor Trucks Is Not Satisfactory

NEW YORK, Sept. 17—A glance at the record of automotive products exported during the month of July shows that although the figures covering cars and parts are normal, the number of trucks exported during the month is distinctly disappointing. It is true that France has taken a considerable number—there are very obvious reasons why she must do so—but apart from this the total for the month is so very small as to be almost negligible. As a matter of fact our truck exports for the month, including those sent to France, is little more than one-half the total value of those shipped abroad in June. Deduct the July deliveries to France and the remainder are valued at but \$237,330.

No doubt there may be a shortage of shipping from time to time, which, in part, accounts for the falling off, but the transportation problem is being solved and shipping is now a great deal better to Latin American and other parts than was the case a little time ago.

Every encouragement is being given by the Government to the development and maintenance of foreign trade. Truck builders are in a priority class as regards the supply of material for approved use.

#### AUTOMOBILE, TRUCK AND PARTS EXPORTS FROM NEW YORK FOR JULY

	Cars		Trucks		Parts Value
	No.	Value	No.	Value	
Argentina.....	149	\$226,927	1	\$3,250	\$214,466
Australia.....	293	268,526	..	..	19,161
Barbadoes.....	1	600	..	..	500
Bolivia.....	..	..	2	9,000	123
Brazil.....	151	159,152	14	8,400	26,536
British Guiana.....	3	1,731	..	..	618
British Oceania.....	..	..	..	..	78
British South Africa.....	..	..	..	..	6,749
British West Africa.....	18	14,859	..	..	14,103
British West Indies.....	7	4,355	..	..	1,965
Chile.....	92	127,675	4	7,102	52,047
Columbia.....	11	6,615	..	..	2,305
Costa Rica.....	..	..	..	..	84
Cuba.....	30	41,513	17	36,925	18,562
Dutch East Indies.....	32	25,705	..	..	..
Dutch Guiana.....	..	..	..	..	633
Danish West Indies.....	..	..	..	..	76
Dutch West Indies.....	..	..	..	..	190
Ecuador.....	13	13,400	..	..	458
England.....	2	8,500	38	108,726	25,165
France.....	138	70,590	128	503,802	555,533
French Africa.....	21	11,282	9	7,305	..
French Guiana.....	1	318	..	..	17
French West Indies.....	..	..	..	..	201
Greece.....	..	..	..	..	328
Guatemala.....	..	..	..	..	160
Haiti.....	5	2,360	..	..	1,594
Honduras.....	1	2,500	..	..	266
Ireland.....	..	..	2	4,276	..
Italy.....	17	30,000	..	..	15,761
Jamaica.....	20	15,654	..	..	2,338
Japan.....	49	48,035	5	4,565	23,273
Japanese China.....	..	..	..	..	476
Mexico.....	10	6,385	2	6,250	2,998
Newfoundland.....	19	15,520	..	..	253
New Zealand.....	90	72,984	2	2,342	31,536
Nicaragua.....	4	2,976	..	..	..
Norway.....	36	92,190	..	..	640
Panama.....	2	2,400	..	..	1,231
Para.....	..	..	..	..	21
Peru.....	77	91,178	4	11,240	10,222
Portugal.....	16	17,185	1	3,950	4,375
Salvador.....	1	1,500	..	..	644
Santo Domingo.....	14	15,901	..	..	2,889
Spain.....	87	100,844	2	8,000	4,823
Trinidad.....	12	10,875	7	15,089	2,126
Uruguay.....	183	161,221	..	..	17,869
Venezuela.....	5	6,098	..	..	3,818

## Safety Congress at St. Louis

### 4000 Industrial Plants Represented—Special Automotive Sections

ST. LOUIS, Sept. 16—Almost 2000 delegates to the Seventh Annual Safety Congress of the National Safety Council registered to-day at the Hotel Statler. The Council represents about 4000 industrial plants and in his report W. H. Cameron, secretary of the Council, said:

"The total number of fatal accidents has been reduced one-third since this organization began its work. Five years ago 35,000 men and women were losing their lives every year in accidents, and the number of industrial accidents was about 2,000,000. With mechanical safeguards, supplemented by safety education in all plants, the number of accidents could be reduced not one-third, as it has been, but from 50 to 85 per cent, I believe."

The two big features announced for the first day of the convention were cancelled because Secretary of the Interior Franklin K. Lane and Charles M. Schwab of the Emergency Fleet Corporation telegraphed that they could not be present.

Mr. Schwab, who will speak on "The Democratization of Industry," will appear later in the week.

As a result of these cancellations, the first day was given over largely to business sessions and the reports of committees and the officers.

David Van Schaack of Hartford, Conn., director of publicity for the Aetna Insurance Co., who is president of the National Council, in his address at the opening session, dwelt upon the safety propaganda which the Council is now making its particular war—the introduction of safety instruction in schools.

Nearly 200 speakers, most of them representatives of the large industrial plants, are on the program for the five days, as the Congress ends Friday. At the dinner President Wilson will deliver a short address by telephone. There is a strong sentiment that some plan should be developed whereby the methods used by the Government in training maimed soldiers for new occupations should be maintained in the future for victims of industrial accidents.

The Automotive Section will meet on Friday. The program of that session is given on page 515.

The automotive industry also is interested in the "Public Safety" Section on Thursday afternoon, the program of which is as follows:

I. Automobile Headlamps, W. F. Little, Electrical Testing Laboratories, New York City.

II. Desirability of Uniform Signs and Signals, with Some Suggestions, John Gillespie, Detroit, Mich.

III. Public Accounts—What They Mean in Monetary Loss, A. W. Whitney, General Manager, Workmen's Compensation Service Bureau, 13 Park Row, New York City.

IV. The Classification of Public Accidents, Frederick S. Crum, Assistant Statistician,

Prudential Life Insurance Company of America, Newark, N. J.

During the week of the Congress here a very special effort is being made to eliminate all accidents in the city, both industrial and street accidents. Policemen, drivers and shop workers are asked to use every precaution to show how few accidents are necessary to a large community. Almost every motor vehicle is carrying a special sign.

### Airplane Assembly System Incorporated in Training Course

WASHINGTON, Sept. 17—A system of airplane assembly has been incorporated with the general training course at Kelly Field, Texas, for both cadets and student officers. This is a departure from the general curriculum, is not general and has not yet been approved by the training section. At present the work includes 12 days of instruction in putting together wings and fuselage only. The other parts of the plane will enter into instruction as the course advances, until the practical assembling of a complete airplane is a part of the instruction of every flier. It is expected that this will prevent carelessness, tendency to hurry the work or to overlook anything that may later endanger life. It will take the prospective flier completely through all the shops.

### Pier Exposition Opens

CHICAGO, Sept. 16—The Automotive and Accessories Exposition opened on the Municipal Pier Saturday. A big floor space is used on one-half of the big pier building and the management expresses the belief that the week will disclose a successful exposition.

There is a total of 106 exhibitors, 78 of whom show parts and accessories. There are six complete trucks shown, two truck formers, four farm tractors and four tractor parts, one industrial tractor, one road tractor, one house lighting system and ten miscellaneous displays, including the Red Cross, State of Wisconsin agricultural exhibit, Cook County School, and some farm papers.

The exhibit of agricultural implements was limited to two disks and a plow attached to the three Fordson tractors, shown by the Rue Motor Co. The other tractor displays included the New Craig tractor with its P-T wheel, which makes its first appearance at this show, the Inter-State tractor and the Happy Farmer.

The chief tractor part exhibit is that of the Foote Bros. Gear & Machine Co. with its planetary tractor gearset. The Mercury Mfg. Co. had one of its industrial tractors on display, and the One-Wheel Truck Co. had a road tractor.

Motor trucks shown are the Winter, Muskegon, Traffic, Forschler and Tower.

### Washington Office for Duesenberg

WASHINGTON, Sept. 16—The Duesenberg Motors Corp. has established a Washington office in the Munsey Bldg. It is in charge of General Sales Manager N. G. Rost.

## Tractor Curtailment Discussed

### No Decision Reached—Further Curtailment in Agricultural Implements Considered

WASHINGTON, Sept. 17—A preliminary meeting was held here yesterday by the War Service Committee of agricultural implements and independent tractor manufacturers with the War Industries Board with a view to further curtailing agricultural implements and possible curtailment to some extent of the manufacture of farm tractors. No decisions were arrived at, the greater part of the discussions being on the importance of farm tractors both among our Allies and in this country. The War Industries Board stated that independent tractor manufacturers were present. Names of those at the conference could not be obtained owing to the fact that Judge Edwin D. Parker, Priorities Commissioner, who presided, did not make a record of them.

The farm implement and farm operating equipment industry has already discontinued the manufacture of 3000 surplus types of plows and tillage implements, as was announced in an earlier issue of AUTOMOTIVE INDUSTRIES. Further reduction of this and possible reduction of tractors is being considered to further conserve iron and steel for other war needs.

### A Substitute for Glass in Aviators' Goggles

WASHINGTON, Sept. 17—The Medical Research Board of the Division of Military Aeronautics has found a substitute for glass for aviator goggles made of thin sheets, not glass, but which can be used as such. This substance has been on the market for some time, but the company which makes it has not heretofore been able to cast it in the right strength and thickness suitable for goggles. The substance is hard and non-inflammable and insures practically a non-shatterable lense for the protection of the pilot's eyes.

### Deferred Classifications for Transportation Employees

WASHINGTON, Sept. 17—Concerns engaged in the transportation within cities and along the public highways of necessary commodities can claim deferred classification for their necessary employees, according to a ruling made here to-day by the Provost Marshal General of the War Department. This means that a motor truck transportation company hauling merchandise or commodities essential to the maintenance of the military establishment, or the effective operation of the Army, or the maintenance of national interest during the emergency, can claim deferred classification in the draft for their employees providing they are necessary to them.



**Jarosch Leaves Bearings Co.**

LANCASTER, PA., Sept. 12—F. J. Jarosch has resigned as chief engineer of the Bearings Co. of America and become secretary and manager of the Liberty Engineering Co., Lancaster, Pa., recently formed for consulting, designing, research and development work. Associated with him are: President, J. E. Perkinson; vice-president, C. W. Lea, and treasurer, R. A. Heiland.

M. Bleiweiss has been appointed manager of the planning department and stores of the Templar Motors Corp., Cleveland. He retires from the Premier Motor Corp., Indianapolis, where he served as assistant to sales manager and assistant to factory manager.

Guy E. Tripp, formerly Colonel United States Army and head of Production Division, has been made Brigadier-General United States Army, and placed in charge of the production of ordnance material. General Tripp is succeeded as head of the Production Division by Colonel C. C. Jamieson.

Zeno D. Barns, who for the past 3 years has been connected with the Westinghouse Air Brake Co. as non-ferrous metallurgist, is now connected with the general operating department of the Aluminum Castings Co., Cleveland.

Fred W. Vormelker has been appointed efficiency engineer of the Russel Motor Axle Co., North Detroit, and will have charge of all work pertaining to the following departments: Time study, routing, factory time, employment and efficiency.

Charles M. Steele, formerly vice-president of the Carl M. Green Co., Detroit, who has been in this country on leave of absence for the past 2 mo., has returned overseas to continue his work with the Y. M. C. A. He is located in Paris and is in entire charge of the entertainment division of the Y. M. C. A. work in France.

**Memorial Road for Michigan**

DETROIT, Sept. 14—Willard M. Bryant, Kalamazoo paper manufacturer and field secretary of the Michigan State Good Roads Association, is the leader of a movement having for a purpose the building of a "Memorial Paved Way," 18 ft. wide and extending throughout Michigan for a distance of 300 miles.

It is to be a memorial in honor of the fallen soldiers of the state. The route proposed is through St. Joseph, Benton Harbor, Kalamazoo, Camp Custer, Battle Creek, Charlotte, Lansing, Owosso, Saginaw to Bay City. It is said that the project has met with the approval of many prominent men in the state and that it may result in a permanent organization being established to set the project under way.

## Men of the Industry

### *Changes in Personnel and Position*

**Sandusky Changes Personnel**

SANDUSKY, Sept. 14—The Dauch Mfg. Co., which produces Sandusky tractors, has made two changes in its personnel: L. E. Willson has been appointed general sales manager, and J. W. Wellington, general manager. Willson was formerly vice-president in charge of sales of the Briscoe Motor Corp., Jackson, Mich., and Wellington was formerly production manager of the New Castle (Ind.) plant of the Maxwell Motor Co.

Clay G. Howery, formerly associated with the production and purchasing departments of the Continental Motors Corp., Detroit, has been appointed general manager of the American Steel Supply Syndicate, Detroit. The management has been reorganized and the company equipped with an extensive screw machine and heat-treating department. The corporation is working almost entirely upon Government orders, manufacturing parts for engines.

George T. Bryant, formerly connected with the Russell M. Seeds Advertising Agency, has been appointed sales manager for the Hide, Leather & Belting Co., Indianapolis. This company manufactures leather belting and parts for cars, trucks and tractors.

Norval A. Hawkins, sales manager for the Ford Motor Co., has entered the United States Army Ordnance Department as an assistant to Major George D. Wilcox, who is in charge of the Motor Transport Service for the Detroit district. Mr. Hawkins has been granted leave of absence by the directors of the Ford company to permit him to devote all his time to Government work. He will resume his duties with the company when his services are no longer required by the Government.

**Furlough Essential Skilled Men**

WASHINGTON, Sept. 14—Companies engaged in war work who find that the draft is taking their skilled men in such numbers as to impair efficiency and seriously reduce production of war material may apply to William R. Ritter, War Industries Board, for the furlough of these essential skilled men. Investigations will be made by the Commodity Section Chiefs of the War Industries Board, and Mr. Ritter will decide regarding the furloughs following their recommendations.

**Emil Grossman in New Business**

NEW YORK, Sept. 14.—Emil Grossman, former president of the Emil Grossman Mfg. Co., has instituted a new business, styled E. G. Mfg. Co., located at 50 West 54th Street. The company's business consists of locating surplus stocks of automotive equipment and supplying jobbers whose stocks are short.

Samuel W. Prussian, president and owner of the Guaranty Truck Co., Cambridge, has accepted a position in the Quartermaster's Department for the duration of the war, although he is exempt from the draft because of his age.

Harry W. Ford, former president of the Saxon Motor Car Corp., Detroit, has gone to Washington and is associated with Colonel Barret Andrews in the reorganized Army Transport Corps under General Drake.

E. S. Ralph, for several years with the advertising department of the American Seeding Machine Co., Springfield, Ohio, has been appointed advertising manager of the R. & P. Tractor Co., Alma, Mich.

George C. McMullen has been appointed Western representative of the Timken Roller Bearing Co., with headquarters in San Gabriel, Cal.

W. H. Conant of New York, formerly manager of the Pittsburgh Motor Vehicle Co., is now manager of the Prismolite Co., Columbus, Ohio.

S. A. Campbell, formerly sales manager of the Warnola Mfg. Co., New York, is now associated with the Bay State Pump Co., Boston.

**American Motorcycles for Canadian Police**

MONTREAL, Sept. 13—Thirty-five motorcycles are being purchased for the police department, at a cost of between \$400 and \$500 apiece. Twenty will be Harley-Davidsons, obtained from the Art. Ross Co., and fifteen will be Hendersons, obtained from Graveline & Kennedy. Delivery of some of the machines has already been made.

**Lansing Forge Enlarges Plant**

LANSING, Sept. 12—The new addition to the Lansing Forge Co. is expected to be completed by Oct. 1. The new facility is 67 by 80, and will be used for dies and stock storage. The company took over the property of the old Emergency Drop Forge Co., which went into the hands of a receiver. The new organization consists of outside capitalists who make a special of the forging business. Many changes have been made in the old plant, which has been modernized in every way.

**Lease Old Pathfinder Plant**

INDIANAPOLIS, Sept. 15—The plant of the Pathfinder Automobile Co., which recently passed through dissolution proceedings, has been leased by the S. M. Dixie Shoe Polish Co. of Brooklyn, N. Y., and will be used for the manufacture of shoe polish.

**Indiana Truck Corp. Erecting Building**

INDIANAPOLIS, Sept. 15—The Indiana Truck Corp., Marion, is erecting a new building 70 x 200 ft. The building will be of fireproof construction. The company has recently received government contracts which have necessitated the increasing of its manufacturing facilities.

**Sun Plant Is Sold**

INDIANAPOLIS, Sept. 15—The plant of the Sun Motor Car Co., Elkhart, has been sold to W. L. Huffman, Omaha, who announces plans for establishing a company for the manufacture of motor trucks. The plant contains 60,000 ft. of floor space. The new owner has announced no plans as to the type of truck to be manufactured.

**Truck Man Adds Tractors**

CHARLES CITY, IOWA, Sept. 14—The American Engine & Tractor Co. has closed a contract with the Brehm-McMullen Co., Minneapolis, for 300 Matchless-American 15-30 farm tractors. The Brehm-McMullen Co. is Acme truck distributor.

**Smith Engineering Works Extends Plant**

MILWAUKEE, Sept. 16—The Smith Engineering Works has broken ground for a two-story machine-shop and office building, 67 x 100 ft., to cost \$32,500. The company is a large builder of machine-tools, machinery and metalworking shop equipment.

**Winther Increases Manufacturing Facilities**

KENOSHA, WIS., Sept. 16—The Winther Motor Truck Co., Winthrop Harbor, Ill., which is now at work on its new \$125,000 truck manufacturing plant, is enlarging the scope of the project to some extent by making provision for a one-story building, 50 x 70 ft., to be used for offices and drafting rooms. The factory is expected to be ready for occupancy about the middle of October.

**Oil Co. Effects Another Consolidation**

APPLETON, WIS., Sept. 16—The Badger Producing & Refining Co., which is operating several large oil wells in Oklahoma, has absorbed the Green Bay Oil & Gas Co., Green Bay, Wis., and its holdings in Texas and Oklahoma. This is the second consolidation within a short time, the Badger company having taken over the Appleton Oil & Gas Co. in July. The main offices of the three merged companies will continue to be located in Appleton.

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged***New Company Takes Over Fickling Plant**

LONG ISLAND CITY, N. Y., Sept. 16—The Enameling & Stamping Corp. of New York has taken over the plant of the Fickling Enameling Corp., at Second and Webster Avenues, and has re-equipped it with up-to-date appliances designed to handle baked-on enameling, rust-proof coating, etc., on fenders, hoods and automotive accessories of all kinds.

**Velie Develops Kerosene Device**

MOLINE, Sept. 14—The Velie Motors Corp., following a series of tests with a kerosene device for its passenger cars here last Monday, has decided to start manufacturing the device, which it will sell to other makers of cars, the U. S. Government and to Velie owners. The device was first used on Velie tractors. Then it was further developed for trucks, and now it has been further perfected for passenger cars. The tests last Monday were severe. There were present as observers some of the big distributors, and they rode in the cars to note at close range how the device worked.

**Overland Gets British Order**

TOLEDO, Sept. 14—The Willys-Overland Co. has received an order from the British Government for 10,000 semi-chassis for war purposes. The amount of the contract is around \$7,500,000, it is stated, which brings the total business of the company for the United States and its allies up close to the \$50,000,000 mark. It is understood that negotiations for important military work are still pending.

**New Jobber in Utah**

SALT LAKE CITY, Sept. 14—The Motor Mercantile Co. has entered the automotive equipment jobbing trade at 115-117 South West Temple Street in a modern three-story building. It is wholesale only. The principals are: A. D. McMullen, president and general manager, formerly of the Strevell-Paterson Co. and Capital Electric Co.; vice-president, E. J. Raddatz; secretary and treasurer, F. A. Pyke; sales manager, V. A. Culver; buyer, George G. Hansen, formerly buyer for the Chanslor & Lyon Co., San Francisco. The directors are McMullen, Pyke, Raddatz, Culver and J. P. Gardner. The active officers are all well known to the inter-mountain trade.

**Arbenz Factory Practically Suspends Operations**

CHILLICOTHE, OHIO, Sept. 14—The Arbenz Car Co. has practically suspended operations owing to its engineer, N. J. Arbenz, being with the expeditionary force and to the difficulties experienced in obtaining material and labor. A few cars, for which parts are in stock, are being finished.

**Amazon Purchases O'Neill**

AKRON, Sept. 16—The Amazon Rubber Co. has purchased the tire accessory business of the O'Neill Tire & Rubber Co. The purchase includes the exclusive right to the name O'Neill. The O'Neill business will be added to the Amazon business and continued.

**New Plant for Bailey Co.**

CHICAGO, Sept. 16—The George D. Bailey Co., which manufactures the Bailey ball thrust bearing for Fords and Chevrolets, and also the R C magneto coupling, has moved into its new plant at 4500-06 Ravenswood Avenue.

**Moon to Build Army Trucks**

ST. LOUIS, Sept. 16—The Moon Motor Car Co. has contracted to build 300 motor trucks for the Army, the first truck order this company has received.

**Hamilton Making Tractors**

TORONTO, ONT., Sept. 14—The Hamilton Gear Machine Co., largest machine cut gear manufacturing company in Canada, has entered the tractor field with a machine of its own design—the Straight Line Tractor. It is a three-plow job, conservatively rated at 12-25 hp., and is of the four-wheeled type with large diameter front wheels.

**More Room for G. & J. Tire**

INDIANAPOLIS, Sept. 15—The G. & J. Tire Co., of this city, has awarded a contract for a warehouse to cost \$50,000. The new structure will be two stories high, with brick walls and slow-burning construction. It will have a frontage of 70 ft. and a depth of 170 ft.

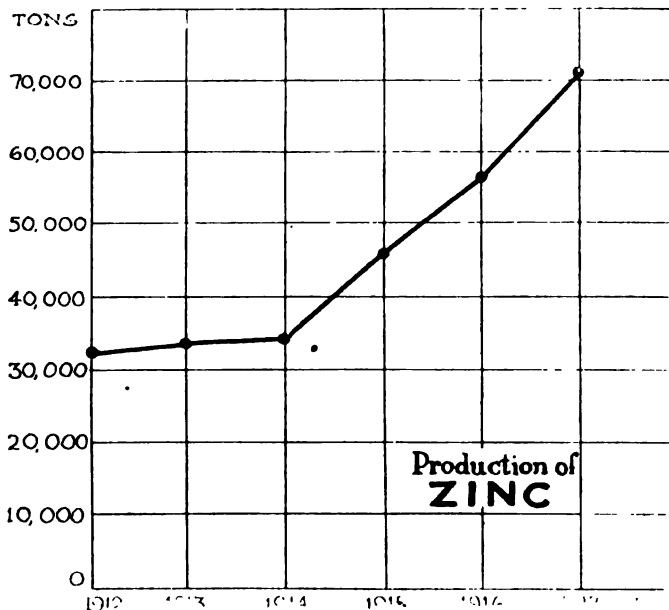
**Boone Tire Extends Plant**

CHIPPEWA FALLS, WIS., Sept. 16—The Boone Tire & Rubber Co., Sycamore, Ill., which is putting the finishing touches upon its new and main factory at Chippewa Falls, Wis., announces that George M. Graham has become associated with the plant as works manager. Mr. Graham is a tire and rubber expert with wide foreign and American experience and comes to the concern from Pennsylvania. The beginning of regular production at Chippewa Falls has been greatly delayed by the difficulty in getting delivery of some of the machinery and equipment, but most of this is now on the ground.

## AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>		<b>Lard:</b>	
Muriatic, lb. ....	.02-.03	Prime City, gal. ....	2.30
Phosphoric, ct. ....	.35-.39	Ex. No. 1 gal. ....	1.60
Sulphuric (60), lb. ....	.009	Linseed, gal. ....	1.90
		Menhaden (Brown)	
<b>Aluminum:</b>		gal. ....	1.30-1.31
Ingot, lb. ....	.33	Petroleum (crude),	
Sheets (18 gage or		Kansas, bbl. ....	2.25
more), lb. ....	.40	Pennsylvania, bbl. ....	4.00



This chart shows a steady increase in the production of zinc in the U. S. A. since the commencement of the war. The United States, although not the largest producer of zinc, shows the greatest increase of any country in recent years

<b>Antimony, lb. ....</b>	.13%- .13%	<b>Rubber:</b>	
<b>Burlap:</b>		Ceylon:	
8 oz., yd. ....	.17%- .17½%	First latex pale	
10½ oz., yd. ....	.22 - .22½%	crepe, lb. ....	.61 -.63
<b>Copper:</b>		Brown, crepe, thin,	
Elec., lb. ....	.26	clear, lb. ....	.60
Lake, lb. ....	.26	Smoked, ribbed	
<b>Fabric, Tire (17½ oz.):</b>		sheets, lb. ....	.59 -.61½
Sea Is., combed, lb. ....	1.65-1.70	<b>Para:</b>	
Egypt, combed, lb. ....	1.25-1.35	Up River, fine, lb. ....	.68
Egypt, carded, lb. ....	1.20-1.30	Up River, coarse,	
Peelers, combed, lb. ....	1.05-1.20	lb. ....	.40
Peelers, carded, lb. ....	.95-1.05	Island, fine, lb. ....	.59
<b>Fibre (¼ in. sheet</b>		Island, coarse, lb. ....	.27
base), lb. ....	.50	<b>Shellac (orange), gal. ....</b>	.70 -.76
<b>Graphite:</b>		<b>Spelter</b> ....	.09½-.09%
Ceylon, lb. ....	.07½-.25	<b>Steel:</b>	
Madagascar, lb. ....	.10 -.15	Angle beams and	
Mexican, lb. ....	.03%	channels, lb. ....	.03
<b>Lead, lb. ....</b>	.08 -.09	<b>Automobile sheet</b>	
<b>Leather:</b>		(see sp. table).	
Hides, lb. ....	.18 -.35½	Cold rolled, lb. ....	.06½
Nickel, lb. ....	.40 -.43	Hot rolled, lb. ....	.03½
<b>Oil:</b>		<b>Tin</b> ....	.78 -.79
<b>Gasoline:</b>		<b>Tungsten, lb. ....</b>	2.45
Auto., gal. ....	.24½	<b>Waste (cotton), lb. ....</b>	.12%- .17
68 to 70 gal. ....	.30½		

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when sec- onds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping.....	6.20	6.10
Automobile body stock, extra deep stamping.....	6.45	6.35
Heed. flat fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 35 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
Black Sheet Extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge		Bid	Asked	Net Ch'ge
Ajax Rubber Co. ....	60½	62½	..	*Saxon Motor Car Corp. ....	5	7	- ¼
J. I. Case T. M. Co., pfd. ....	81	83½	+ 3	Standard Motor Construction Co. ....	12½	13½	..
Chalmers Motor Co., com. ....	4	6	..	Standard Parts Co. ....	60	65	..
Chalmers Motor Co., pfd. ....	20	30	..	*Stewart-Warner Speed. Corp. ....	56½	57½	- ½
Chandler Motor Car Co. ....	86½	88½	-1½	*Studebaker Corp., com. ....	45½	46½	-1½
Chevrolet Motor Co. ....	115	122	-14	*Studebaker Corp., pfd. ....	85	90	+ 5
Fisher Body Corp., com. ....	36	37	..	Swinehart Tire & Rubber Co. ....	50	60	..
Fisher Body Corp., pfd. ....	84	85	..	United Motors Corp. ....	27½	27½	- 4
Fisk Rubber Co., com. ....	60	62	..	*U. S. Rubber Co., com. ....	60	61	2
Fisk Rubber Co., 1st pfd. ....	97	103	..	*U. S. Rubber Co., pfd. ....	103½	105	+ ½
Fisk Rubber Co., 2nd pfd. ....	79	83	..	*White Motor Co. ....	45½	46½	- ½
Firestone Tire & Rubber Co., com. ....	105	107	..	*Willys-Overland Co., com. ....	19½	20½	- ¼
Firestone Tire & Rubber Co., pfd. ....	94	96	..	*Willys-Overland Co., pfd. ....	81	83	-1
General Motors Co., com. ....	114½	116	-10½				
General Motors Co., pfd. ....	78	78½	- ½				
B. F. Goodrich Co., com. ....	46½	47½	+ ½				
B. F. Goodrich Co., pfd. ....	99½	101	..				
Goodyear Tire & Rubber Co., com. ....	152	155	..				
Goodyear Tire & Rubber Co., 1st pfd. ....	99½	100½	+ ¼				
Grant Motor Car Corp. ....	1½	2½	- ¼				
Hupp Motor Car Corp., com. ....	3	3½	..				
Hupp Motor Car Corp., pfd. ....	78	82	..				
International Motor Co., com. ....	32	39	+1				
International Motor Co., 1st pfd. ....	62	66	..				
International Motor Co., 2nd pfd. ....	36	41	..				
Kelly-Springfield Tire Co., com. ....	47½	49	+ ¼				
Kelly-Springfield Tire Co., 1st pfd. ....	79	87	-2½				
Lee Rubber & Tire Corp. ....	20	21	+ ½				
Maxwell Motor Co., Inc., com. ....	25½	26	-1				
Maxwell Motor Co., Inc., 1st pfd. ....	56½	57½	-1½				
Maxwell Motor Co., Inc., 2nd pfd. ....	20	20½	- ½				
Miller Rubber Co., com. ....	106	108	..				
Miller Rubber Co., pfd. ....	95	96	..				
Packard Motor Car Co., com. ....	120	126	+2				
Packard Motor Car Co., pfd. ....	90	93	-1				
Paige-Detroit Motor Car Co., com. ....	15½	16½	- ½				
Peerless Truck & Motor Corp., com. ....	14	16	-1				
Portage Rubber Co. ....	105	109	..				
Reo Motor Car Co. ....	14½	15½	+ ¼				

\*At close Sept. 14. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE  
ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co. ....	..	7½	..
Bower Roller Bearing Co. ....	..	18½	..
Chevrolet Motor Co. ....	115	122	-10
Continental Motor Co., com. ....	5½	5½	..
Continental Motor Co., pfd. ....	..	94	..
Edmund & Jones, com. ....	..	17	..
Edmund & Jones, pfd. ....	..	90	..
Ford Motor Co. of Canada. ....	150	152	-1
Hall Lamp Co. ....	..	14	..
Michigan Stamping Co. ....	..	..	..
Packard Motor Car Co., com. ....	..	125	..
Packard Motor Car Co., pfd. ....	..	..	..
Paige-Detroit Motor Car Co. ....	..	16½	..
Prudden Wheel Co. ....	10½	..	+1
Reo Motor Car Co. ....	..	..	..

## INACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Atlas Drop Forge. ....	..	25	..
Kelsey Wheel Co. ....	25	..	..



# Industrial Review of the Week

## A Summary of Major Developments in Other Fields

### August Output of Steel

#### Ingots Shows Increase

The close relation between steel works output in the United States and the steady pushing forward of American lines in France has been emphasized in the past week. Manufacturers of barbed wire were called to Washington to plan for quickly increasing output, after many weeks of restricted production. The entire capacity, which is 50,000 tons a month, may soon be engaged. Besides American requirements a new call has come for 60,000 tons for Italy and 65,000 tons for Great Britain, and the latter amount may be increased to 90,000 tons.

One Pittsburgh mill, on an urgent order for 80-lb. rails for France received last Wednesday rolled 20,000 tons before the end of the week. There is an entirely unprecedented volume of shell steel orders; sheets are wanted in large quantities for trench shelters and rolling kitchens, and in all ways the needs of the American army have been pressed upon the steel mills, until for one week the incessant call for ship plates has become an undertone.

There has been a week of meetings in New York preparatory to the quarterly price conference in Washington, now set for Sept. 19 instead of the day preceding. Lake Superior iron ore producers, particularly underground miners, have formulated their argument for a second advance. Eastern iron ore companies have come together for the first time and will be represented at the price table. Wire companies have agreed that barbed wire should be advanced \$5 a ton and nails by a like amount. The smaller steel makers who buy their pig iron, and who represent about 10 per cent of the finished material output in important lines, will make a stronger appeal than at any previous conference.

Foundry pig iron producers decided at their meeting last Thursday that their case must be presented separately at Washington and not through the general steel committee. Regional prices are being agitated and the Southern furnace companies are especially insistent.

At Washington, while the cry still goes up for greater production, there is little encouragement to the pleas for higher prices, though some producers, both of pig iron and finished steel, are claiming that in the last quarter of the year their costs will be higher than present prices.

Attempts to bring steel plants under the rulings of the National War Labor Board continue and the situation is tense, not so much from actual differences between the manufacturers and employees as from the efforts from without to raise issues that will bring Government interference.

Chicago at last reports definite announcements of the prices secured by agricultural implement buyers through

Government intervention, including 25 per cent discount on shafting and disk steel at 7.5c. An order for 15,000 tons of rivets is being placed this week for Hog Island. Government absorption of bolt and nut as well as rivet output is more complete.

Jobbers have not been encouraged by the week's developments as to army requirements. Their B4 classification gives less and less promise of stock replacements as the revised schedule of imperative shipments to France keeps mounting.

The price of domestic manganese ore is involved in a conference being held to-day (Wednesday) on the amount of Brazilian ore to be imported in the remaining months of the year. If these imports are reduced, exports to South America must be cut down, as manganese is now simply return cargo for ships that will not be allowed to come back light. If manganese imports from Brazil are reduced, higher prices for domestic ores and for ferromanganese will be urged.

The August output of steel ingots is estimated at 3,498,000 tons for 27 working days against 3,532,600 tons for 26 days in July. Steel works production thus suffered to a greater extent last month than that of pig iron.—*Iron Age*.

#### Texas Co. Report Shows Remarkable Record

NEW YORK, Sept. 16—The gross earnings of the Texas Co. as shown by the company's report show an increase from \$26,391,745 to \$80,260,633 during the years 1915 to 1918, each total being for the fiscal period ending June 30. Net earnings during the same period have increased from \$8,024,692 to \$34,873,402 and the surplus for 1918 is \$14,397,241 as compared with \$3,393,327 for 1915. Profit and loss surplus has risen from \$14,529,301 to \$54,667,429.

#### Chevrolet Motor Co. to Dissolve

NEW YORK, Sept. 17—The directors of the Chevrolet Motor Co. are calling a special stockholders' meeting on Oct. 11, at Wilmington, Del., for the approval of a plan involving the dissolution of the company and a distribution of its assets. The Delaware corporation only will be dissolved under this scheme, the several subsidiaries operating under the name of the Chevrolet Motor Co. being continued as going concerns.

As the Chevrolet assets, with the exception of the company's holdings of General Motors stock, have been absorbed already by the General Motor Corp., it was realized there was no advantage in keeping the corporate name of the Chevrolet Motor Co. alive; hence the decision to dissolve the company and distribute its assets to the stockholders.

### Bituminous 17,000,000

#### Tons Behind Schedule

As was to be expected, the observance of the Labor Day holiday throughout the mining regions cut into the production of both anthracite and bituminous coal during the week ended Sept. 7. Bituminous output totalled 11,249,000 net tons for the week (5½ days), while anthracite shipments for the same period amounted to 1,617,579 net tons.

It should be recorded, however, that the miners at quite a few operations made up for the holiday by working extra time the Saturday preceding, and another fact which should be emphasized is that the percentage of absenteeism the day following the holiday was negligible. Appeals to the miners for more regular working time are undoubtedly having their effect.

Bituminous coal output is now approximately 17,000,000 net tons behind schedule, and production for the rest of the coal year must be maintained at the rate of 2,041,000 net tons a day if the deficit is to be made up. The car supply is now excellent, however, and the bituminous mines have everything in their favor for a drive on greater output. Anthracite production for the coal year to date is estimated at 45,645,597 net tons, which is an increase of 1,084,000 net tons over the same period of last year.

Market conditions present no radical changes. The Fuel Administration has the distribution and allotment of all grades of coal well under control, and a determined effort is being made to supply the Northwest before navigation on the lakes closes for the season. Dealers have many unfilled orders on their books, but the total quantity of coal delivered to domestic consumers to date is far greater than was true at this time last year.—*Coal Age*.

#### Fox Leaves Saxon

DETROIT, Sept. 17—C. L. Fox, assistant sales manager of the Saxon Motor Car Co., will leave next week for Jacksonville, Fla., where he will go into training in the Motor Transport Corps.

#### Two New Strom Bearing Offices

CHICAGO, Sept. 16—The U. S. Ball Bearing Mfg. Co. has opened two new sales offices. A San Francisco office at 434 Rialto Bldg. is in charge of S. C. Kyle. A Detroit office at 1437 Dime Bank Bldg. is in charge of A. deMaringh.

#### Abandon Importers' Salon

NEW YORK, Sept. 16—The Annual Importers' Automobile Salon, which is held at the Hotel Astor in New York and at the Congress in Chicago, has been abandoned. Members of the board of directors voted unanimously not to hold the event.

## China Offers Poor Prospect for Automotive Industry

By Harold B. Wilson

CANTON, CHINA, Aug. 8—It will probably be many years before the automotive industries reach any great prominence in China, especially in the South. Canton is the largest of the southern cities. It has 2,000,000 inhabitants and occupies a space of only about 20 sq. miles. Outside of the Bund, a 2-mile street along the river and about three other very short streets, there is not a roadway in the city wide enough for an automobile to operate.

There is one automobile here, belonging to one of the generals, and when it comes down the Bund, it excites as much attention as a circus parade in Bingville. Where possible cartage is handled on the river and canals. Coolies equipped with bamboo poles and rope take care of the remainder.

Before automobiles can be used roads must be built. At present the only means of passage through the rural districts are paths just wide enough for two people to pass on foot or on horse back. Many places these paths are not wide enough for two people to pass on foot and wooden platforms are built over the rice fields for one to stand on while others pass.

The principal farming here is rice and truck growing. Truck patches are usually very small and all the work is done by hand. Rice fields are small also and since the plowing is done when the ground is under water or at least very wet, tractors are cut out of the question. Water buffaloes are the only power for this work.

The coast towns like Hong Kong and Shanghai have many automobiles but comparatively few trucks. Gasoline is so dear and coolies so cheap is the chief reason for this absence of trucks. Automobiles are used mostly for business purposes. These cities are trade centers and as the street car systems are very poor many business men find cars very convenient but expensive, as gasoline costs

approximately \$1 gold per gallon at the present time. The radius of the travel out of Hong Kong is too short for automobiles to be used, to any great extent, for pleasure.

In Canton and Hong Kong the motorboat is far more important than the automobile at present and will continue to be for some years to come. They are really a necessity to business concerns. The Standard Oil Co. and the Asiatic Petroleum Co. have a number of motor houseboats for work in the interior. Other concerns will doubtless follow their example when their business up country has reached sufficient volume to warrant it. The most popular fuel for motorboats is kerosene as the cost is a little less than half that of gasoline. Many of the larger boats are equipped with surface ignition crude oil engines. One Chinese concern, the Hip Tung Wo Engine Co., is doing a thriving business building and operating surface ignition oil engine passenger boats and tugs. The day will come when China will have roads and her people will have money to buy automobiles. First she must have a stable and efficient government and a large foreign trade. She has been marking time for a great many years but is beginning to show signs of progress. Her people are too intelligent and industrious to allow her to always remain in a rut.

### Consolidated Machine Co. Moves

The Consolidated Machine Co., Detroit, manufacturers of screw machine products, tools and gear blanks, has moved to 121 State Street, where more than double the former space is available. C. F. Richards is president of the company and Wayne C. Plummer is secretary and treasurer.

### Blackburn Co. Changes Name

CLEVELAND, Sept. 16—The automobile department of the Blackburn Specialty Co. will hereafter operate under the name of the Cox Mfg. Co. The company will continue the manufacture of locking devices and other accessories.

## From New York to Chicago by Airplane in One Day

NEW YORK, Sept. 14—The landing of the postal airplane at New York, Sept. 10, recorded the first trip ever made by an airplane from Chicago to New York in a single day. The numerous attempts heretofore to make this flight have encountered interruptions which have prevented the completion of the trip until the succeeding day.

Pilot E. V. Gardner, accompanied by Edward Radle, mechanic, left Chicago at 6.25 a. m. in a plane propelled by a Liberty engine and landed at Hicksville, L. I., at 8.20 p. m. Allowing for one hour's difference in time and for stops made for replenishing of gas and oil, the trip from Chicago was made in 12 hr. and 55 min. The actual flying time, however was 10 hr. and 5 min., there being a delay of 1 hr. and 57 min. at Cleveland and another 53 min. at Lockhaven, Pa., in procuring gas and oil.

### Fliers Slightly Injured

Mr. Gardner began his flight at Chicago in a driving rain and encountered a severe head wind at Cleveland. He flew over New York at an elevation of 7000 ft. and landed in the dark on a very bad field at Hicksville, L. I. In taking the landing the machine made a spill, slightly injuring the occupants. Mr. Gardner received a cut on his nose and near his left eye, and Mr. Radle was cut on the arm.

Two bags of mail for New York and connections were carried on the plane from Chicago and delivered at the New York post office.

### McCarthy Drill & Tool Has New Plant

TOLEDO, Sept. 16—The McCarthy Drill & Tool Corp. is now occupying its new two-story factory building at Clinton Street and Oakwood Avenue. About a year ago the McCarthy corporation purchased the Toledo Machine & Tool Co. Since taking possession, the company has expanded and enlarged its business and is handling export orders for drills, reamers and cutters, as well as an extensive direct government business.

# Calendar

### ENGINEERING

Nov. 14-15 New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

### ASSOCIATIONS

Sept. 19-21—Syracuse, N. Y. Semi-annual meeting of the American Gear Manufacturers' Association.

Oct. 7-12—Milwaukee. American Foundrymen's Assn. and allied organizations. Milwaukee Auditorium.

### SHOWS

Sept. 8-20—Greely, Weld Co., Colo. Tractor Show, Central Community Fair.

Sept. 9-14—Milwaukee, Milwaukee Automobile Dealers, Inc. Fourth Annual Wisconsin State Fair. Hart J. Ruddle, Mgr.

Sept. 9-14—Syracuse, N. Y. Tractor demonstration (State Fair). J. Dan Ackerman, Secy.

Sept. 9-15—Madison, Wis. Tractor demonstration (State Fair). O. E. Remy, State Fair Secretary.

Sept. 12-13—Marion, O. Tractor demonstrations, Farm Bureau Associations. M. C. Thomas, County Agricultural Agent.

Sept. 14-21—Chicago. Automotive and Accessories War Exposition. Municipal Pier.

Sept. 19-21—Harrisburg, Pa. Tractor demonstrations, State Fair.

Sept. 23-28—Boise, Ida. Tractor demonstration (State Fair). J. C. Wooley, Moscow, Ida.

Oct. 1-5—Washington, Ga. (Wilkes Co.). Tractor demonstrations, State Fair.

Oct. 12-19—Atlanta. Tractor demonstrations Eastern State Fair and Automotive Exhibition.

Oct. 14-27—Dallas, Tex., Seventh Annual Texas Automobile Show. Texas State Fair.

Sept. 17-20—Riverhead, L. I. Tractor demonstration (County Fair). Harry Lee, Secy.

Sept. 30-Oct. 4—Trenton, N. J. Tractor demonstration (Trenton Fair). Harry B. Salter, Supt.

Oct. 16-18—Ottawa, Ont., International Plowing Match. Tractor and Farm Machinery Demonstration. Experimental Farm.

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration. State Fair.

Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.

### RACING

Sept. 21—Sheepshead Bay.

Oct. 5—Cincinnati. Cincinnati Speedway.

# AUTOMOTIVE INDUSTRIES

*The* AUTOMOBILE

Engineering  
Literary

SEP 30 1918

UNIV. OF MICH.

"The arrival of Maxwell Truck at Columbus Circle, New York City, after its record breaking run from San Francisco. The entire trip was completed without a single plug adjustment, replacement or attention of any kind, in fact the plugs were not removed from the motor from start to finish."

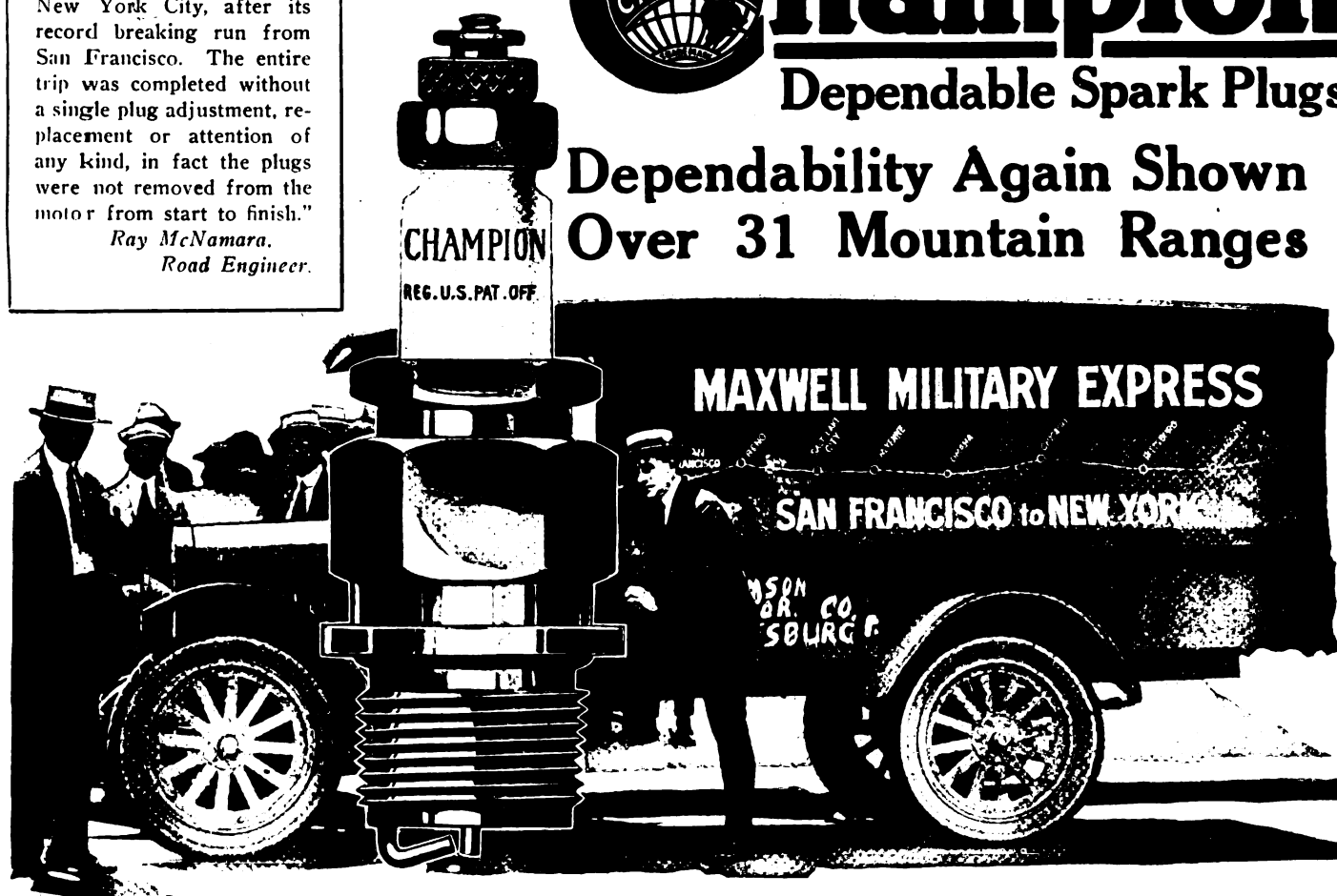
Ray McNamara,  
Road Engineer.



## Champion

Dependable Spark Plugs

### Dependability Again Shown Over 31 Mountain Ranges



Champion Maxwell, 7½-18  
Price, \$1.00

**T**HE irrefutable evidence of the dependability of Champion Spark Plugs continues to mount higher and higher.

Concerning the remarkable cross-continent run of the Champion equipped Maxwell Truck (3,428.7 miles in 17 days, 8 hours and 20 minutes) Ray McNamara, Road Engineer, says:

"It was not necessary to remove a spark plug from the motor from start to finish, which performance is very phenomenal when the 31 mountain ranges that are crossed are taken into consideration; these ranges vary from two to twelve miles of steady climbing, and the same distance prevails going down on the other side of the mountains.

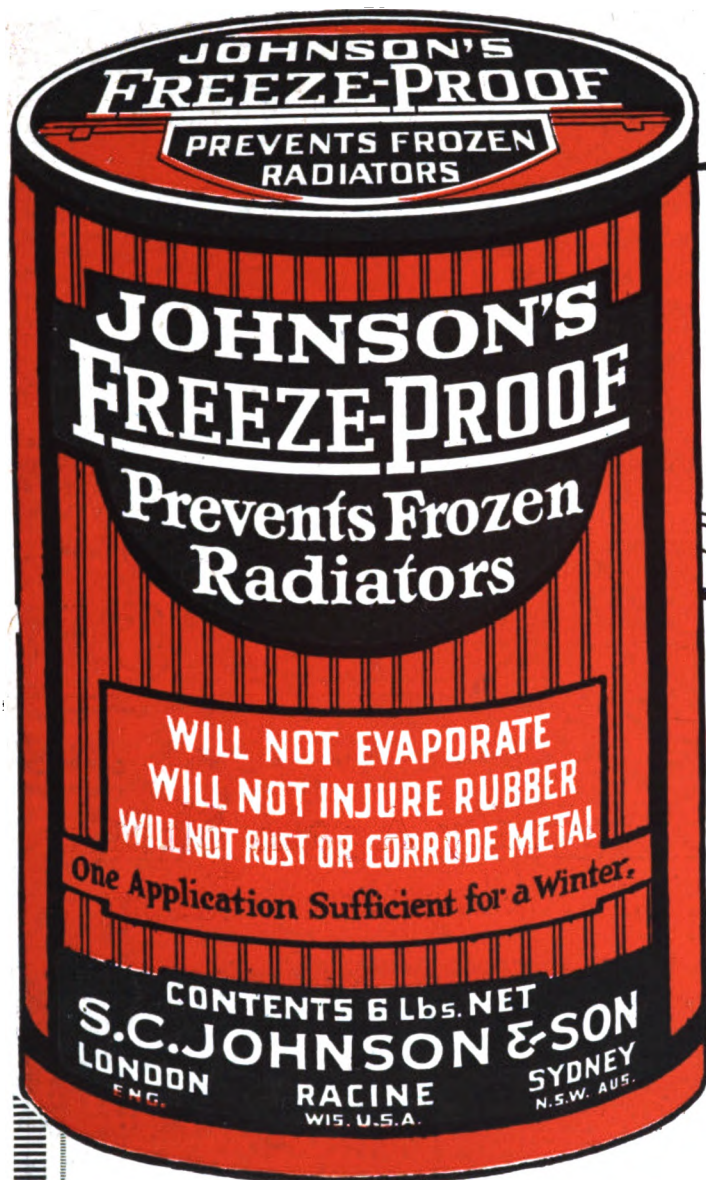
where it is necessary to use the motor to help hold back the load on the steep grades."

An overwhelming majority of all American motors are equipped with Champion Spark Plugs, because every test and experience demonstrates again and again their superior efficiency and durability.

Champion Spark Plug Company, Toledo, Ohio

Canadian Office: Champion Spark Plug Company of Canada, Limited, Windsor, Ontario





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This is a logical anti-freeze preparation to stock—it is put up in compact form so will not require much space—there is no freight to pay on the water—it is absolutely guaranteed if used according to the simple directions on the label—it will be the most extensively advertised anti-freeze preparation on the market—it is backed by an advertising appropriation of \$150,000.00 which will be spent in the leading magazines, weeklies and on the billboards.

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I am interested in handling Johnson's Freeze-Proof for the coming winter. Please send me your booklet of Facts about Freeze-Proof—also quotations.

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S. C. JOHNSON & SON, Dept. A, Racine, Wis.

# AUTOMOTIVE INDUSTRIES

## THE AUTOMOBILE

VOL. XXXIX

NEW YORK, THURSDAY, SEPTEMBER 26, 1918—CHICAGO

No. 13

## Gear Makers Decide on Closer Co-operation

Comprehensive Standardization Plan Involving All Types of  
Gears Started—Increasing Production and Man-  
Power Conservation the Great Issues

By P. M. Heldt

**S**YRACUSE N. Y., Sept. 21—Getting their complete organizations co-operating to the highest efficiency under war conditions, and complete co-operation with the Government in its war activities, constituted the keynote of the semi-annual convention of the American Gear Manufacturers' Association, which was concluded here to-day.

Not an address was made during the 3 days of the meeting that did not contain some reference to war conditions and ways of meeting them, and a spirit of patriotic fervor pervaded many of the speeches made at the social gatherings.

A representative of the War Industries Board, Charles A. Otis of Cleveland, chief of the Resources and Conversion Section, came to Syracuse to talk regarding plans adopted for the conversion of plants and equipment engaged in non-essential industries to suit them for essential work.

Some conception as to how the members of the association can co-operate with the Government was given by President F. W. Sinram, when he told of the endless ramifications of the use of gears. There are gears in every ship, every airplane, every submarine, every truck, every military tractor, every farm tractor, every motorcycle, every steam shovel,

crane, gasoline locomotive, trench engine, gun, gun-mounts, and gears are in use in all mines, mills, and much electrical equipment. At present 80 per cent of all gear work is war work.

This broad use of gears going into industries very often not closely related and not having common interests points to the great necessity for standardizing in order that production be kept at its highest percentage and man-power be conserved as much as possible.

President Sinram emphasized the fact that few gears are purchased directly by the Government, yet gears invariably form parts of all complete war machines in use.

"The requirements of the nation," said President Sinram, "predominate over every other consideration. It devolves upon every gear producer to apply his plant and equipment where it will fit into the general requirements to the best advantage. Production is the need of the hour. Co-operation between those operating in the same field is demanded by the present. This has become a patriotic duty and is not only encouraged, but expected by the Government.

"We live in a new era. Standardization is not

only encouraged and recommended by the Government, but the latter has seen fit to command it in certain industries in the interest of conservation, production and economy. Our program for technical standardization is gradually taking shape. It should receive considerable impetus during this meeting. Let all concerned keep ever at it during the ensuing 6 months in order that the current association year may record material progress. Standardization is important to the future of the industry.

"Another phase of standardization—commercial—is receiving consideration; uniformity of practice is desirable in many connections. The sessions of this meeting may open the way for a step forward in this direction.

"Perhaps a few statements of facts pertinent to gear production may suggest what is necessary from the different angles for satisfactory performance on the part of the industry.

#### The Importance of Gears

"1—There is no finished product more vital to the war than gears.

"2—The production of gears is a technical, highly specialized business. Efficiently conducted it demands in personnel ability—commercial, technical and mechanical—of a high order.

"3—Many phases of gear production demand skilled workers to an extent not required by the average metal working industry.

"4—A large fixed investment—plant, machinery and tools—is required for any considerable scope and volume.

"The requirements of the nation are paramount to every other consideration. It devolves upon every gear producer to apply his plant and equipment where it will fit into the general requirements to the best advantage. Production is the need of the hour.

"Co-operation, as never before, between those operating in the same field is demanded by the present. This has become a patriotic duty and is not only encouraged, but expected by the Government.

"We live in a new era. Standardization is not only encouraged and recommended by the Government, but it has seen fit to command it in certain industries in the interest of conservation, production and economy.

"Another phase of standardization—commercial—is receiving consideration; uniformity of practice is desirable in many connections. The sessions of this meeting may open the way for a step forward in this direction.

"Summer is over. Our meeting here to-day marks the opening of the fall and winter season. It is also expected to represent the start to renewed activity in every phase of association endeavor."

#### How Gear Makers Can Co-operate

The most tangible way in which the gear makers can co-operate with the government, by increasing production and conserving man-power, is along the lines of standardization, and a complete program for pushing standardization work was outlined and an organization of committees to carry this work out arranged for. This was followed up by instructions to all the committees on the work to follow in this field. B. F. Waterman, chairman of the General Standardization Committee, has this work in charge, and his program has in mind considering the design of gears so as to evolve rules and formulas which will make it possible for all of the forty-seven members of the gear association to manufacture approximately the same product.

This program, outlined in detail later, arranges for the consideration of the design of all types of gears, so that different makers can produce approximately the same design; and it also involves a standard specification sheet for use in contracts and orders.

Still another example of how the members of the association may co-operate as a war conservation measure was suggested by Frank Burgess of Boston, when he reported on

the possibility of one maker loaning hobs to other companies. At present there are over 1800 hobs owned by the members and scarcely more than one-third of these are in constant use. By the loan suggestion it would be possible to keep in use a much greater percentage of the time.

The association appointed a War Service Committee, and it is expected will be a fit method of association representation on matters with the government.

The increasing use of women in gear factories and the efficiency of these was one factor of the meeting. W. Diefendorf gave a special address on this subject.

The advantages of housing workmen under war conditions was well outlined by C. V. Stuart, who told of the results attained by one of the steel companies in this field.

The report of the membership committee showed that 14 well-known gear concerns had applied for membership in association, and their applications were accepted. The members are the Cullman Wheel Co., Chicago, the Br. Lipe Gear Co., Syracuse, and the Indianapolis Tool & Co., Indianapolis. This brings the number of concerns represented in the association to 47.

B. F. Waterman, chairman of the General Standardization Committee, presented a committee report. Between the V. Sulphur Springs meeting last April and the present meeting the committee held two meetings at which the conclusion reached that certain items in gear design and manufacture were ripe for standardization. Sub-committees have been appointed to deal with the following classes of gears respectively: Bevel, spur, worm and spiral herringbone, position gears and sprockets. There will also be a hardening and heat-treating committee and a committee on gears pinions for electric railways and mines.

Instructions were issued to each committee outlining subjects which it should deal with from the standpoint of standardization, as follows:

#### Recommendations for Standardization

##### To the Bevel Gear Committee

1—We think it well to consider the design of gears with the aid of evolving rules and formulas enabling all members to turn out approximately the same product. As each sub-committee representing a type of gear will work on the subject of design, there should be consistency in all formulas.

2—Formulas for strength of gear teeth and the relation of strength to wear.

3—Adopt a standard long addendum for straight tooth gears and consider a modification of addendum and dedendum agree with the correct or normal pitch as is practiced in herringbone gears.

4—Make up a standard specification sheet for use in contracts and orders.

##### To the Spur Gear Committee

1—We think it well to consider the design of spur gears with the aid of evolving rules and formulas enabling all members to turn out approximately the same product. As each sub-committee representing a type of gear will work on the subject of design, there should be consistency in all formulas.

2—Develop a formula for the strength of spur gear teeth and relation of strength to wear.

3—Make up a standard specification sheet for use in contracts and orders.

##### To the Worm and Spiral Gear Committee

1—Rules for the design of worm gears enabling all members to turn out approximately the same product.

2—Formulas for the strength of worm gears and the relation of strength to wear.

3—A specification sheet for use with contracts and orders whereby customers and maker will know just what will be produced.

##### Committee on Composition Gearing

1—Standard methods of construction advised by manufacturers of this type of gearing.

2—Standard methods of handling the material to prevent absorption of moisture.

3—Strength formulas for various kinds of material used in type of gearing.

4—Best methods of cutting and the speeds and feed permitted.

5—Tabulate successful long-lived drives, giving full details as to full load, intermittent load, speeds, etc.

6—Make up standard specification sheet for use in contracts and orders.

##### Hardening and Heat Treating Committee

1—Depth of case and its relation to pitch and service.

2—Materials and treatments suitable for different services.

3—Standardizing scleroscope and Brinell readings.



*Herringbone Gear Committee*

- 1—Formulas whereby members will produce gears approximately of the same design and where others interested might do so.
- 2—Formulas for strength of herringbone gears and the relation of wear to strength.
- 3—Tabulate successful designs giving details.
- 4—Get up a specification sheet for use with contracts and orders whereby customer and manufacturer will understand just what is to be furnished.

*The Sprocket Committee*

- 1—Evolve formulas for dimensions of hubs, arms and rims, having in mind the design of spur wheels which are now being considered by the spur gear committee.
- 2—Another matter that was brought up was the question of when small sprockets should be hardened. Some standard practice might be determined here by working in conjunction with the chain manufacturers. A table of the strength of various kinds of chains with the safe working speeds would be useful. This data, of course, must be obtained from the chain manufacturers. (A copy of a letter received from the committee on Steel Roller Chains of the American Society of Mechanical Engineers in which they agreed to co-operate was sent to each member of this committee).

*Electric Railway and Mine Committee*

- 1—Evolve rules and formulas whereby all members will turn out approximately the same product. As each sub-committee representing a type of gear will work on the subject of design, there should be consistency in all formulas.
- 2—Develop formulas for the strength of gear teeth and the relation of strength to wear.
- 3—Make up a standard specification sheet for use in contracts and orders.

Each list of subjects was accompanied by the following comment: "In undertaking this work it seems advisable to limit ourselves somewhat in the number of subjects that we consider so that we will have a better chance of concentrating and finishing up the various subjects; it may be that the committee will decide that these be considered in a different order than given or that something else is of more importance, when they will feel free to take it up, although we trust that the sub-committees will keep the General Standardization Committee in touch with what they are doing."

The report of the committee on commercial standardization, which is drawing up specifications which are to accompany all bids and contracts for gears, was not quite ready, but William Ganschow of Chicago, a member of this committee, read an outline of the items to be covered. It is proposed to submit the revised specifications to the membership for comment once more before putting it up for a vote.

*The Hob Exchange Plan*

Frank Burgess of Boston read a preliminary report of the hob exchange committee. The idea is that a tabulation shall be made of all hobs owned by members, with a note as to whether they are willing to loan them to other members under conditions agreed upon. A survey made shows that over 1800 hobs are owned by member companies and that not more than one-third of them is in even fairly constant use. The plan has the hearty approval of several members and is directly in line with the conservation movement.

John B. Foote of Chicago made a comprehensive report for the labor committee. The following war service committee has been appointed to represent the gear industry: F. W. Sinram, chairman; S. L. Nicholson, vice-chairman; Frank Hamlin, secretary; Frank Burgess, H. W. Chapin, James E. Gleason, F. T. Zollinger, T. G. Meachem, E. J. Frost and William Ganschow. The personnel of this committee was approved as being well selected both as regards branches of the gear industry and sections of the country.

On Thursday evening the members and others in attendance were the guests of the Brown-Lipe Gear Co. and the Brown-Lipe-Chapin Co. at a dinner given at the Onondaga. The affair was a very enjoyable one.

During the Friday morning session W. H. Diefendorf of the New Process Gear Corp. read his paper on the employment of women in the gear industry. Mr. Diefendorf said in substance:

"For years back we had observed women employed in the mechanical arts, not only in light and intricate work, such as inspection, watch making, but also operating machines working on fairly heavy and sizable parts, which latter practice, I believe, was carried to a much greater extent abroad. We, therefore, decided to try the experiment in one of our gear cutting departments on some of our lighter work. The re-

sults justified our hopes and we proceeded to extend the system to cover other sections and departments, which enabled us to supply the necessary quota of operatives at a time when they were badly needed.

"Recent visits to plants producing war material revealed the fact that women are now being employed, not only on grinding operations, light lathe work, etc., but also on heavy work, such as the milling of engine bases, as well as on certain portions of engine assembly. Naturally the positioning of heavy parts requires the use of chain hoists and the aid and guidance of male overseers and assistants. In the light of such facts it is apparent that women operatives *can* be used in the heavier as well as the lighter varieties of gear work, though probably the logical field for such help is in connection with the blanking and cutting of small gears on a piece work basis where the operative receives a financial return for her labor commensurate with her application and her natural ability.

"Women also make excellent inspectors, their delicate touch—more sensitive than that of men—aiding them in detecting imperfections when giving the gears a rolling test, and this, coupled with their quick eyes and nimble fingers, gives them an advantage in gaging and visually inspecting finished parts.

"War conditions have, of course, accentuated the seriousness of the labor problem and with the close of hostilities, in all probability, many of the women now employed in the mechanical trades will return to their former status, but it does not seem at all probable that, having become accustomed to a fat pay envelope, they will willingly go back to the less lucrative field of housework, etc. Consequently, so long as there remains a demand for operatives at good wages we may expect to see woman a keen competitor of man and in certain lines running in the forefront of the race, resulting in a condition which, if continued, will undoubtedly force upon the community the consideration of such things as communal homes, communal kitchens, etc.

"To my mind there can be but one reply to the question in hand, which is that the up-to-date gear maker not only can but should accord to woman a place among his operatives."

Mr. Otis, of the War Industries Board spoke for several hours, dwelling upon the great shortage of steel which is due to a shortage of coal that results from lack of sufficient manpower; and he insisted upon the absolute necessity that the steel requirements of the fighting forces be met first.

*The Steel Outlook*

At the final meeting this morning C. E. Stuart of the Central Steel Co., Massillon, Ohio, gave a talk on The Outlook of the Steel Supply. He read a letter from J. L. Replogle in which were given the estimates of steel production and war requirements which have already been published. These, as is known, leave a deficiency of 6,000,000 tons for the current 6 months. Fortunately this is only a "paper" deficiency and various things will tend to lessen the actual consumption for war purposes.

Mr. Stuart also dwelt on the labor situation and described some methods employed by his firm to increase the efficiency of their labor. Working in co-operation with a land company the concern has invested \$112,000 in bunk houses for laborers close to the steel mills. Each contains a cot and bed. The bed is properly made and the house swept out during the day, so that when the tenant arrives in the evening he finds it neat and tidy. Formerly many of the foreigners employed at the mills roomed at a considerable distance outside the city, where, it was found, they were subject to baneful influences. Now, with the men close to the factory, on the addition of the land company, they are under police supervision furnished by the company. A refrigerating plant was installed and each workman is allowed a limit of three bottles of beer a day. The investments thus made have resulted in an appreciable increase in efficiency and the workmen are encouraged to and do buy the houses after they find they like the place.

Another paper read during this session, by C. E. Crofoot, was on "Trade Acceptances." Mr. Crofoot favored the use of trade acceptances in the gear industry and the recommendations made in his paper were referred to the committee on commercial standardization.

# Useful Data From Harrisburg Tests

## Tractor Demonstration, Staged by Department of Agriculture, Gives Valuable Performance Information—Plow on Basis of Advertised Capacity

**H**ARRISBURG, PA., Sept. 24—A commendable effort to stage tractor demonstrations that will furnish useful tractor performance data for such agricultural areas as Pennsylvania was carried out by the Department of Agriculture of this state during the last 4 or 5 days.

The demonstrations were originally scheduled for September 19, 20 and 21, but owing to rain the program was entirely upset and the demonstrations were not completed until tonight. Unfortunately two or three of the contestants had made other arrangements at Pennsylvania county fairs, and they had to withdraw their tractors when the demonstrations were scarcely one-third over.

These state demonstrations were not spectacular; only fifteen different models of tractors competed, but they were epoch-making in that a close record was kept on all of the work done. Machines were given approximately 2 continuous days at plowing, followed by a fraction of a day on fitting the soil for winter wheat, and seeding.

### Observer on Each Tractor

During every stage of the demonstration each tractor was accompanied by an official observer who recorded the exact time required for the particular work; the number of stops made, and the length of each, and information as to whether these were due to troubles with the tractor, or with the plow, or other equipment; they also reported the exact amount of fuel consumed by each tractor in each of the jobs to which it was assigned.

All of this information is not as yet available but will be given out by the Department of Agriculture in the next week or 10 days. One report has been given out to date which covers a 3-hr. period of plowing on typical Pennsylvania land. This report, published herewith, contains much valuable information on the performance of the tractors, particularly on smaller areas than that plowed at the national demonstrations.

The plowing was done in a 42-acre field measuring approximately 76 x 90 rods; the furrows were 76 rods in length. Two-thirds of the ground was clean sod, and the one-third an old corn stubble in which the weeds were 3 ft. in height. All of this ground was very hard until 2 days previous to the demonstrations when it was brought into good plowing condition by the heavy rains.

### Accurate Information Sought

One of the purposes of the Pennsylvania Department of Agriculture in staging these demonstrations was to secure an accurate line of information on what different tractors would do under Pennsylvania conditions. The Pennsylvania farmer does not question what a tractor will do on the prairie stretches of Kansas, but he has the Missouri instinct with regard to what it will do on the hills and among the stones of his own state. The Pennsylvania farmer also has some peculiar ideas as to how farming must be done in his locality and he is doing his best to discover the capacity of the tractor to meet his local requirements.

He also feels that the rate of plowing which is possible in the western states is not possible in Pennsylvania. He is further of the opinion that fuel consumption in his state is higher than that in the West.

The 3 hr. of plowing, which is covered by the report herewith, is not a complete answer to this question, and several more demonstrations of this nature will be required before accurate figures are obtained. For example, in the field plowed there were no stones, although in the fields not covered by this report, much time was lost by stones. The field covered in the present portion of the report is practically level

and so gives no clue as to the performance of tractors on hilly ground. Hilly conditions were encountered but the report on them is not ready.

### Test Based on Advertised Capacity

The tabulation herewith is based on each tractor plowing in a 3-hr. period the amount it is supposed to plow according to the advertising of the manufacturer. In laying out the plot for each tractor, the area allotted was based on the speed of the tractor in m.p.h., the number of plows, and the width of the plows.

A definite area was staked out for each tractor and this is given in the fifth column of the tabulation, which is headed, "acres plowed." The assumption was that all of the tractors should plow their respective area in 3 hr. flat, providing they averaged the speed given in the entry blank. This had to include all of the time consumed in turning at either end of the field.

As to how close the different contestants came to this schedule is shown by the fourth column from the end headed "gross time." The figures are given in hours and minutes. This gross time includes time lost for stops due to the tractor and also the plows as given in the last two columns. From this it will be seen that only one tractor finished ahead of its 3 hr. schedule. This was the Frick, which was 8 min. ahead of schedule. This tractor in doing its plowing had lost 2 min., 1 min. for tractor stop and 1 min. for a plow stop.

### Many Closely Approached Time Limit.

There were several other tractors that approached closely to their plowing schedule, or as in this case, nearly finished their plot within the 3-hr. period. The Parrett was 5 min. over its schedule. This machine had to plow in the corn stubble which was knee high with weeds and if the recorded plow stop were eliminated, its net plowing time was only 2.5 min. above the 3-hr. schedule.

The new International four-cylinder tractor, using a vertical engine—this tractor has not been seen in western demonstrations—had to operate through the same weeds that the Parrett did, and it finished 5 min. ahead of its schedule, or in 2 hr. and 55 min. It lost 6 min., due to plow stops, so that its real net plowing time was 2 hr. and 42 min. or approximately 17 min. under its entered speed. It entered at 2.5 m.p.h. speed and performed at 2.54 m.p.h.

There were other tractors that came close to finishing on the 3-hr. schedule. The Case 9-18 model finished in 16 min. over the 3 hr. The International Harvester Titan model was only 8 min. over the 3 hr., and if a 4-min. plow stop is deducted its net plowing time was but 4 min. over the 3 hr.

The Waterloo Boy finished in 3 hr. and 13 min., or 13 min. above schedule. Allis-Chalmers finished 13 min. above schedule. The Huber was 23 min. above schedule.

### Real Reason for Delays

There were very legitimate reasons why some of the tractors could not plow on schedule. In this connection the work of the Cleveland must be noted. It was the lot of this tractor to draw a very bad section of land, part of which was made up of a rough fence bottom extending from one end to another of its area. The fence had only been removed the day previous and it was almost impossible to keep the plows clean during several rounds while this was being plowed. Over two-thirds of the ground the Cleveland had to plow was overgrown with weeds, which delayed the work. This tractor was entered to plow at 3.5 m.p.h. and its actual speed worked out at 2.54.

There were some of the other tractors which did not per-

form up to their rated speed for different reasons. In some cases the machines were fresh from the factory and were not sufficiently worn in to put up the supreme test.

In the tabulation the tractors that had to plow on the corn stubble overgrown with weeds were the Emerson-Brantingham, Knickerbocker, Parrett, I. H. C. and Cleveland. The Reed tractor withdrew after making a round or two due to clutch troubles.

The Knickerbocker is a Ford attachment in which a special rear axle with heavy wheels is fitted to a touring car body. It had a severe test, as its entire plowing area was in the weedy section.

The Emerson-Brantingham was the only tractor to haul four plows.

#### Fuel Consumption Figures Valuable

The fuel consumption figures, while accurate and valuable, are perhaps not sufficiently comprehensive to be taken as a Pennsylvania criterion. They are, however, the best figures available, and give a pretty good indication of what can be expected. With those tractors using kerosene the consumption per acre is over 3 gal., with the exception of two machines, namely, the Emerson-Brantingham, which pulled four plows, and the Frick, which pulled three plows.

These fuel consumption figures were quite amazing to many of the contestants, who imagined they would not use so much kerosene. One grade of kerosene was used, which was the standard grade sold in Pennsylvania. All tanks were filled from the same tank wagon. These fuel figures do not include the gasoline used for starting. In some cases a good deal more gasoline was used than was required for starting.

For example, the Emerson-Brantingham used over 4 gal. of gasoline, or very close to a gallon per acre, in addition to its kerosene, so that its low kerosene consumption figure must only be read in connection with the gasoline used as well. This does not apply to the Frick, which used a very small quantity of gasoline, approximately 1 pt.

There were three tractors that used gasoline entirely. These were the Cleveland and the Moline, both of which pulled two-bottom 14-in. plows, and were entered at a speed of 3.5 m.p.h. The Moline did its plowing in sod, whereas the Cleveland had the corn stubble and the rough fence bottom. The fuel consumption of these two was remarkably close, Moline averaging 3.18 gal. per acre and Cleveland 3.21. Had both been working on the same class of soil, it is questionable which would have shown the better performance. The net plowing time of the Cleveland was 3 hr. and 47 min. and that of the Moline 3 hr. and 55 min.

Generally speaking, the fuel consumption for those tractors using gasoline was under that of those using kerosene, the Frick being the single exception. The average of gasoline per acre was pretty close to  $\frac{1}{2}$  gal. less than that of the average of kerosene.

There were remarkably few stops due to tractor troubles, the Reed being the only serious case. The Knickerbocker or Ford had 45 min. checked against it for tractor stops, much

of which was due to repairing the fan belt. The majority of the other tractor stops were due to changing spark plugs, tightening terminals, repairing fan belts, and adding water to the radiator.

Although no official record was kept of the oil consumed, all of the tractors filled up before starting, and one or two were compelled to add oil to the engine before the 3 hr. were up. The rules had contemplated keeping a record of the oil but it was wisely decided not to do this. When many of the tractors drew off the crankcase oil at the end of the period it was badly thinned, undoubtedly due to kerosene getting past the pistons into the case.

In connection with the consumption of oil in a tractor engine, it would seem best to make a distillation test of the lubricant in the crankcase after the test to show the percentage of kerosene. This has been done with motor trucks and valuable results have followed. It would appear to be the only accurate means of ascertaining how successfully the kerosene fuel has been burned. Such distillation tests would furnish valuable information for the tractor industry.

The rules and regulations governing the demonstrations were very simple. It was required that each tractor should, as stated, plow at its rated speed, and do this at a depth of 6 in. The different entrants drew for positions on the field. After the day's work was done the tractors were packed under military guard.

The Pennsylvania Department of Agriculture selected as observers what are known as county agents. These are generally college graduates, resident in the different counties, and employed by the state to give advice in the county on all questions relating to agriculture. Many of these county agents have staged the conventional 1-acre plowing demonstration during the past few months, and many others are planning to have similar demonstrations next spring.

#### State Purchased 35 Tractors

The State of Pennsylvania, through the Department of Agriculture, purchased last spring thirty-five tractors of different makes, and has been operating these in different sections of the state. The Department of Agriculture has daily reports on the work of these and it is largely because of this that the present demonstrations were decided upon.

It is expected next week to publish reports showing the fuel consumption for plowing on hilly soil containing some stones, and other reports showing the fuel consumption required in fitting the ground for winter wheat and seeding it.

Many of the county agents who acted as observers are of the opinion that if tractor demonstrations in Pennsylvania are to carry real conviction to the farmer, they must plow and cultivate as is considered best. There are those who are asking for plowing 8 to 10 in. deep and turning a furrow 10 or 12 in. wide instead of 14 in. They claim that you cannot do proper plowing with a 14-in. furrow unless the depth is more than 6 in., as called for in the present demonstrations. The 6-in. depth is satisfactory for winter wheat, but is not satisfactory for spring plowing.

Pennsylvania State Tractor Demonstration Record Results of a 3-Hour Plowing Test

Name	Rating	Plows No. Size	Entered Speed, m.p.h.	Actual Speed, m.p.h.	Acres Plowed	Acres per hr.	Gals. Kerosene per Acre	Gals. Gasoline per Acre	Total Kerosene, Gals.	Total Gasoline, Gals.	Gross Time, Hrs. Min.	Net Time, Hrs. Min.	Tractor Stops, Min.	Plow Stops, Min.
Emerson-Brantingham	12-20	4-14	2.33	1.74	4.855	0.984	2.033	0.915	9.875	4.406	4:56	4:15	2	39
Knickerbocker	22	2-12	2.50	1.66	1.908	0.403	...	2.817	...	5.376	4:44	3:59	45	...
Reed	12-20	2-14	2.50	...	...	...	...	...	...	...	...	...	...	...
Parrett	12-25	3-14	2.375	2.31	3.030	0.983	3.790	...	11.500	0.125	3:05	3:02.5	...	2.5
I. H. C.	8-16	2-14	2.50	2.54	2.121	0.719	3.830	...	8.125	0.125	2:55	2:49	...	6
Cleveland	12-20	2-14	3.50	2.48	2.970	0.701	...	3.210	...	9.750	4:14	3:47	8	19
Case	9-18	2-14	2.25	2.06	2.190	0.670	3.200	...	7.000	0.500	3:16	3:16	...	...
Huber	12-25	3-14	2.50	2.21	3.180	0.939	3.010	...	9.562	0.500	3:23	3:16	...	7
Titan	10-20	3-12	2.50	2.39	2.727	0.870	3.483	...	9.500	0.062	3:08	3:04	...	4
Plowman	15-30	3-14	3.00	1.89	3.819	0.741	3.930	...	15.000	1.1875	5:09	4:45	15	9
Plowman	13-30	3-14	2.33	1.76	2.970	0.713	3.130	...	9.310	0.375	4:10	3:58	3	9
Waterloo Boy	12-25	3-14	2.25	2.09	2.862	0.889	3.140	...	9.000	0.250	3:13	3:11	...	2
Frick	12-25	3-14	2.33	2.33	2.925	0.991	2.307	...	6.750	0.187	2:57	2:55	1	1
Allis-Chalmers	10-18	2-14	2.25	2.09	2.190	0.680	3.800	...	8.440	0.625	3:13	3:08	...	5
Moline Universal	9-18	2-14	3.50	2.57	2.970	0.727	...	3.180	...	9.437	4:05	3:55	2	8



# Purchasing Agents Discuss Priority

Representative of War Industries Board Explains Its Desire to Be Helpful—Over 400 Attend Banquet

**D**ETROIT, Sept. 23.—(Special to AUTOMOTIVE INDUSTRIES).—Five hundred purchasing agents from all lines of industries gathered at the Pontchartrain this morning to attend the opening session of the annual convention of the National Association of Purchasing Agents. With a gathering representing several billion dollars' worth of purchasing power annually, the convention is one of the most significant gatherings yet held by this rapidly growing association.

Registered delegates represented the biggest manufacturing concerns from Connecticut, California, Michigan, Illinois, Indiana, Missouri, the Atlantic Coast, centering at New York; western New York State, Ohio, Pennsylvania, and other sections of the country.

There were eighteen delegates from Philadelphia, seven from Springfield, Mass.; seventeen from Connecticut, eleven from Rochester, four from Dayton, twelve from Toledo, six from St. Louis, six from Milwaukee, twenty-two from Buffalo, thirty-six from New York, twenty-five from Pittsburgh, seven from Columbus, seventy-three from Detroit, fifty from Cleveland, thirty-nine from Chicago, seven from central Indiana and the remainder from miscellaneous sections of the country as far west as the Pacific Coast.

## More Than 400 In Attendance

More than four hundred members attended the annual banquet, Sept. 24, an event which is felt by the members to mark another great forward stride in the growth of this young but powerful organization. A strong address by Albert C. Ritchie, Counsel for the War Industries Board, who told the real meaning of priorities, and the causes back of the work of the board, was one of the important features.

Our raw materials are plentiful but not inexhaustible, Albert C. Ritchie, who is attorney general of Maryland as well as counsel for the War Industries Board, told the members of the association. Mr. Ritchie represented the War Industries Board and was assigned to deliver a message from the Board by Chairman Bernard M. Baruch.

Steel unfortunately happens to be the material which is shorter than others, yet in addition to being needed in the war it is needed in practically all industries. Our resources must be first for war and then for industry, and it is part of the work of the War Industries Board, as defined by Mr. Ritchie, to see that the various divisions of war work secure the proper amounts of raw materials in the correct relative quantities and then to see that the industries get the material in the quantities in accordance with the war program of the government.

Our allies are calling upon us heavily and we must support them because their work is the same as ours. For this reason the War Industries Board must make a study of the material situation in every particular and first see what the requirements for war are, and then apportion what remains to the industries.

The Board has at work approximately 1500 men, all directed by the seven members of the Board who are the division leaders. These men have made amazing savings by cutting down the number of different models or styles of product in practically every line of industry. They have entered shops and suggested better methods of production and have gone to factories in work not useful to winning the war and turned them over to war work.



ALBERT C. RITCHIE  
*Attorney-General of Maryland and  
Counsel to War Industries Board*

Mr. Ritchie cited building materials as a typical example. He said that the total amount of steel manufactured in the United States during the past six months was 17,000,000 tons, while the war program called for 21,000,000 tons. The steel is also needed for bridges, buildings, rails and any of a great number of industrial purposes. For this reason the work of the Priorities Committee on this subject alone presents problems of greatest delicacy.

Talking of priority, Mr. Ritchie said it is not only necessary to determine if the firm is making war material alone. The degree of importance of these war materials must be properly graded so that they will arrive in the proper sequence. Of the steel available, General Pershing demands enough for railroads to support the advance of the armies. Mr. Schwab wanted the steel for ships in order to keep the line of communication across the ocean unbroken. Mr. McAdoo demands the steel for rails and locomotives on this side of the water because the lines of communication begin here.

## How Priority Applies

It is the duty of the manufacturer, according to the War Industries Board, to give precedence in manufacture to orders which carry the highest priority rating, so that these ratings apply not only to transportation of materials but also to their course through production.

The War Industries Board is, of course, concerned with many matters outside of priority. There is also the work of price fixing and conservation. The industries have welcomed the efforts of the Board in both these directions and called the Board in to help them in their problems. The number of buggy models, for example, has been cut down to two instead of hundreds which previously existed. The number of automobile tire sizes is being reduced to nine. Another great division, headed by Mr. Otis, studies plants and their equipment for the purpose of changing them over to war work if they are not engaged in some essential industry.

Mr. Ritchie recommended that all those concerned in any way with priority problems write to the Board for publications which are now printed on the subject. The inquiries should be addressed to the secretary of the Board, and these



William Gugenheim,  
Bauer Bros. Co., Springfield, Ohio



W. P. Ogden



Herbert E. Cass,  
Merrett Soule Co., Syracuse

booklets will clear up many of the questions which are now being asked regarding the manner of handling priorities.

Above all, the speaker explained, the Board is not so much a regulating body as a co-operative one, and it wants the people who are working with these problems to send their men to Washington to get in touch with the divisional heads of the Board to discuss their problems.

Priorities was the subject principally under discussion at the Tuesday meeting. That purchasing agents are greatly puzzled regarding the handling of priorities was evident.

A committee was appointed to draw up a resolution that the sub-contractor be allowed to have the same priority classification as the first contractor. This action is sufficient to show how little informed buyers really are regarding the manner of using priorities, because it has frequently been pointed out in Washington that the sub-contractor has the same status as the main contractor in priority.

W. H. Ogden of the Scovill Mfg. Co., Waterbury, voiced the sense of the meeting when he stated that the Government is screwing the lid down tighter and tighter and everyone must arrange their business so that they are helping the cause.

Another member stated that the committees appointed by bodies such as the Purchasing Agents' Association can do no good, since they cannot add anything to the work that the Priorities Board is already accomplishing.

"We must remember," this member said, "that we are in this war and have to win it, and all our buying business should be conducted with that idea uppermost."

So that manufacturers and the War Industries Board can come to a better understanding President E. L. McGrew, purchasing agent of the Standard Underground Cable Co., Philadelphia, appointed a committee consisting of D. E. Ferguson of Pittsburgh, chairman; Thomas F. Kenney of New York, Charles A. Steele, Philadelphia; V. W. Bergenthal, St. Louis, and W. E. Hopton, Syracuse.

Some of the papers read included "Commercial Bribery," by W. P. Ogden, Scovill Mfg. Co., Waterbury; "Should the Stores Department Be Under the Purchasing Agent's Control?" by William Gugenheim, Bauer Bros. Co., Springfield, Ohio; "Buying Substitutes," by E. J. Solon, Owens Bottle Mach. Co., Toledo, Ohio.

The program included James Schermerhorn, Detroit *Times*, a nationally-known figure, toastmaster; Edgar A. Guest, whose war poems are widely known, and Dr. M. S. Rice, a powerful patriotic speaker who made a strong appeal to every man and woman in the country to make every sacrifice and to throw themselves heart and soul into this conflict to make war head the final list of non-essentials.

In addition to the business program, the visitors were conducted to the plant of Henry Ford & Son, tractor manufacturers, at Dearborn, and the Burroughs Adding Machine Co.

## How Purchasing Agents May Serve the Nation in Their Work

By C. A. Woodroof  
Saxon Motor Car Co.

THE purchasing agent can best serve the nation in his work by practicing the principles of conservation, co-ordination and co-operation. It is only by the help of our fellow men that we accomplish anything. A man alone can do little of significance, but with the help of others he can build railroads and houses, and his power is practically unlimited.

It is only necessary to look at Russia, which, through its scattered efforts and lack of unity of purpose, has become nothing more or less than a gigantic jig-saw puzzle. Contrast this with England, France or the United States, where the united efforts of the people have succeeded in accomplishing a great purpose, and who on this account are going to put a glorious end to this war.

The purchasing agent is in a position to study conditions and to apply the results of his study to his work. He knows the fundamentals of a great many industries which center

in his product. The purchasing agent of an automobile factory not only knows the intricacies of his own business, but he must also have a knowledge of every other line, whether it is the manufacture of a cotter pin or of photography from the clouds which cover his plant.

He must know the location of every plant making the product in which he is interested. He must know the course of making this product; he must know the equipment of the plant, and its capacity, in order to conduct his purchases with the greatest amount of intelligence.

As a result of his specialized knowledge, great numbers of the members of the Purchasing Agents' Association have been called to Washington as commissioned officers or civilians to aid the Government in the co-ordination of their war orders. Purchasing agents can help each other.

There is nothing like personal experience, but second to



F. J. Salom,  
Amens-Battle Co., Toledo



Frank T. Lodge,  
Detroit



E. L. McGrew,  
Standard Underground Cable Co., N

this is the personal experience of others, and if we can through this association permit each other to profit by our personal experiences, one of the greatest aims of the organization will have been accomplished.

The war will impose on us a high tax for a long time. It is only by conservation and thrift that we will meet this tax. It has not been necessary hitherto for us to practice this strict economy, but it is now necessary. A lesson is pointed out to us by the French. After the Franco-Prussian war such a heavy indemnity was imposed on France that Germany thought that she would never again be able to oppose the scheme of German world dominion. It was the stocking of the French peasant which saved France.

The standardization of catalogs is a step in the right direction. The use of two colors and a standard size of sheet will conserve ink and paper. It will help the paper manufacturer, the envelope maker, and if the loose-leaf style of catalog is decided upon, it will eliminate the mailing of thousands of sheets of unnecessary matter to people who are not interested in it. It will conserve the efforts of postal clerks and of the thousands of people through whose hands the extra matter would have to pass.

The purchasing agent should only order what material he actually needs. Under no circumstances should material be hoarded. The purchasing agent should go directly to his source of supply, ordering exactly what he needs and conserving freight space on the shipment of this material. He should by no means extend his inquiries broadcast, creating a false demand and an impression of shortage where none such really exists.

The purchasing agents can suggest that automobiles be used in place of railroad trains. The truck can supplant the pinch bar and freight car for short distance moving. He can utilize the knowledge gained in his visits to other plants to suggest better and more efficient methods in his own.

He can study the economical use of materials, as, for instance, in reducing the tin content in babbitt in order to furnish a greater supply for Government needs, and, furthermore, he can use over any obsolete stock which other purchasing agents have on hand, thus helping all parties.

Above all, the purchasing agent should not compete with the Government in buying. The biggest thing a purchasing agent can do now is to aid the Government by honestly observing priorities and buying efficiently. In purchasing, it is disloyalty and treason to compete with Uncle Sam now.

## A New Book on Austin Buildings

THE "Austin Book of Buildings," No. 5, just off the press, is a 64-page volume completely covering the service performed to-day by the Austin Co. of Cleveland.

Starting with a description of the Austin method, which is an application to the construction of industrial buildings

of the principles of quantity production by the development of standardized parts and models interchangeable in a manner as to provide a large array of buildings both in and size. The method is largely used to-day because of the fact that it provides for the erection of substantial fire buildings in a minimum time.

There are chapters covering the 10 Austin standardizing units, combinations of Austin standards, specifying the Austin industrial building service, equipment and service.

There are a large number of illustrations showing buildings that have been erected at short notice for large industrial undertakings. Detailed drawings and cross section floor plans, side elevations and front elevations are given.

## Teaching by Intensive Methods

IT was at first believed that a man or woman wholly familiar with machine shop practice could not quickly be trained for operations of the greatest precision in repetitional production, but the contrary is the fact. H. E. Miles, chairman of the Section in Industrial Training of the Council of National Defense, in a recent interview said: "A new person, mechanically inclined and of good intelligence, can be taught a single machine (lathe, grinder, miller, in surprisingly short time under highly specialized instruction."

At first, if the machine is complicated, it must be a challenge for the operator, but shortly he or she will set up the machine for any one of a series of similar operations. This has been carried to unbelievable extent in England, and in the United States women in about three weeks have been taught to run single machines within limits of one-thousandth to sometimes five ten-thousandths of an inch.

Many of the leading machine tool builders in Cincinnati, Worcester and elsewhere are developing this type of worker satisfactorily.

## Removing Temper From Steel

THE Swiss journal, *Die Elektroindustrie*, gives particulars of a process for removing the temper from hardened steel. The piece to be softened is placed on a bed of iron at red heat and covered by a plate of cold iron. The whole has cooled the piece of steel, whatever its previous quality and degree of hardness, is detempered completely, and can easily be worked without its quality having undergone any change by, for example, decarburization. The method is specially applicable to the unhardening of more particularly punches and dies. Tests have given excellent results, and the method has the advantage that all pieces of steel do not show any shrinkage after treatment.



# Hawaii Has More Automobiles Than China and Japan Together

## Truck and Tractor Possibilities—Used Car Problem Very Much Present—Analysis of Selling Field

**T**HE Hawaiian Islands constitute a better export market than China and Japan, and in these islands there are to-day more automobiles than in China and Japan combined. At the end of 1917 there were 2087 cars in the islands as compared with 1678 at the end of the previous year, 1381 at the end of 1915 and 939 at the end of 1914, or 6 months after the war started.

Tom O. Jones, for years connected with the automobile industry, gives these figures in a recent report he has made to the Department of Commerce as a result of a special investigation be made for the department throughout Japan and in parts of China and in the Hawaiian Islands.

According to the report of Mr. Jones, Hawaii is not a huge market by any means, but nevertheless one worthy of serious consideration. Prosperous countries always offer attraction to the automobile maker and his sales forces, and there is no denying the prosperity of our first overseas holding. Practically every financial interest in the islands is centered in sugar, and the last few years have been ones of great prosperity for the sugar growers. It is only necessary to survey the records of the various companies since about 1913 to realize this fact.

The Securities Manual issued by the Honolulu Stock and Bond Exchange under date of May 15, 1917, shows that 12 sugar corporations, with an average capitalization of \$3,187,500, paid dividends of 12.8 per cent in 1914, 23.8 per cent in 1915, and 35.2 per cent in 1916. These figures are not cited to boom Hawaiian sugar stocks, for they are the figures for only 12 companies out of 24 listed, and they make the best showing. Some of the others were less prosperous, but the figures given indicate why Hawaii is buying automobiles. Capital stock of the sugar companies is traded in rather generally and much of it is held by men in other lines of business. These sugar profits also affect many other lines of trade in the islands.

### The Automobile Population

That this assists the automobile trade is conclusively proven by the following customs figures showing shipments from the United States during the years 1914 to 1917:

Years	Number	Total value	Average value
1914 .....	939	\$961,677	\$1,024
1915 .....	1,381	1,482,622	1,074
1916 .....	1,678	1,672,190	997
1917 .....	2,087	1,941,820	935

It is evident, therefore, that Hawaii is taking a larger number of cars each year, and that the average price of these cars is being reduced each season, an intimation to the makers of the lower-priced cars that the field has attractions for them.

Hawaii has felt shipping conditions as keenly as terri-

tories much farther away, and it is literally true that for the past year and a half the selling of motor cars has been more a question of getting deliveries than of finding buyers. This condition is proved by the fact that one company which received a shipment of 30 cars, having a list price in the United States of over \$1,500 each, disposed of the entire shipment within 10 days after arrival last fall, and difficulties have, of course, considerably increased since then.

Motor vehicles are used to a large extent on four of the islands. Oahu has approximately 3400 cars at the present time, Hawaii 1500, Maui 800 and Kauai 580. There are probably over 30 motor vehicles on the other islands.

### Selling Methods

Doing business with Hawaiian dealers is so nearly identical in every detail with business with any distributor in America that it needs very little comment. The manufacturer doing business with any of the established companies on the islands would be safe in drawing his drafts just as he does on a rail shipment to any distributor in the United States. However, most companies treat the shipments as export business and require payment against steamer bill of lading at point of shipment, although some manufacturers handle the territory as subsidiary to the San Francisco branch or distributor. It is fully worth a direct factory contract.

Honolulu is, of course, the commercial center, and headquarters for distribution must be established there. Some of the larger dealers have branches at Hilo to handle the business on the island of Hawaii. To secure the trade on the other islands, either a resident agent is appointed, who stays in the territory at all times, or a salesman from the Honolulu establishment makes regular trips for the purpose of closing retail sales. One car manufacturer has an independent contract with a Hilo dealer, as well as one at Honolulu, but in most cases the business can be handled as satisfactorily by turning over the whole territory to a Honolulu dealer.

### Used Cars on Hand

Possibly 50 per cent of all sales made on the islands are contingent on the taking of a used car. As a consequence, the disposal of secondhand cars has become a matter of serious worry to the dealers. Within the last year several such cars have been exported to Japan. The dealers claim that they are endeavoring to foster this business by taking precautions to see that the cars are in good condition when shipped.

The higher-priced cars are sold almost altogether on a cash basis. An exception to this rule is found among Hawaiian and Japanese who are driving their own cars in rent service. The machines bought for this purpose are generally big seven-passenger cars which in the United States sell for \$2,000 up. These drivers prefer

to buy new cars, paying for them on a monthly basis and giving the old car as the first payment. Some of the secondhand cars in good condition find an outlet in this field.

Buying of the lower-priced cars, that is, cars listed at less than \$1,000 in America, is done largely on a payment basis, usually one-half cash and the balance within one year. This condition is one that requires a considerable amount of capital in the operation of the business. Instances can be cited where men, impressed with the possibilities of trade in Hawaii, have invested the greater part of their capital in buying and bringing in sample cars, only to find upon studying conditions that a far greater amount of money would be required to establish the business.

There are many inducements to impel and almost demand the ownership of a car in Hawaii. Distances are not short. Honolulu itself has good street car service, but there are many points that can not be reached conveniently by trams, and the motor is preferable in going to the beaches, various army posts, and the country club. On the other islands practically all transportation is done by private vehicles. The distances between plantations and the sugar mills are considerable, and, of course, the motor car cuts down time. Nearly everyone looks forward to the ownership of a car at as early a date as possible.

Road conditions generally may be classed as very fair. Residents complained bitterly over the conditions of some of the highways, but on the whole they are not bad. A considerable amount of road work is being done in all the islands.

#### Trucks Are Gaining

The value of the commercial motor vehicle is fully realized by the business men in the territory. In the cities of Honolulu and Hilo these vehicles are superseding other means of hauling, just as they are in cities on the mainland and in practically the same proportion. Numbers of trucks are used by the army transport service.

In the outlying districts the sugar companies have found trucks suitable for at least two purposes up to the present time, namely, the hauling of laborers to and from their work and the carrying of supplies. Some of the plantations cover large areas. The employees, of

course, are scattered, and when work is to be done at a distant point, trucks are usually assigned to pick up the workers each morning at some given assembling place and carry them to the fields. The plan has been found to pay well, for the workers reach the fields in better condition for work than if they had been forced to walk several miles. They get to work earlier and also work later, the truck calling at the end of the day to take them back to their homes.

#### Tractor Field Is Slow

More difficulties beset the tractor, and its introduction in the islands will be considerably slower than in the case of trucks. This, the planters claim, is due to the fact that sugar land must be plowed to a depth of 18 to 22 inches. The method now generally employed in plowing is to place two large Fowler tractors on either side of the field, attaching the plow to a cable connecting the tractors and draw the plow from one side of the field to the other. The cable is wound on drums on the tractors. In this way the desired furrow depth can be attained, and no other method as satisfactory or economical has yet been devised. There is a possibility of the use of the smaller tractors in harrowing. For the transportation of the sugar cane after it is cut the railroad system is employed. Some plantations have as much as 80 miles of track laid through their grounds. These narrow-gage tracks take but a minimum of space and offer the best means of bringing the cane to the mills.

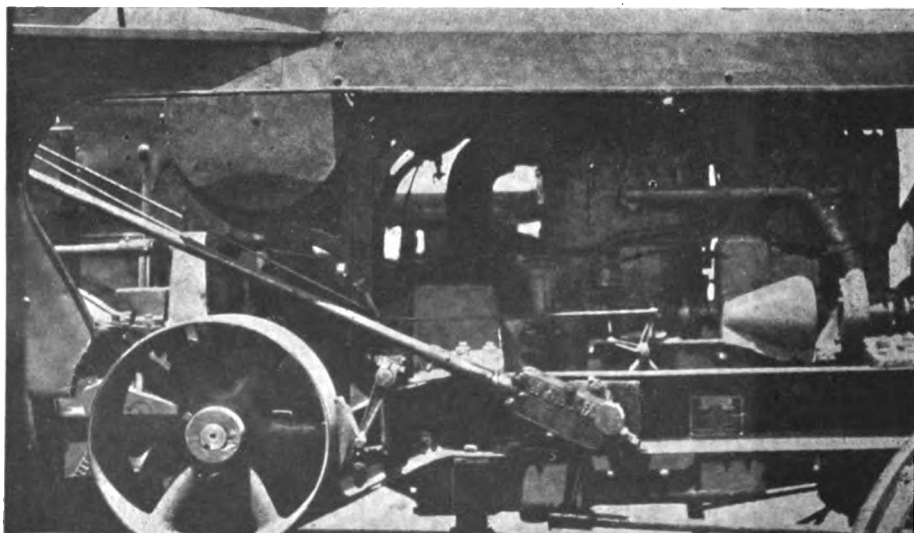
#### Agricultural Possibilities

Some of the American tractors are suitable for the cultivation of pineapple land, and there is a field here for their use, as the plowing is not so deep as that required on cane land. Much of the pineapple land is hilly and the tractor must be well motored to do the work. A small caterpillar tractor was brought into the islands within the past year, but too recently to make possible any conjecture as to its ultimate success.

The market for accessories, tires, and other requirements is identical with that in the United States for an equal number of cars. The dealers now established have very attractive showrooms and good garage facilities and are fully worthy of the best attention of the manufacturer.

## Increasing Tractor Accessibility

*HERE is a steering gear placed where it can be reached easily and conveniently for adjustment or repair. While it is not practicable to place the steering gear outside the frame of a passenger car or truck there seems to be no reason why, in most cases, it can not be done in tractor building. It's a point worthy of the careful consideration of all tractor designers.*



# Relative Efficiency of Male and Female Operatives

## A Comparison of the Output of Women and Men on Similar Work—A Study of the Experiences of 127 Manufacturing Establishments in the Metal Trades

**W**HAT is undoubtedly one of the most comprehensive and exhaustive investigations into the present extent and the possible extension of the employment of women in industries in the United States, and one of the most thorough and informative presentations of results obtained from such research effort, is covered by and embodied in the report of the National Industrial Conference Board on the wartime employment of women in the metal trades.

As was mentioned in a recent issue of *AUTOMOTIVE INDUSTRIES*, the association of manufacturers' associations, because of the importance of the metal trade to the conduct of the war, and the widespread desire of manufacturers to obtain all available information concerning the employment of women as operatives in metal working plants, began, early this summer, an investigation on an elaborate scale to determine the extent to which women have so far been substituted for men, or introduced as additional workers into the industry, their relative efficiency, wages, working conditions and other factors such as attendance, labor turnover and the necessary and desirable changes in plant and equipment which have been indicated by experience.

Some 600 selected establishments were furnished with a questionnaire, and the results obtained from this source were supplemented by field inquiry and observation. Approximately 330 establishments replied to the questionnaire, but of these only 131 employed female labor in manufacturing processes. In these 131 establishments there was a total working force of 384,709, of whom 49,831 were women and 334,878 were men. Women, therefore, represented 12.9 per cent of the total.

While a number of the employers who responded to the questionnaire indicated in their replies that they contemplate a reorganization of their plants in order to fit them better to utilize the increased number of women whom they expect to employ in the near future, it did not appear from the data obtained that there has been so far any great increase in the number of women used in the manufacturing industries, except in a relatively small number of companies, and more especially in those which are engaged in the manufacture of war materials.

It is not possible, says the report, a part of which is reproduced verbatim in the following paragraphs, to determine what percentage of the total number of women employees in the 131 establishments has been added or substituted on work performed by men previous to August, 1914. From 96 establishments which furnished definite figures on this point the women added or substituted during the period since that date numbered 10,801 out of a total of 34,667 female employees, or 31.2 per cent; 5100, or nearly 50 per cent, have been added or substituted in ten munition establishments.

Table No. 1 as given here is compiled from replies received from 10 concerns in the automobile and automobile accessories field. These concerns employed a total of 78,400 men and 3690 women. Of the women, 1673 had been added or substituted on men's work since August, 1914.

Table No. 2 classified the establishments from whom answers to the questionnaires were received, according to the relative efficiency of men and women workers as measured by output on the same respective processes.

Eliminating the 28 establishments in which, for one reason

or another, no comparison can be made, this summary indicates that the output of women compares favorably with that of men, since it appears that in 30 establishments of the remaining 99 the output of women was greater than that of men in all operations on which both were engaged; in 6 it was greater in some, equal in others; in 30 it was equal to that of the men. In other words, in 66 establishments, or two-thirds of those furnishing definite information as to output, women's production was equal to or greater than that of men in the operations on which both were employed. In only 15 establishments was it found that women produced less than men in all operations on which they were engaged. Their production in the remaining 18 establishments, although less on some operations, was equal or greater on others.

### Relative Efficiency of Men and Women

It appears, moreover, that the efficiency of women did not depend on the nature of the industry as such, or to any marked extent on the fact that they had but recently been

TABLE NO. 2—SUMMARY COMPARISON OF OUTPUT OF WOMEN WITH THAT OF MEN ON SIMILAR WORK BY INDUSTRIES

(National Industrial Conference Board)

Classification of Establishments	Output of Women							
	Total number of establishments	Greater in all operations	Greater in some operations, equal in some	Equal in all operations	Greater in some operations, less in some	Equal in some operations, less in some	Less in all operations	Not comparable or not stated
Total .....	127	30	6	30	7	11	15	28
Automobiles and automobile accessories ..	10	1	..	3	1	2	1	2
Typewriters and other light machines .....	6	2	..	2	..	1	..	1
Electrical machinery, apparatus and supplies ..	18	2	..	6	2	2	2	4
Foundry and machine shop products .....	37	12	1	11	1	2	5	5
Munitions .....	13	4	1	1	2	1	2	3
Railway equipment .....	7	1	1	1	..	3	1	..
Tools, cutlery, and hardware .....	16	5	2	4	..	..	..	5
Miscellaneous metal products .....	20	3	2	2	1	..	4	8

introduced into an industry. In none of these classifications do a majority of establishments report women always less efficient than men, and it is significant that in the manufacture of foundry and machine shop products, on which women were in the past seldom employed except as core-makers, 24 establishments report women's work equal or superior to that of men in all operations, as against 5 finding them inferior.

Analysis discloses that among those operations which some employers reported women to be performing less efficiently than men, there are very few which are not being carried on with much success by women in other establishments. For instance, in one automobile factory women are found inferior to men in light bench and machine work; yet in a similar factory and in many others doing similar work their output



**Table No. 1—Relative Efficiency of Male and Female Workers**  
A Comparison of the Wages and Output of Women and Men in Ten  
Plants in the Automobile Industry

*Prepared from Data Gathered by the National Industrial Conference*

Serial Number and Product of Establishment, and Number of Men and Women Employed (a)	Number of Women Added or Substituted on Men's Work Since August, 1914 (b)	Occupations of Women (c)	Wage Rates of Women Compared with Rates of Men so far as Reported	Abstract of Employer's Statement as to Wages	Abstract of Employer's Statement as to Output
<i>No. 1</i> Automobiles 12,021 men 815 women	390	Drill press Gear machine Lathe Milling machine Punch press Coremaking  <i>Sewing machine</i> BENCH WORK Inspecting Stock room attendant Tool room attendant		Women do not receive same rate of pay, because it is necessary to provide extra help for handling stock and setting up machines; average earnings for female help as compared with male are about 60% to 65%.	Women as efficient as men on drill presses, light bench-work, and light inspection; on punch presses approximately equal, but necessary to provide die setters, start machines and place stock so that women do not do lifting. In light stock handling about as efficient; on medium heavy bench work 75% to 80% as efficient.
<i>No. 2</i> Automobiles 9,034 men 461 women	277	Drill press, light Lapping machine Shaving machine Milling machine Bench work Stock room attendant	Time, less	Women receive two-thirds men's day rate on same job, but same premium. Piece rates not stated.	On machine work, not as efficient as men, because women lack mechanical knowledge; on stock handling, inspection, etc., sometimes better than men, more thorough and careful.
<i>No. 3</i> Automobiles 32,954 men 371 women	100	<i>Machines, light</i> Bench work, light Putting covers on coil units and testing	Time, equal	No women on piecework.	Women do 10% less than men; though faster, they have less endurance.
<i>No. 4</i> Automobiles 836 men 105 women	Not stated	Machines Bench work Inspecting		Wages of women same as those of men, considering character of work.	Output of women same as that of men.
<i>No. 5</i> Automobiles 5,629 men 315 women	72	Sewing machine Coremaking		We aim to pay practically same for output as when men were on the job. On sewing machines men made about 45¢ per hour; women earn about 35¢.	Women on sewing machines do slightly less than men; on light coremaking, as much as men did formerly.
<i>No. 6</i> Automobiles 875 men 89 women	11	<i>Sewing machine</i> Pasting Back stuffer Inspecting		Women receive less pay than men.	
<i>No. 7</i> Automobile accessories 1,250 men 450 women	300	Drill press Lathe, hand screw Lathe Milling machine Slot machine	Piece, equal	Time rates not stated.	Equal.
<i>No. 8</i> Automobile signals 285 men 100 women	100	Drill press, light Foot press, light Power press, light Assembling	Piece, equal	No women on time work.	Equal.
<i>No. 9</i> Automobile bodies and aeroplane bodies 6,350 men 150 women	Not stated	Sewing machine aeroplane upholstery  <i>(By Departments)</i>			Too early to judge.
<i>No. 10</i> Automobiles 9,166 men 834 women	423	Drill Gear Mill Press Auto B & S Threading Inspection Tool room Tool repair Tool store  Indirect material Fitting Motor Transmission Trimming Store Carpenter Receiving Stock Repair Shipping	Piece, equal	Almost all women engaged in machine work are paid piece rates, their rates being invariably same as men's. Women assemblers and miscellaneous employees are paid by the hour, commencing at 25¢ and raised according to ability. Time rates not stated.	Women's output almost invariably greater, in some cases disproportionately greater, than men's.

**Explanatory Notes:**

- a—The figures in this column include clerical employees, in the majority of establishments.  
b—The figures in this column include clerical employees in a few cases, but their number is practically negligible.  
c—*Italics* in this column indicate occupations on which women were employed previous to August, 1914, and on which their employment has been subsequently extended; Roman type indicates occupations on which women have been newly introduced since August, 1914. Clerical occupations are not designated.

on the same processes is equal to or greater than that of the men.

An aeroplane manufacturer reports that women produce only half as much as men in assembling work or in welding, or in operating drills, punch presses, and hand millers; yet in other factories women have been found to excel men in all these operations except welding, and in welding at least one establishment has found them equal to men. Sorting and packing, reported as being done less rapidly by women in one machine tool establishment, are occupations in which they had already achieved marked success elsewhere.

The success reported in these cases suggests that extended experience, improvements in management, or other changes, might insure to those plants where the output of women falls below that of men the same good results that are now secured by others in their lines.

Among operations which are nowhere reported to be performed as well by women as by men are chipping castings, machine filing, lapping gages, and brazing. The first two are somewhat heavy work for women. Women were doing machine filing in only two and brazing and chipping castings in only one of the establishments reporting.

#### Experience of Individual Establishments

Further light is thrown on the question by the statements of employers as to the operations successfully performed by women. In one automobile establishment women are working on shaving machines, milling machines, light drill presses, and lapping machines, and are doing bench work, light assembling, stock handling and inspection of small parts. In regard to their output it was stated:

On productive work, women as a rule are not as efficient as men, due to the fact that they have no mechanical knowledge of machines and do only what the job setters show them; also, on assembly work they take longer to understand the proper fits, etc., than a man. On nonproductive work such as stock handling, inspection, etc., the women are as good as the men, in some cases much better, as they are more thorough and careful. This is particularly true of the light work.

In another automobile plant, where women are employed in 23 departments doing the same types of work enumerated above and performing other tasks formerly carried on by men, they give still greater satisfaction:

The comparative output of women on the same process is almost invariably greater than that of the men, in some cases quite disproportionately so. In some cases, notably on a nut tapping machine, a woman was put on and at the end of the week she had turned out about double the quantity of the man working next to her, and after endeavoring to equal her speed for a few days, the man quit, and was replaced by another woman who is now very nearly the equal of the first. We find, particularly in assembly work, that the women are much more conscientious and painstaking than the men.

The report of a gear manufacturing establishment where women are sand blasting very small castings and performing grinding, drilling and broaching operations indicated that their output is from 15 per cent to 25 per cent higher than that of the men.

An unusually striking instance of the efficiency of women in metal trades work appears in a recently published statement of a New York gear manufacturing concern:

On our three-inch Gleason generators, the largest day's production turned out by our best men operators on differential side gears was 91 pieces, and on differential pinions, 260 pieces for a nine-hour day. The slowest woman operator in point of production equals the best day's product by the men, and our speed merchants, as we call them, turn out 126 side gears and 320 differential pinions in a nine-hour day, an increase of 35 side gears and 60 differential pinions.

On our 24-inch Fellows gear shapers the women turn out from 20 to 30 more pieces in a nine-hour day than the men.

On our filing and burring machines, the women are far ahead of the men on production and accuracy. They overrun the men about 250 pieces in nine hours, and the small amount of work rejected by the inspectors is surprising, as compared to the amount that the inspecting department rejected when the same machines were operated by men.

On our drill press work is where our women really shine. In one case they have increased the production 1200 pieces in a nine-hour day. The case I speak of is putting on a radius and reaming the bore of differential pinions. This requires two operations on a two-spindle drill press, one operator putting in the radius and the other reaming the bore. The largest production turned out by two men was 3200 pieces each; to date, two women have turned out 4400 pieces each in nine hours, under exactly the same conditions, and it is hard to tell where they are going to stop. We have one woman who drills two 5/32 in. oil holes 3/4 in. deep and one 1/2 in. hole 1/2 in. deep in 246 stem gears in nine hours; this is 50 more pieces than the men ever turned out.

One of the most conspicuous examples of success with women workers is offered by an establishment employing

5000 women in practically all mechanical operations required in the manufacture of fuses. On the basis of time studies, a maximum of 375 standard pieces per day had been set for male turret lathe operators, who were turning out an average of 190 pieces; when women were employed on this work they produced 531 pieces. In the assembly department, where 2000 girls are at work, the estimate by two sets of engineers for the best possible production by men was 15,000 complete fuses daily in two shifts; the average output actually obtained when women were employed was 38,000 per day in one shift. In this case, however, the excess of output actually obtained over the estimates was so great as to leave little doubt that some other factor than the superior efficiency of women was involved. The president of this company considers the endurance of women, as well as their rapidity, superior to that of men:

In spite of the amount of work they do, they are not overworked. In fact, they seem to be able to keep up their high rate of speed better than the men. In one of the assembly departments, for instance, we tried men on a particularly trying job. At the end of three days they came to us and told us that the work was too strenuous. We put girls on the benches, and since then there has been no complaint.

In a steel establishment where women are employed in manufacture of fuses, women operators of drill presses and milling machines are found to be from 25 per cent to 50 per cent faster than men. Another manufacturer of small metal parts for munitions stated that women drill press operators handle 196 parts per hour on daywork while on nightwork men turn out only 148. Although the output on a day shift cannot fairly be compared with that on a night shift, this would not explain so marked a difference in results. In a bolt and nut establishment women working on drill presses and milling machines have achieved an average increase in output amounting to 30 per cent.

An especially interesting illustration of the variety of work of women in railroad shops is given by a woman who has risen from mechanical work to an important executive position. In one of these shops women were employed as follows:

1 milling machine operator	6 car preparers
2 coremakers	4 upholsterer helpers
1 chipper	2 carpenter helpers
1 tinsmith helper	1 locksmith
1 rivet heater	2 lacquerers
1 ordinary drill operator	1 turntable operator
1 tool dressing helper	4 yard laborers
4 hammer drivers	

In another, women were, in addition to these occupations, operating cranes, lathes and boltheaders, and grinding drills. With regard to their efficiency it was stated:

The comparative output of men and women on the same processes varies with the type of work. Usually the output is similar. One foreman said: "In quantity less; in quality women put out superior work."

Some incidental advantages mentioned by various manufacturers are pertinent in considering the introduction of women workers. Women are commended as being more thorough and conscientious than men, as spoiling less work and as being more careful of tools. Even where the quantity of their work is less than that of male workers, the quality is frequently reported as better. Another valuable characteristic sometimes referred to is the regularity of women's output. A bolt and nail manufacturer employing women on pointing bolts, thread cutting, nut tapping, filing, papering and packing bolts, reported their output as at least 10 per cent larger, and added that the quantity can be depended on from day to day.

#### Absence of Restriction of Output

The reported superiority of women in some of the instances cited was so great as to suggest that restriction of output by men may have played a part in raising the comparative efficiency record of women. Certainly there is a strong probability that where phenomenal increases of output were obtained by women workers the men had not been working up to their capacity. The information obtained on this point was not sufficient to warrant conclusions. Evidence from other sources, however, suggests rather definitely that women are less inclined than men to practice arbitrary restriction. A statement made by the president of the British Iron and Steel Institute is pertinent:

When it was found that the demands of the government for a greatly accelerated production of shells required the employment of girls in the projectile factory, owing to the scarcity of skilled workers, these girls in all cases produced more than double that by thoroughly trained mechanics—members of trade unions—working the same machines under the same conditions.

In the turning of the shell body the actual output by girls with the same machines and working under exactly the same conditions and for an equal number of hours, was quite double that by trained mechanics. In the boring of shells the output was also quite double, and in the curving, waving, and finishing of shell cases quite 120 per cent more than that of experienced mechanics.

Restriction of output by male workers in Great Britain before the war was admittedly very common; a large proportion of the increased production in that country is to be attributed to the absence of restrictive practices among women workers.

Yet in many types of light work women apparently are capable of bettering men's record even when the men do their best.

#### Present Limitations of Women's Efficiency

In reviewing this record of efficient performance by women it must be emphasized that most of the tasks on which they are engaged are semi-skilled work of repetitive character, in which rapidity, lightness of touch, and natural dexterity are more important than skill acquired through long training and experience.

The reports of employers often refer to the special deftness of women in handling small repetitive work, and in numerous plants departments have been arranged to secure a better routing of material and a subdivision of tasks which offer a maximum of light repetitive operations. This is doubtless the most direct road to the immediate successful utilization of female labor.

It is too early to form conclusions as to the ability of women to perform work of higher skill. The necessity for immediate increase of output made it essential to give women specialized training for particular jobs rather than to develop them into general mechanics. Even in England, where in one place or another women are used in practically all operations in the engineering and munition trades, they have not received the broad general training which skilled workmen are given. Opinions of English employers have undergone considerable change during the course of the war. Although the subdivision of the processes has secured most remarkable results, women collectively are doing much more than mere repetition work. According to one British report:

Women have entirely destroyed our pre-war ideas as to what constitutes "skilled" work. When in the early days of the war women were trained to turn out 19 pdr. H. E. shell and equal the production of male labor, many thought that such work, amounting as it does to a little more than manipulative dexterity, was about the limit of the capacity of women who had not received a regular course of engineering training. After a few months workshop experience, however, women are to-day building the greater part of one of the best high-speed engines in the country, each woman setting her own tools and work, and able to machine any piece of work that the tool she is on will take.

Women are doing magnificent work both in regard to accuracy and output.

It should be emphasized, however, that even where women are doing such work as setting up, assembling, or performing machine tool operations, they have been trained for a particular type of machine and for a limited range of operations. How far the present limitations of women workers, noted by both American and British manufacturers, might be overcome by broad technical training cannot be determined from experience now available.

#### Wages

The following summary indicates the wage policy of establishments furnishing data for this investigation as reported in replies to the schedule of inquiry.

In this table the column headed women's rates "Equal to men's" means that rates were the same for men and women whether on piece or day work respectively; in some cases women were engaged exclusively on piecework; in other cases on time work. The establishments listed in the column headed "Less than men's" also sometimes employed women exclusively on either piece or time work. In a few cases, as stated in the footnote, complete information was not furnished. Again, the operations were sometimes modified so that the work done by women, while similar to that done by men, was not identical; for instance, additional help was pro-

vided or only the lighter part of the operation performed by women. In such cases piece rates paid women frequently were lower than those paid men; in some other cases women were paid lower time rates.

TABLE NO. 3: SUMMARY COMPARISON OF WAGE RATES OF WOMEN WITH THOSE OF MEN, BY INDUSTRIES

(National Industrial Conference Board)

Classification of Establishments	Total Number of Establishments	Wage Rates of Women			
		Equal to Men's	Piece Rate Equal to Men's, Time Less	Less than Men's	Not Comparable or Not Stated
Total.....	127	53	29	24	21
Automobiles and automobile accessories...	10	4*	1	3†	2
Typewriters and other light machines.....	6	2	2	2	
Electrical machinery, apparatus, and supplies.....	18	3	2	8‡	5
Foundry and machine shop products.....	37	18**	8	7	4
Munitions.....	13	5	6	..	2
Railway equipment....	7	6	..	..	1
Tools, cutlery, and hardware.....	16	9	3	1	3
Miscellaneous metal products.....	20	6	7	3	4

\*In two cases time rates not stated.

†In one case piece rates not stated.

‡In one case time rates not stated.

\*\*In some cases piece rates equal.

‡In one establishment some piece and time rates are less.

Excluding the 21 establishments for which there was no basis for comparison, this table shows that in 53 of the remaining 106 women received the same rates of pay as men, whether on time or on piece work; in 29 women's piece rates were the same as men's but their time rates were lower; in 24 both piece and time rates were lower. It may be noted in this connection that the U. S. Department of Labor has declared itself in favor of equal wages for women performing the same work as men on Government contracts, and that a similar position has been taken by the Director-General of Railways in ordering the recent wage increases and by the National War Labor Board, which has defined its policy in the following terms:

If it shall become necessary to employ women on work ordinarily performed by men, they must be allowed equal pay for equal work.

#### Equal Wages for Equal Work

The principle of equal wages for equal work found especially marked recognition among employers in those industries where the employment of women is a comparatively new feature. For example, 18 establishments manufacturing foundry and machine shop products pay women equal rates in all cases where they are performing the same work as men, while 8 pay them equal piece rates. In the munitions industry, 5 establishments pay equal rates and 6 others pay equal piece rates but lower time rates. The relatively large number of cases where women receive lower rates in electrical manufacturing probably is due to the fact that women have been employed in this industry for a much longer period and that certain occupations came to be regarded as women's work when the principle of equal wages was seldom accepted.

Where the wages of women were less than those of men, the difference usually was from 10 per cent to 25 per cent, although in seven establishments there was a still greater difference. Various reasons were assigned for this lower wage scale. One machine tool manufacturer declared that it was the intention to pay equal wages as soon as the cost of changes made to allow the introduction of women has been recovered. Some stated that women's wages are gradually being increased as they become more efficient, with the intention of ultimately making them equal to those of men. In several places women are paid a lower time rate while learning, after which they receive equal pay on a piece-rate basis.

Another reason offered for lower wages to women is the necessity of providing them with helpers to set up machines, to make repairs, and to bring up stock, or of introducing specially adapted tools.

The preceding discussion refers to rates of wages and not to earnings, which may differ although rates are equal, either on account of the individual capacities of the workers, their endurance, the hours of work, or for other reasons.



# Making War Maps by Camera

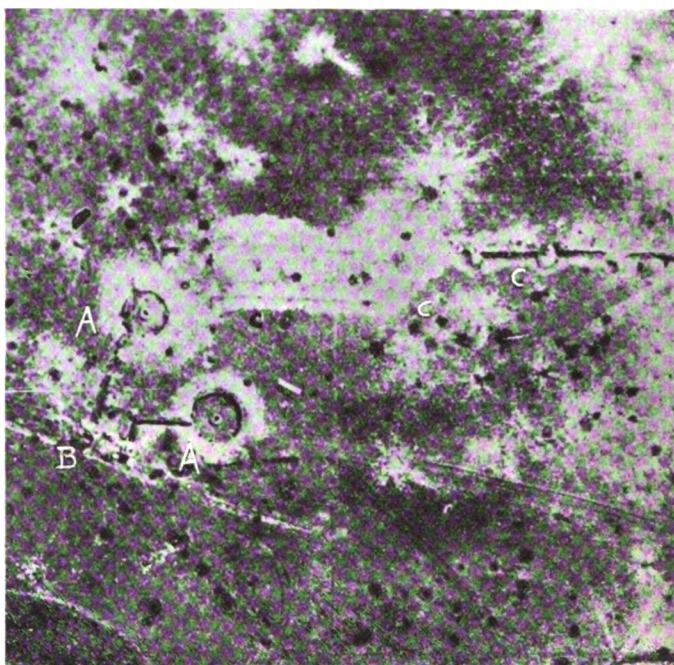
Airplane Needs Skillful Piloting While Photographer Works—Color-Sensitive Plates Used in Non-Focusing Box-Type Apparatus

## PART II

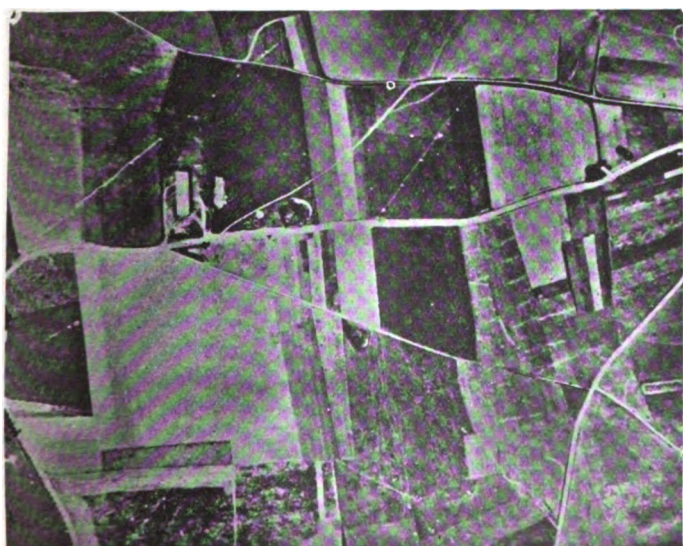
**A**ERIAL photography is not in itself a particularly safe occupation. Leaving an aerodrome, equipped with a camera and supply of plates, the machine climbs toward the enemy line, and almost instantly encounters the archies, the anti-aircraft guns, which are always on the lookout for reconnaissance machines. As a rule, these encounters are a sort of continual match between the pilot's ingenuity and the anti-aircraft gunner's power of prediction. The gunners must guess where the pilot is going in order to allow the time necessary for his shells to reach the machine. The pilot usually takes a side slip, but when he is taking overlapping photographs this is impossible, and he evades the gun by manipulating his throttle, slowing down if the gunner is firing much ahead of him, or speeds up if the shells are behind him. Following a photographic reconnaissance the negatives are turned over to the photographic section immediately upon arrival at the hangar, and are developed and printed almost as quickly as the plane is pushed into the shed.

### Automatic No-Focus Cameras Used

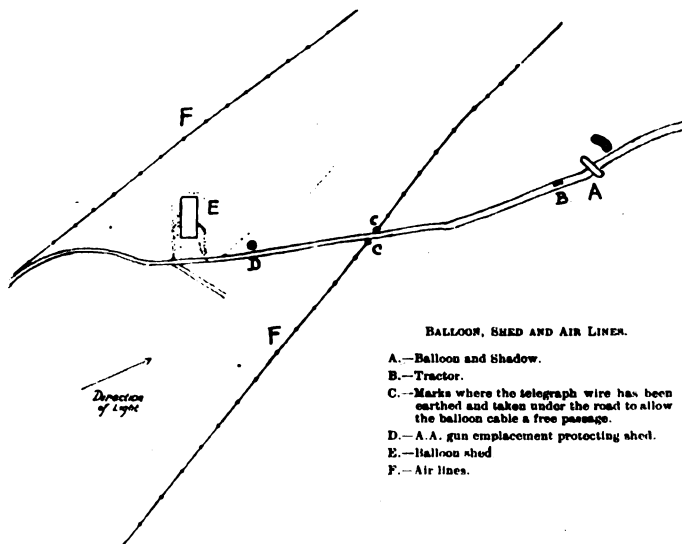
During the first months of the war, ordinary cameras were used, but the leather bellows were found disadvantageous, because they were blown in by the great wind pressure. Focusing cameras were found inefficient. Changes resulted in automatic cameras, with the focus at infinity, requiring no focus adjustment, and constructed in a box type without the leather bellows. Plates are changed automatically as quickly as the photograph is taken, either by the use of small propellers, electricity, or clock mechanism. This gives the pilot less detail work and allows him to take his photographs while at the



Stores of batteries. A shows the typical German stationary anti-aircraft gun pits with concrete pedestals in the center for gun mounting. B shows the ammunition pits and the dugouts connected by short lengths of trench. C shows the dugout from the trench for the personnel



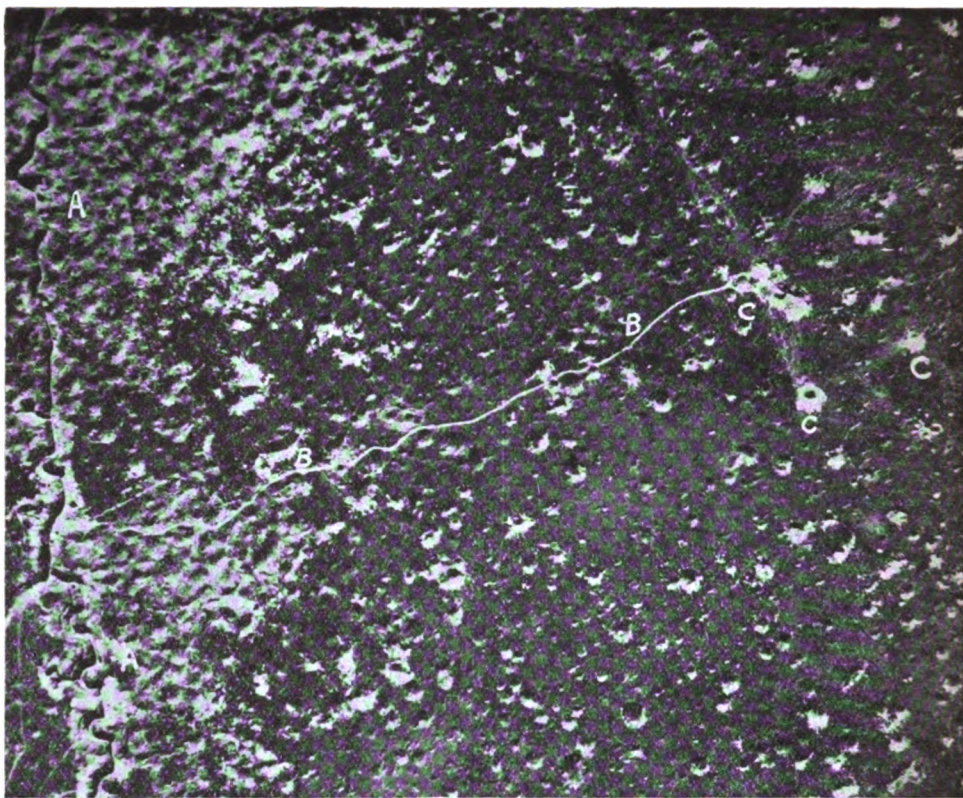
A very interesting photograph, showing a balloon, tractor, balloon shed, gun emplacements and an air line. The balloon is reflected in the photograph by a small white sausage-shape and is made readily discernible by its shadow on the ground, which proves that it is an object suspended in the air. The tractor B, although discernible in the original photograph, is not clear in the reproduction



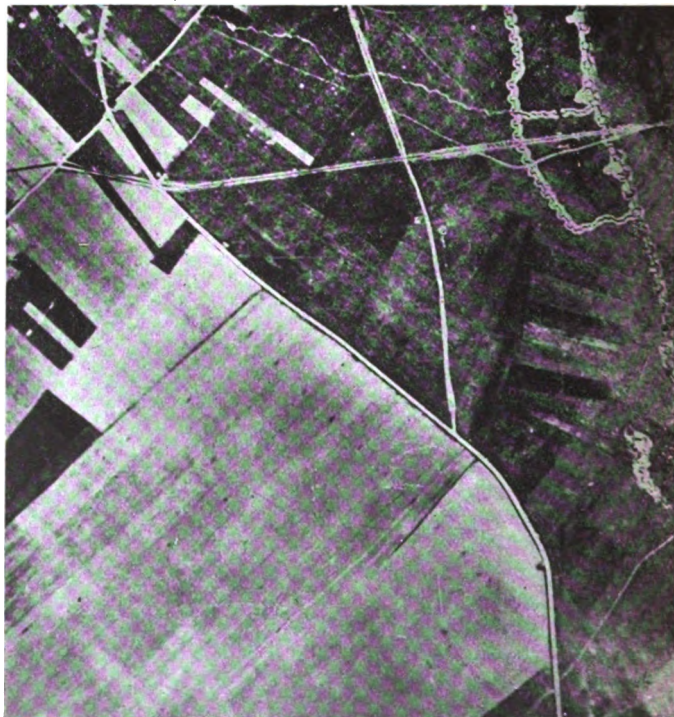
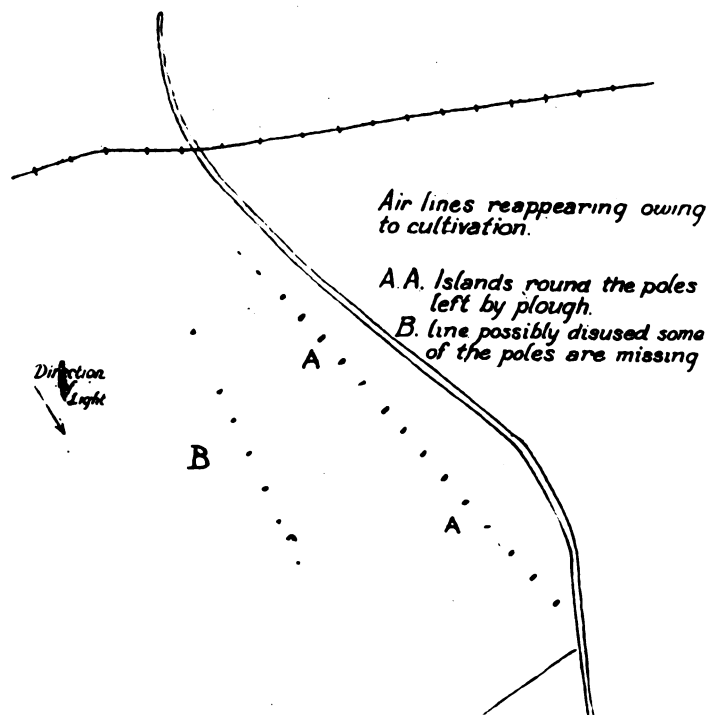


same time watching for enemy aircraft. An important need in aerial photography to-day is a satisfactory automatic film camera which will eliminate the need for glass plates and allow greater numbers of photographs to be taken. At first, the fastest types of plates were used, but owing to the flat results obtained and to the invariable ground mists in Europe, color-sensitive plates, such as panchromatic plates with yellow filters, were used more advantageously. Small 4 x 5 plates were used at first, and enlarged, but the use of larger plates is now approved.

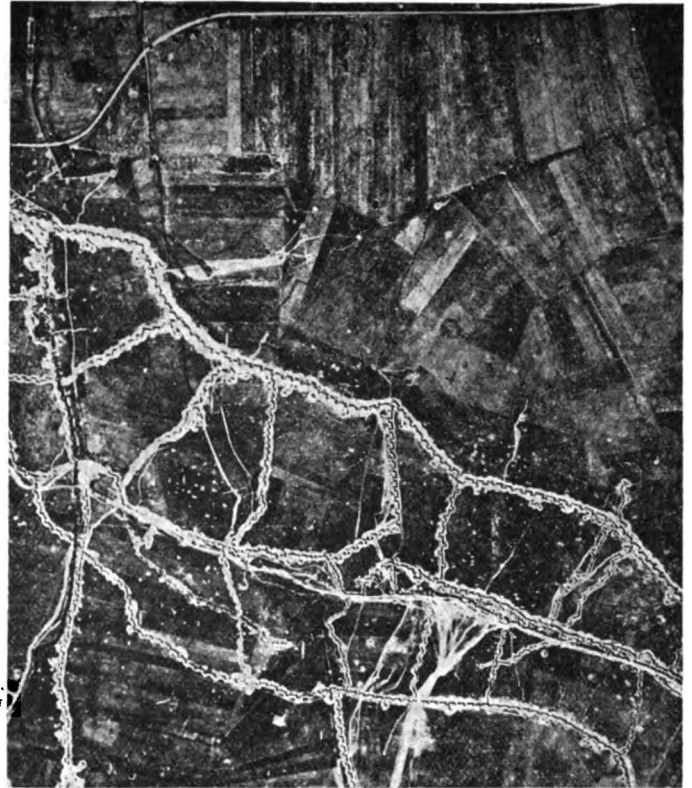
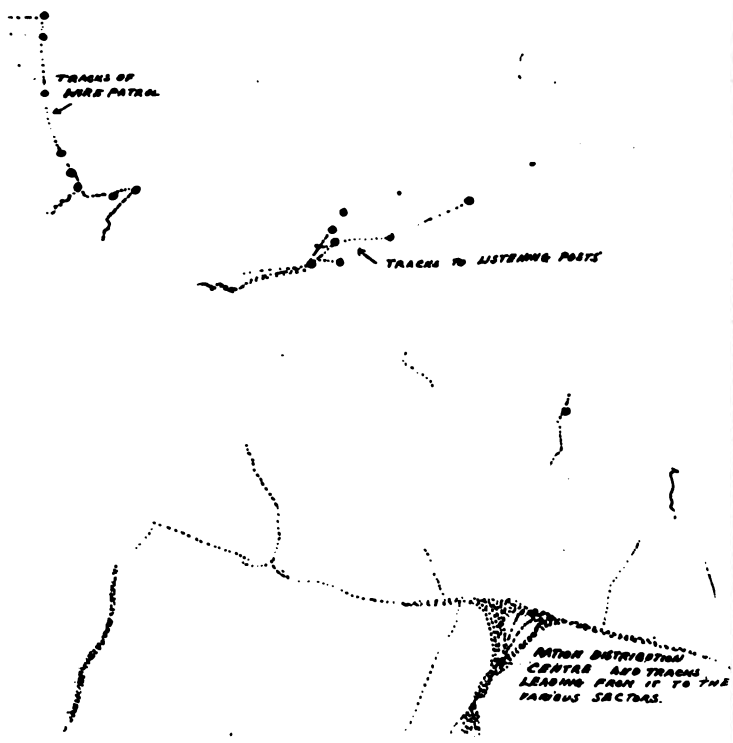
The photographs accompanying this article and the maps made from them are taken from an instruction book for the Intelligence Division of the British Army. This book is the first of its kind and some idea of the tremendous importance of this branch of the army is reflected in the character of the illustrations and the interpretative diagrams. During the recent Allied offensive it was not uncommon to have a print before an officer planning an attack less than 45 minutes after the plate had been exposed.



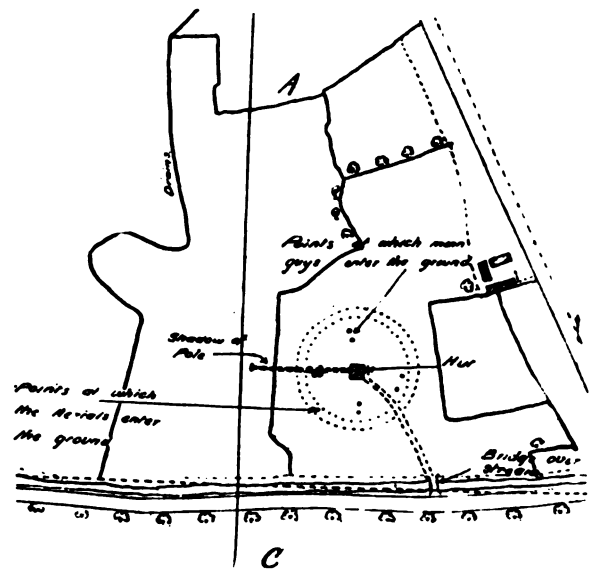
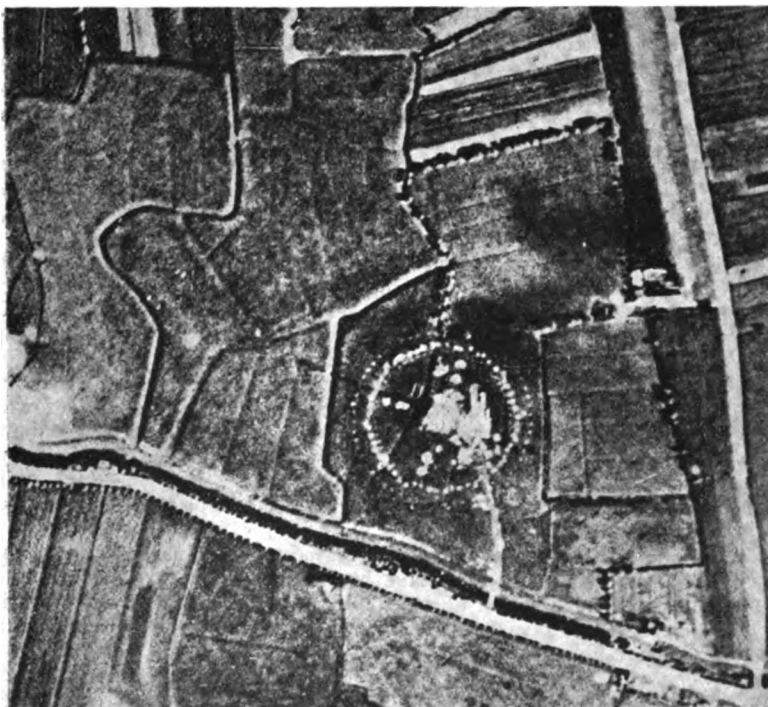
*Fortified shell holes in No Man's Land. The letter A shows the German front line trenches. B indicates the track between the front line trench and the fortified shell holes in No Man's Land. C marks the net of organized shell holes. Using a photograph of this sort an artillery commander directs his artillery*



*This interesting photograph and sketch map of buried cables and air lines show clearly how the intuition of a Sherlock Holmes is essential in interpreting aerial photographs. In the diagram the letter A indicates small dots which show as black spots in the illustration. The interpreters of the photograph decided that these black spots represented parts of a farm which the farmer did not plow. They figured that he did not plow them because there were obstructions, such as poles. Because the poles were regular in their formation they decided that it was a telegraph or telephone air line of communication*



Network of trenches showing the listening and observation posts. It is by the use of photographs like this that the infantry commanders make their night raids over the top for prisoners. The photograph shows the exact location of the enemy. The raiding party knows accurately how to surround the posts without suspicion



Interpretation of Air Photograph, Showing German Field Wireless Station Near Lepelhem

1. Air Photograph No. 48 N62, dated 17th July, and taken at 8 a. m., shows a German field wireless station. The reasons for arriving at this conclusion from the examination of the photograph are as follows:
  - (a) The shadows cast by a pole protruding from, or in the vicinity of, a hut.
  - (b) Double heaps of soil at regular intervals of 90 deg., suggesting the pits made in chalky ground for anchoring the guy ropes supporting the pole.
  - (c) A double circumference of pits, enclosing the station, which is of the "Umbrella" type, i.e., composed of a series of wires forming a cone.
  - (d) Bridge and track used by only a small personnel, as shown; also by the undisturbed grass, except in the immediate vicinity of the hut.
2. The height of the pole has been calculated at 120 feet to 125 feet. The height of the sun at 8 a. m. on the 17th of July was 24 deg. The necessary corrections have been made for summer, local time, etc.



# Greater Engine Efficiency Demanded

War Economics Require We Stop 70 Per Cent Waste of Thermal Efficiency in Waterjackets and Exhaust

CLEVELAND, Sept. 21.—President Charles F. Kettering started the winter circuit of S. A. E. Section meetings here to-night by one of his interesting talks on aviation, engine fuels and other matters dear to his heart. As in other talks, he did not mince matters and struck straight from the shoulder.

"The internal combustion engine is understood in general, but in fuel and efficiency problems special attention must be focused on it. Our engines are not efficient. We must design engines that will use fuel more economically and not throw away 40 per cent of its thermal efficiency through the water jackets and 30 per cent through the exhaust, as is done to-day.

"In considering the motor and the fuel the engineer must think fundamentally. Given an engine he must make fuel to fit it. Tests were made at the Dayton laboratories with various kinds of fuel. One test was made to find out why kerosene could not be used. These tests disclosed that kerosene knocks were not premature. They always occurred 20 deg. after the piston was on its downward course and 50 deg. after ignition.

"Observations were made through a glass-covered opening in the cylinder and every knock displayed a carbonized flame within the casing.

"There is much talk of the airplane industry after the war. It may or may not be a great development. The present cost of an airplane engine is from \$10 to \$20 per horsepower. This is quite high. If someone can design one at a couple of dollars per horsepower a great future is in store for the industry.

"The fundamental problems in airplane construction are weight, horsepower and fuel consumption. These travel in a circle. If it is desired to increase the carrying capacity of a machine while maintaining a given ceiling, larger wings are needed. This, in turn, demands increased horsepower, which necessitates the use of more fuel. This again adds to the weight and the wing surface must be again enlarged, and so on. The problem resolves itself into one of fuel economy and decreasing the weight of the engine.

"The Liberty engine weighs 825 lb. It is necessary to carry 0.7 lb. per horsepower for cooling, making a total of 280 lb. The question is, first, how much weight per square foot is the plane intended to carry, and next, what is the maximum of speed of travel desired? That will determine how much engine is required.

## Commercial Airplane Possibilities

Whether or not future airplanes will carry freight depends upon what the cost can be made per ton mile. Should we arrive at a satisfactory cost it will be necessary to establish airplane roads to guide the planes. Being at a high elevation, pilots of planes would experience difficulty in identifying markings (numbers) on the ground or on top of structures. In unsettled weather conditions they would be traveling above the clouds, making this method of markings further ineffective. The only manner in which planes could be efficiently directed over a route would be by wireless. Each station would have its own number which would be caused to register as the plane passed over it.

"Practically all the laws of aerodynamics are clear. Stresses are understood; materials are known, although there may be a question as to whether metal or wood is better. Someone may come along with a new treatment of metal which may revolutionize the whole thing."

President Kettering mentioned the untruthful reports that came back here following the arrival in Europe of the redesigned De Havilland 4. He declared that Pershing as a matter of fact did not know they were there.

The reports claimed that this type of plane would be unsatisfactory because the gas tank was not large enough, because the wing covering was sewed on improperly, because there was the wrong kind of splice and because there was no stabilizer brace on the tail (which later was affixed). Shortly afterward, however, word was received that "since the above telegram was sent it has been given by direct information that the D. H. plane is the best and that the Liberty engine is the best in Europe. To-day airplanes are given priority above food and soldiers. It is said that if the war lasts 2 years more the Liberty engine will be the only one used. One thousand engines are going over every week. At first two spares were sent over for every plane, later two engines were sent for two planes, and soon it will not be necessary to ship spares; every engine will mean a plane. By Jan. 1 1200 planes a week will be shipped.

Their average life at the front is 60 days.

It now takes only 14 days from the time the tree is cut for a piece of wood to be turned into a wing beam, as compared with 9 months a year ago.

## Where Shop Training Can't Be Done

THERE are some shops in which, from the very nature of the conditions that exist, it is impossible to train new employees as they should be trained except in special training departments, says H. E. Miles, chairman of the Section in Industrial Training of the Council of National Defense.

If the spirit of the factory is bad, if there is much confusion, wastage, stalling and nervous strain, then even the simplest thing can better be taught in a special training department.

To illustrate: Four girls were trained (on difficult work, in this case) and on going into the shop earned an average of \$7 the first day, \$8 the second, \$9 the third, and a little later \$11. A sub-foreman then told them that they must stop at about \$6, for the men around them would not stand for more. Nothing could be taught at machines in such a factory work-place; for instruction includes the development of war spirit, speed and accuracy, and must be given in an atmosphere and surrounding surcharged with these virtues. Incidentally, the director of training in this shop says the girls will maintain their \$11 average with the prospect of being ostracized for so doing.

It is said that a barber or street car driver, with a kit of tools of a sort that gave him character, secured a job as a machine hand in a great New England factory and held it for four days before he was discovered. That would be a poor place to train in.

The company has since put in a training department where it instructs at the rate of 50 men per day, two days each, in very accurate machining, but with such perfection of stops and other fool-proof appliances as make two days enough.

In another factory employing some 4000 men and needing 3000 more, an operator called to the foreman, "Come and tell me how to do this." Said the foreman, "Weren't you hired as an all-round toolmaker?" "Yes." "Then, d— you, bore that or get out." He got out and later explained, "I am an all-around toolmaker. I was ordered to bore out a 75-mm. cannon. I never saw one in my life and I didn't propose to spoil the first one for want of advice."

You couldn't teach in such a shop. They plan to put in a training room for simple as well as difficult operations.

# The Theoretical Indicator Diagram

## SECOND INSTALMENT

By O. A. Malychevitch, E. S. A., C. M.

THE following data were obtained by competent investigators:

TABLE III

	Method of De-termination	Type of Engine	Com-pression ratio	Tem-perature T <sub>a</sub> ° abs
Prof. Dalby .....	Pyrometer	Gas engine.	4.6:1	398
Der Oelmotor .....	Pyrometer	Mercedes ..	4.7:1	393
Prof. Hopkinson ..	Deduction	Gas engine.	6.3:1	375

It is desirable that the temperature of the inlet gases be as low as possible, as this item, together with the compression ratio and the thermal efficiency, greatly affects the engine output.

$T_a$ —the inlet temperature diminishes with an increase in the compression ratio, as this diminishes the quantity of burnt gases remaining in the cylinder and the effect of their high temperature.

$P_c$  = the compression pressure:

$$P_c = p_a e^n \quad (13)$$

$T_c$  = the compression temperature abs.:

$$T_c = T_a e^{n-1} \quad (14)$$

where  $p_a$  and  $T_a$  are the suction pressure and temperature abs. respectively,  $e$  is the compression ratio,  $n = 1.35$ .

$P_z$  = explosion pressure:

Applying Charles's law to the working mixture

$$P_c V_c = R_1 T_c$$

and to the burnt gases

$$P_z V_z = R_1 T_z$$

But according to (equation 10),

$$R_1 = \delta R_2$$

So that

$$P_z V_z = \delta R_2 T_z \text{ or}$$

$$\frac{p_z V_z}{\delta p_c V_c} = \frac{T_z}{T_c}$$

If we assume that  $V_c = V_z$  we get:

$$p_z = \delta p_c \frac{T_z}{T_c} \quad (15)^*$$

\*At constant volume:

$$P_z = \delta V_c \frac{T_z}{T_c}$$

$P_c$  = pressure at the completion of the expansion

$$P_c = \frac{P_z}{e^n} \quad (16)$$

$T_c$  abs. = temperature at the completion of the expansion

$$T_c = \frac{T_z}{e^{n-1}} \quad (17)$$

Experiment tends to show that the compression ratio is the only factor having an influence on the temperature  $T_c$ .

Equations (1) to (17) give the necessary data for constructing the theoretical indicator diagram and for calculating the working process of the engine.

Automobile engineers are very skeptical regarding this method and the writer's own experience enables him to appreciate their viewpoint, which is a result of the application of old formulæ without any concentrated effort

\*We know nothing definitely about the temperature  $T_r$ , but it is certain that  $T_r$  depends on  $T_c$ , the temperature at the end of expansion and very probably it is not very much lower than  $T_c$ .

to develop a method for the collection of scientific and experimental data.

We will now work out a practical example, illustrating the calculation of the working process of a four cycle engine.

We will select a four-cylinder engine of 90 mm. bore and 180 mm. stroke (Fig. 2).

Piston displacement .....  $V_h = 1145 \text{ cm}^3$

Volume of compression chamber  $V_c = 286.25 \text{ cm}^3$

Total volume .....  $V = 1431.25 \text{ cm}^3$

Compression ratio:

$$\epsilon = \frac{V_h + V_c}{V_c} = \frac{1145 + 286.25}{286.25} = 5 \quad (18)$$

Pressure previous to compression .....  $P_a = 0.87 \text{ at.}$

Initial pressure of working mixture .....  $p_a = 1.00 \text{ at.}$

Pressure of burnt gases in the cylinder .....  $P_r = 1.05 \text{ at.}$

Initial temperature .....  $T_a = 290^\circ \text{ abs.}$

Temperature of exhaust gases remaining

in the clearance space .....  $T_r = 1070^\circ \text{ abs.}$

Heating value .....  $H_g = 10,500 \text{ cal/kg.}$

Air/gasoline ratio .....  $A = 16:1$

Ratio

$$\frac{\text{specific heat at const. pressure}}{\text{specific heat at const. volume}} = n = 1.35$$

By equation (12):

$$T_c = 290 \frac{5 \times 0.87}{0.82 \times (5-1)} = 380 \text{ deg. abs. or } 107 \text{ deg. C.} \quad (19)$$

By equation (13):

$$P_c = 0.87 \times 5^{1.35} = 7.75 \text{ atm.} \quad (20)$$

By equation (14):

$$T_c = 380 \times 5^{0.35} = 660 \text{ deg. abs. or } 387 \text{ deg. C.} \quad (21)$$

Coefficient  $\psi$

Volume of working mixture at  $p_a T_a$ :

$$V_h \eta_c = V \left( 1 - \frac{1}{\epsilon} \right) \eta_c$$

Volume of working mixture in cylinder at  $p_a T_a$ :

$$V_a = V \left( 1 - \frac{1}{\epsilon} \right) \eta_c \frac{p_a T_a}{p_a T_c}$$

The volume of exhaust gases remaining in the cylinder at  $p_a T_a$  is  $V - V_a$

$$\text{Therefore } \psi = \frac{V - V_a}{V_a}$$

Inserting the value of  $V_a$  and the value of  $T_a/T_c$  from equation (12) we get:

$$\psi = \frac{p_r T_c}{\eta_c (\epsilon - 1) p_a T_r} \quad 22$$

$$\psi = \frac{1.05 \times 290}{0.82 \times 4 \times 1070} = 0.09 \quad (23)$$

By equation (4) we may find the number of kg.-mol. ( $K_1$ ,  $K_2$ ,  $K_3$ ) of the three components of the working mixture and burnt gases.

Reaction I:



Number of kg.-mol. of oxygen required for combustion = 1.

Number of kg.-mol. of carbon dioxide developed = 1.

Change of gas kg.-mol.  $dK = 0$ . (24)

Reaction II:

Water vapor:  $H_2 + \frac{1}{2}O_2 = H_2O$ .

Number of kg.-mol. of oxygen required for combustion =  $\frac{1}{2}$ .

Number of kg.-mol. of water vapor developed = 1.

Change of gas kg.-mol.  $dK = +\frac{1}{2}$  (25)

i.e., the process of forming water vapor ( $H_2O$ ) in burning  $H_2$  gives the increase of volume of gas =  $+\frac{1}{2}$ .

The elements of gasoline are:

Carbon C

Hydrogen H

As mentioned above, we express the working mixture and burnt gases in kg.-mol., taking as a unit the number of kg. equal to the molecular weight of gasoline.

The molecular weight of carbon is 12 and that of hydrogen 2, therefore the number of kg.-mol. of 1 kg. will be:

$$K_1 = \frac{C}{12} \quad (26)$$

$$K_2 = \frac{H}{2} \quad (27)$$

By equation (25) the increase in the volume of gas or kg.-mol. for  $H_2 = +\frac{1}{2}$ . Then the increase for  $H = +\frac{1}{4}$  and

$$dK = +\frac{H}{4} \quad (28)$$

Therefore the sum of kg.-mol. of the components of the working mixture will be

$$K_1 + K_2 + K_3 = \frac{A}{28.89} + dK \quad (29)$$

where  $\frac{A}{28.89} + dK$  is the number of kg.-mol. of working mixture.

From equation (29) we have

$$K_1 = \frac{A}{28.89} - \left( \frac{C}{12} + \frac{H}{4} \right) \quad (30)$$

Substituting the value of equations (3) and (26), (27), (30) in equation (4) we will obtain equation (5).

$$\begin{aligned} C_{mv} &= K_1 \times C_{v1} + K_2 \times C_{v2} + K_3 \times C_{v3} = \\ &= \left\{ \left[ \frac{A}{28.89} - \left( \frac{C}{12} + \frac{H}{4} \right) \right] [4.625 + 0.00053T] + \right. \\ &+ \left. \left[ \frac{C}{12} (6.774 + 0.00189T) + \frac{H}{2} (6.855 + 0.00116T) \right] \right\} = \\ &= (0.160A + 0.180C + 2.271H) + \\ &+ \frac{(0.018A + 0.113C + 0.448H)T}{1000} \quad (31) \end{aligned}$$

This is the equation of the total specific heat of working mixture. It may be applied to the case of fuel naphtha and kerosene as well as to gasoline.

Gasoline consists of 85 per cent carbon and 15 per cent hydrogen, and these elements are mixed with 16 times their weight of air. Substituting these values in equation (31) we get the total specific heat of the working mixture (gasoline).

$$\begin{aligned} C_{mv} &= (0.160 \times 16 + 0.180 \times 0.85 + 2.271 \times 0.15) + \\ &+ \frac{(0.018 \times 16 + 0.113 \times 0.85 + 0.448 \times 0.15)T}{1000} = \\ &= 3.053 + 0.451 \frac{T}{1000} = L + MT \quad (32) \end{aligned}$$

Substituting the values of equation (32), (23) and (8) in equation (9) we get

$$\begin{aligned} &0.70 \times 10,500 + 1.09 \left( 3.053 + 0.451 \frac{660}{1000} \right) 660 \\ &= 1.09 \left( 3053 + 0.451 \frac{T_z}{1000} \right) T_z \quad (33) \end{aligned}$$

from which  $T_z = 2150$  deg. abs. or 1877 deg. C.

From equations (11) and (28) we find:

$$\delta = 1 + \frac{7.22 \times 0.15}{16(1 + 0.09)} = 1.1 \quad (34)$$

From equations (15) and (34)

$$P_z = 1.1 \times 7.75 \frac{2150}{660} = 29 \text{ atmospheres} \quad (35)$$

From equation (17)

$$T_e = \frac{2150}{50.35} = 1200 \text{ deg. abs. or } 927 \text{ deg. C.} \quad (36)$$

For values of  $T_e$  see Table IV.

TABLE IV.

Compression rates ..... 4 5 6  
Temperature  $T_e^\circ$  abs. .... 1100, 1070, 1050

From equation (16)

$$P_e = \frac{29}{5^{1.25}} = 3.3 \text{ atm} \quad (37)$$

Theoretical mean indicator pressure

$$\begin{aligned} p_i &= \frac{p_o}{\epsilon - 1} \left[ \frac{p_z}{p_o} \frac{1 - \frac{1}{\epsilon^{n_2-1}}}{n_2 - 1} - \frac{1 - \frac{1}{\epsilon^{n_1-1}}}{n_1 - 1} \right] \text{ or} \\ p_i &= \frac{p_o}{\epsilon - 1} \left( \frac{p_z}{p_o} X - Y \right) \quad (38) \end{aligned}$$

$$\text{where: } X = \frac{1 - \frac{1}{\epsilon^{n_2-1}}}{n_2 - 1} \text{ and } Y = \frac{1 - \frac{1}{\epsilon^{n_1-1}}}{n_1 - 1}$$

The value of  $X$  and  $Y$  are given in Table V.

n	COMPRESSION RATIO E			
	4.5	5.0	5.5	6.0
1.30	1.20	1.26	1.33	1.38
1.35	1.14	1.22	1.28	1.33
1.40	1.12	1.18	1.25	1.27

$$p_i = \frac{7.75}{4} \left( \frac{29}{7.75} \times 1.22 - 1.2 \right) = 7.5 \text{ atmospheres} \quad (39)$$

Taking into consideration that the exhaust valve begins to open before the power stroke is completed, the pressure of resistance of the suction and exhaust stroke and delaying combustion it is necessary to make correction:

$$P_i = p_i \times \delta \quad (40)$$

where  $\delta = 0.90 - 0.95$ .

$$p_i = 7.5 \times 0.93 = 7 \text{ atmospheres} \quad (41)$$

The fuel consumption per ind. hp.-hour

$$F = 9220 \frac{p_o \eta_e}{T_e p_i A} \quad (42)$$

$$F = \frac{9220 \times 0.82}{290 \times 7 \times 16} = 235 \text{ gr. per hp.-h.}$$



The fuel consumption per C. hp.-h. is

$$\frac{f}{\mu_m} = \frac{235}{0.86} = 275 \text{ gr., and}$$

$$\frac{f}{\mu_m} = \frac{235}{0.62} = 380 \text{ gr.}$$

where  $\mu_m$  = mechanical efficiency = 0.62 — 0.86 (see Fig. 1).

Equations (18) to (42) determine the theoretical indicator diagram presented in Fig. 2.

TABLE VI—VALUE  $\alpha + \beta$  FOR  $n = 1.1, 1.4$

$n +$ Angle $\alpha +$ Angle $\beta$ $\alpha\beta$	1.10 11°30' 0.2-1.5 0.222	1.15 11°30' 12°30' 0.2 0.234	1.20 11°30' 120 0. 0.245	1.25 14°00' 17°00' 0.25-1.4 0.322	1.30 14°00' 18°00' 0.25 0.337	1.35 14°00' 19°00' 0.25 0.352	1.4 18°00' 26°00' 0.33-1.3 0.497-1.2
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In Fig. 2 line  $OV$  represents volumes  $V_o = 286.25$  cc. and  $V_h = 1145$  cc. Line  $OP$  represents pressures in atmospheres and temperature in degrees abs. It is advisable to make the stroke of the engine  $V_h = 180$  mm. in our case. From the origin draw the line  $ON$  at an angle  $\alpha$  of 14 deg. 5 m. corresponding to  $n = 1.35$  and line  $ON_s$  at an angle  $\beta = 19$  deg. 25 min. (Table VI).

Draw point  $a$  with a co-ordinate

$$P_a = 0.87 \text{ atmosphere}$$

and

$$V = V_o + V_h = 1431.25 \text{ cc.}$$

Draw the vertical  $aa_1$  and the horizontal  $aC_1$ .

Through the intersection of  $a_1$  and  $C_1$  draw the oblique lines at 45 deg. as shown (Fig. 2) and from the points  $b_1$  and  $C_1$  so determined draw the next set of vertical and horizontal lines. Their intersection at  $d$  determines the next point of the curve. The network of construction lines determines the polytropic line of compression  $ac$ . By the same method the polytropic line of expansion  $ez$  may be constructed.

With calculated values of temperatures, compression and expansion curves we can determine intermediate points of temperature curves  $a'C'$  and  $e'Z'$  by the following equations:

$$T_n = T_o \left( \frac{P}{P_o} \right)^{\frac{n-1}{n}} \text{ or}$$

$$T_n = T_o \left( \frac{V}{V_n} \right)^{n-1}$$

where  $P_o$ ,  $V$  and  $T_o$  refer to the original state of the working mixture.

$$T_1 = 380 \left( \frac{4}{0.87} \right)^{0.26} = 560 \text{ deg. abs.}$$

$$T_1' = 1200 \left( \frac{18}{3.3} \right)^{0.26} = 1790 \text{ deg. abs., and so on.}$$

Points for the temperature curve may be determined graphically from the general relation:

$$PV = R_1' T.$$

Where  $R_1'$  refers to the whole mass of the gases and not to 1 kg.

From point  $a$  (Fig. 2) draw the lines  $ac_1 \parallel OV$  and from point  $a'$  line  $a'O$  to the intersection with line  $ac_1$  at point  $K$ . It will be found that  $K'O = R_1'$ , since

$$K'O = Oa_1 \frac{KK'}{a_1 a'} = \frac{V p a}{T a} = \frac{1431.25 \times 0.87}{380 \times 6.35} = 52 \text{ min.}$$

where  $6.35:1 = \frac{V_h}{\text{stroke}} = \frac{1145}{180}$  is a scale for diag. (Fig. 2.)

Lay off on the vertical line  $K'g$  a distance  $R_1' = 52$  min. and from the point  $h$  of intersection with line  $ch$

draw the line  $hO$ . The intersection of  $hO$  with  $mx'$  determines point  $C'$ , and so on.

In the same way we determine  $R_1'$ .

According to equation (10):

$$R_1' = R_1' = 52 \times 1.1 = 58 \text{ min.}$$

$$\text{Also, } l'O = \frac{l'z'' \times mO}{mx'} = \frac{p_s V_o}{T_s} = \frac{29 \times 286.25}{2150 \times 6.35} = 58 \text{ mm.}$$

Lay off the length  $l'z''$  on line  $R_1'$  and line  $Oz''$ , determine point  $z' = T_s = 2150$  deg. abs. or draw the line  $Oz'$  until it intersects with line  $mx'$ . Point  $z''$  determines the explosion pressure  $p_s = 29$  at. Point  $S, S'$ , the intersection of line  $Oz''-Ot$  with the expansion curve  $ez$ , gives the necessary correction for delayed combustion in the theoretical indicator diagram for maximum pressure and temperature.

The above-mentioned corrections have practically no influence on the area of diagram, the character of the expansion line and the fuel consumption. The result can be made still more valuable if the calculations are carried through for different air-gasoline ratios and different heating values of the fuel.

It seems apropos to explain the derivation of the fuel consumption equation (42).

The indicated work of 1 kgmol. or 1 kg. of fuel per I. H. P. hour is

$$N_1' = \frac{p_1' \times V_1 \times 1000}{75 \times 60 \times 60} = \frac{P_1' \times V_1}{27}$$

$$\frac{28.89}{1.293} = 22.33 \text{ cu. m.}$$

where  $V_1$  is the piston displacement for 1 kgmol. or 1 kg. of fuel in cu. m.

$p_1'$ , the corrected theoretical mean indicator pressure (equals 40, 41).

To find the value of  $V_1$  we proceed as follows:

The volume of 1 kgmol. of air at  $p_o, T_o$  is 28.89 being the weight of 1 kgmol. of air and 1.293 being the weight of 1 cu. m. of air in kg. at 0° and 760 mm.

(22.33 cu. m. is the volume of 1 kgmol. of all gases.)

The volume of 1 kgmol. of gas at  $p_o, T_o$  is

$$\frac{22.33 \times 1.0334 \times T_o}{p_o \times 273} = 0.0846 \frac{T_o}{p_o} \text{ cu. m.}$$

1.0334 kg. per sq. cm. being the atmospheric pressure at 760 mm.

The volume of working mixture at  $p_o T_o$  (for 1 kgmol. or 1 kg. of fuel) divided by the volumetric efficiency  $\eta_v$  gives

$$V_1 = 0.0846 \frac{T_o}{p_o} \frac{A}{28.89 \times \eta_v} \text{ for 1 kg. of fuel}$$

where  $A$  is the ratio of air to gasoline (16).

Substituting the value of  $V_1$  in the expression for  $N_1$

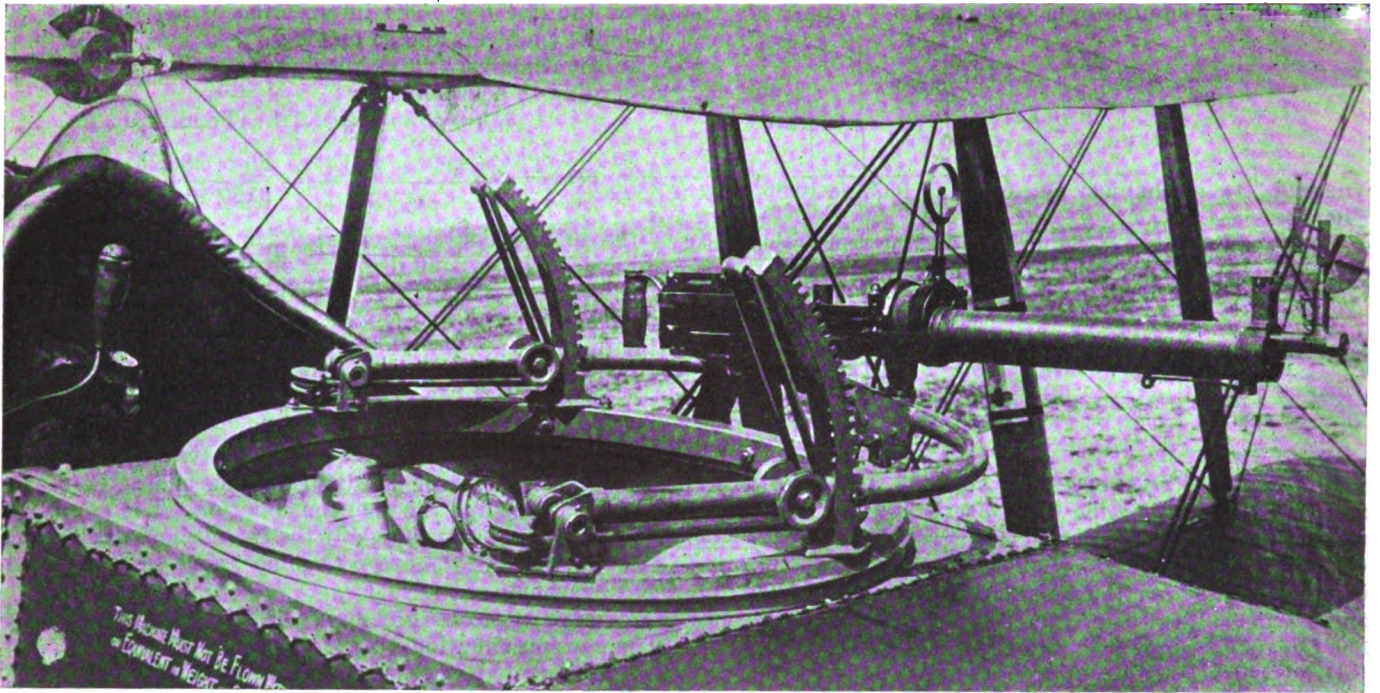
and taking  $\frac{1}{N_1}$  we get the fuel consumption in kgmol. or in kilograms per indicated horsepower-hour—

$$N_1 = \frac{p_1' \times 0.0846 \times T_o \times A}{27 \times p_o \times 28.89 \times \eta_v}$$

Fuel consumption per indicated horsepower-hour:

$$F = \frac{1}{N_1} = 9220 \frac{p_o \times \eta_v}{T_o \times p_1' \times A} \quad (42)$$

$$\text{or } F = \frac{9220 \times 0.82}{290 \times 7 \times 16} \dots \text{ and so on.}$$



*Machine gun mounting on a turret surrounding the observer's cockpit*

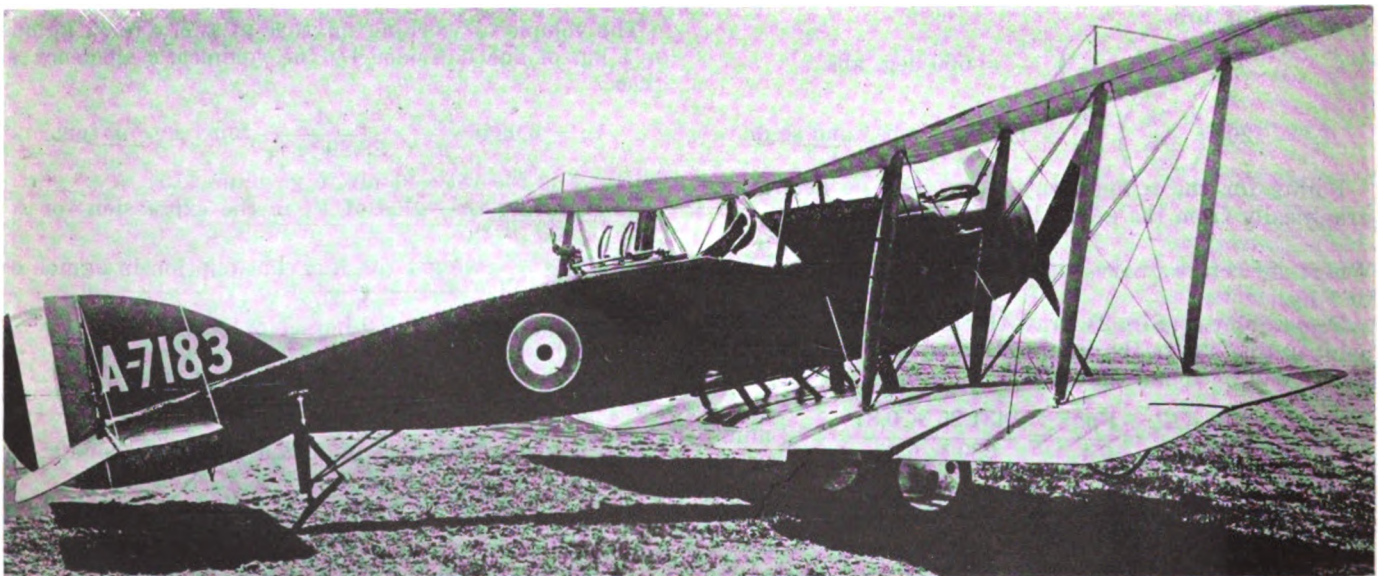
## The Bristol Two-Seater Fighter

ONE of the fastest machines used by the British air force is the Bristol fighter, a two-seater tractor biplane. It has been fitted with a number of different engines, including the 190-hp. Rolls-Royce, the 150-hp. Hispano-Suiza, the 200-hp. Hispano-Suiza, and the 200-hp. B. H. P. The armament of this machine consists of one synchronized Vickers machine gun, operated by the Constantinesco interrupter gear, and one Lewis gun, on a ring mounting. For the Vickers 88 rounds of ammunition are carried, and for the Lewis 7 drums. This machine has a total weight of 2779 lb. and an endurance of 3 hours' flight at 10,000 ft., including the

climb. Its ceiling is 20,000 ft. At the ground level the speed is 119 m.p.h., and at 10,000 ft. 113 m.p.h., while the time required to reach an altitude of 10,000 ft. is 13 min.

The Bristol Fighter has a span of 39 ft. 3 in., an overall length of 25 ft. 9½ in., and a height 9 ft. 4 in. The machine was originated by the British & Colonial Aviation Co., and made its first appearance in January, 1917. It is still being manufactured.

One of the accompanying illustrations shows a close-up view of the observer's cockpit and machine-gun mounting.



*Side view of the Bristol fighter*



# The Pfalz Single-Seater Fighter\*

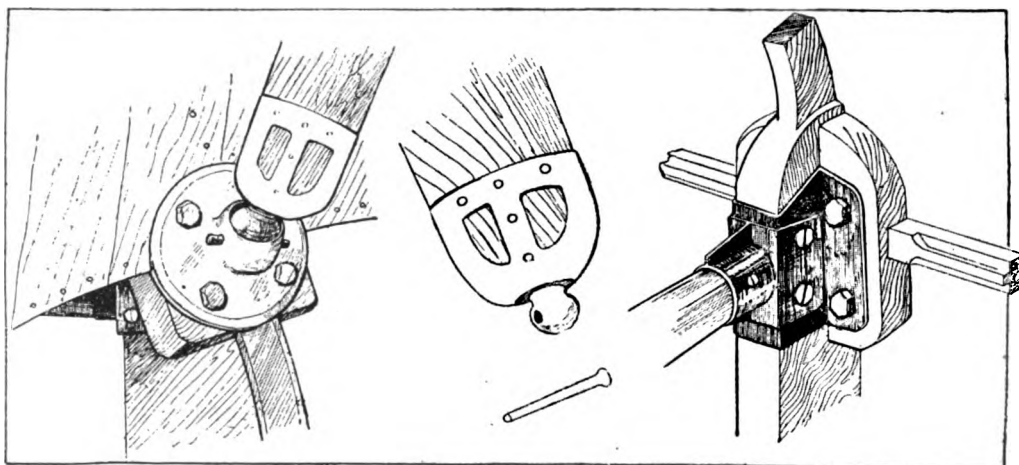
## PART IV

### Arrangement of Wings and Bracing, and Method of Attachment to Body

FUNDAMENTALLY the Pfalz single-seater belongs to the type frequently termed by the Germans a one-and-a-half-plane; that is to say, it is a machine having a larger top plane and a smaller bottom plane. The type was originated by the French Nieuport firm, and the first machine of this type, if not actually making its appearance, was at any rate contemplated, before the outbreak of war. Since then, although comparatively recently, the enemy has copied the type fairly extensively, chiefly in the Albatross single-seaters and in the make at present under review. Aerodynamically this arrangement of the planes is of advantage on account of the fact that in a biplane the lower plane is the less efficient, and that therefore the more of the total surface is formed by the top plane the better the overall efficiency. Practically also certain advantages attend the arrangement. The effect of the smaller lower chord is twofold. The gap between the planes need not be so great as in the case of a biplane having both planes of the same chord, and for a given fuselage depth the top plane may therefore be placed at a smaller height above the top of the body, resulting in a better view forward. Again the smaller bottom chord does not obstruct the view downward to the same extent as does a plane of larger chord. Thus the "one-and-a-half-plane" forms a good compromise between the lighter structure of a biplane and the good visibility of the "parasol" monoplane, which latter is probably unsurpassed as a fighter as far as obstructing the view in all directions to the smallest extent is concerned.

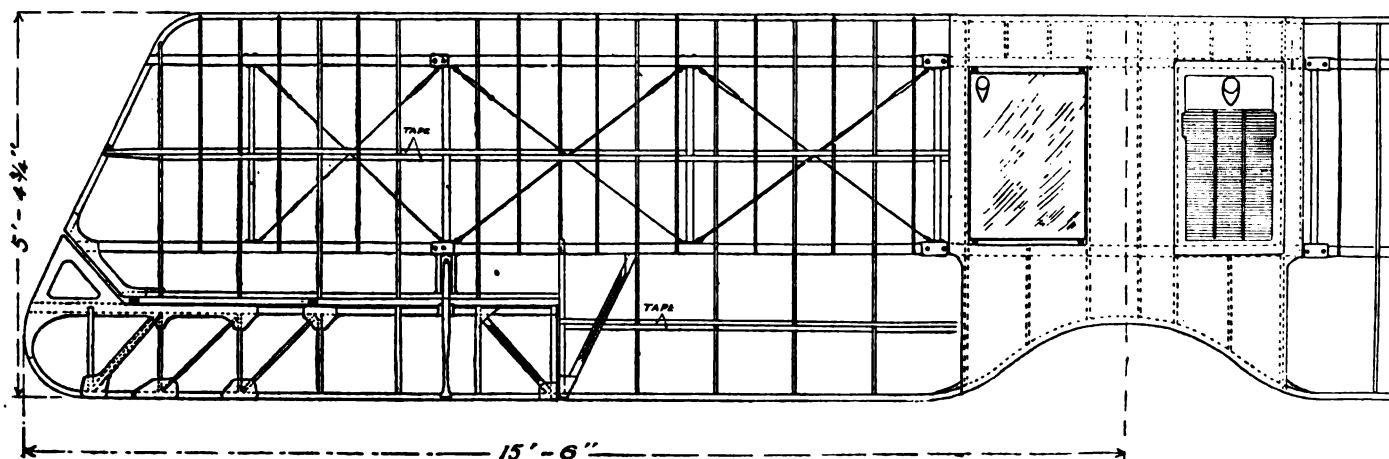
In the design of its wing structure the Pfalz shows several interesting features. The outward slope of the

struts connecting the body with the top plane was originated, we believe, by the Sopwiths in their "one-and-a-half strutter," while the Vee form inter-plane struts are typically Nieuport. Constructionally, however, the Pfalz is a good deal different in both these features. The Vee struts are not strictly speaking placed in the form of a letter V, as they do not quite meet in a point on the lower plane, which has two spars instead of the single spar employed in the original Nieuport. The object of having two spars is evidently to provide a more rigid structure better capable of resisting the twisting moment due to the travel of the center of pressure. Owing to the fact that the inter-plane struts do not come to a point, incidence wires should be employed, but in their stead the struts are so built up as to form the bottom of a solid U which lends to the lower ends of the struts the rigidity usually provided by incidence wires. The same applies more or less to the body struts, which, as was shown in the illustrations published in our issue of Sept. 5, are in the form of an inverted, flattened U with its cross member adjoining the upper plane. Here, again, the construction of the struts has been designed to perform the function of incidence wires. While on the subject of these struts,



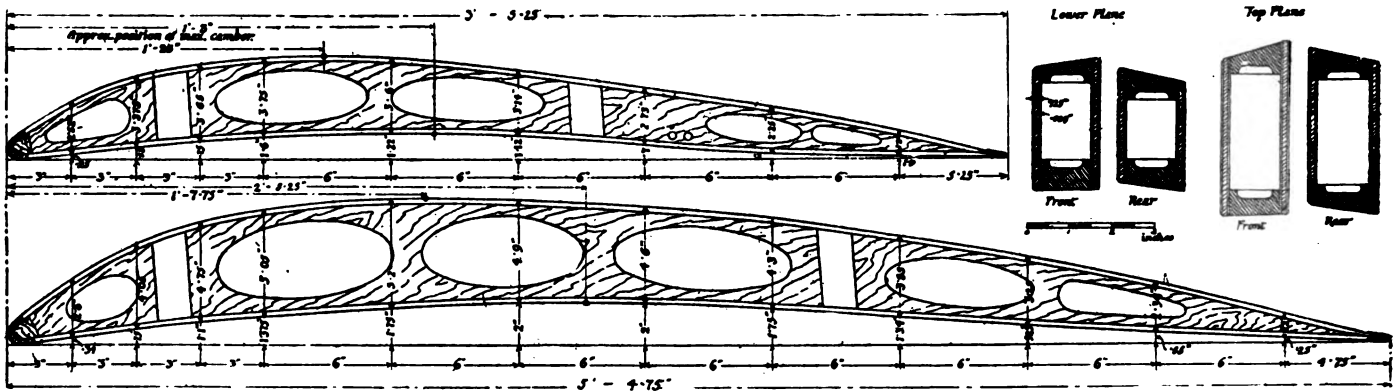
\*From Flight.

Attachment of center section struts to body on the Pfalz

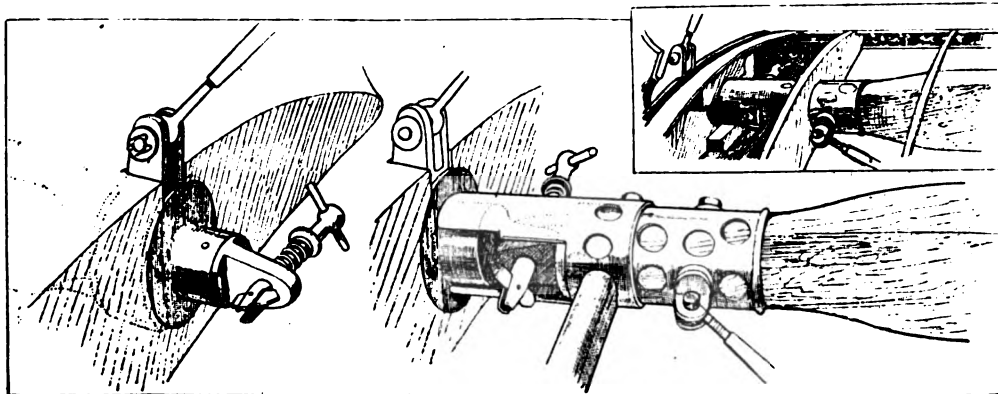


General arrangement of the wings of the Pfalz

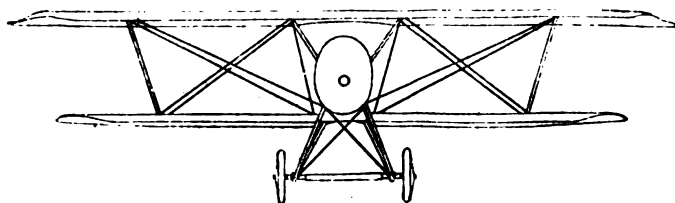




Upper and lower wing sections of the Pfalz, with sections of the wing spars



Quick-release attachment of lower wing spars to fixed wing roots of the Pfalz



Wiring diagram of the Pfalz single-seater. The bracing of the center section struts does not run across the top of the body

attention may be drawn to a somewhat unusual arrangement of the transverse bracing cables. Generally these run from port top rail to top of starboard body struts and *vice versa*. In the Pfalz, however, this arrangement has been discarded and the arrangement indicated in the bracing diagram herewith substituted. The cross wiring does not, it will be seen, run over the top of the body at all. Instead the cables from the upper ends of the struts on one side run to the root of the bottom plane on the same side. The body struts pivot around their attachment to the body, and any lateral displacement of the top plane would therefore result in a raising of one side or the other with a consequent tightening of the corresponding cables. From a practical point of view this arrangement of the cables would appear to possess considerable merits. The crossing of the cables above the body generally necessitates piercing of the top covering, which in most machines is raised considerably above the top longerons, to which the lower ends of the cables are usually anchored. These wires are therefore as a rule difficult to get at, and from a rigger's point of view at any rate the Pfalz arrangement appears preferable. Then again wires crossing above the body frequently interfere with the placing of the machine guns, or with the sighting tube and other accessories. Aerodynamically, it is true, the Pfalz ar-

range is at some slight disadvantage, inasmuch as the length of cables exposed to the air is greater than in the case of cables crossing above the body. When, however, as in the Pfalz, the struts are designed to do away with incidence wires the total length of cables is probably no greater; so one is inclined to consider the arrangement worth while.

The general arrangement of the Pfalz wings is shown in an accompanying illustration. Ailerons are fitted to

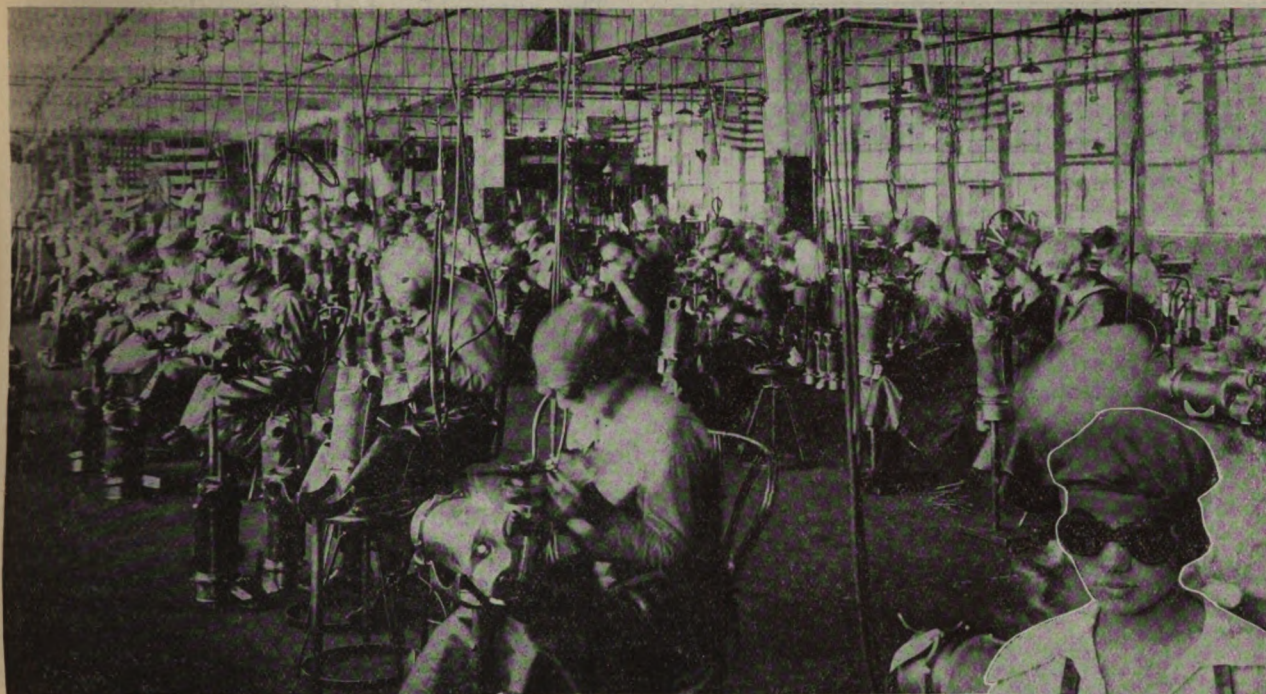
the top plane only, as is almost universal practice in Germany. They are hinged to a false spar, and have their crank levers working in slots in the plane, another feature characteristic of enemy machines. This part of the wing is reinforced extensively by the use of three-ply wood. As shown in the drawing, the petrol service tank is built into the top plane, as is also the radiator, which is provided with a shutter that can, owing to the low placing of the top plane, be operated direct from the pilot's seat, a handle projecting aft from the radiator being provided for this purpose. This central portion of the top plane is also reinforced by a covering of three-ply.

The two wing sections of the Pfalz are shown herewith. The lower section is not, it will be observed, an exact geometrical reduction of the upper one, the trailing portion of its lower surface being more in the nature of a reversed curvature than is the case with the top section. The difference does not, however, appear to be great. The maximum camber of the sections appears to be smaller than one usually finds on German machines. At the same time the camber is very considerable for a machine intended for fast flying, and it is possible that the wing section is partly responsible for the inferior performance of the Pfalz.

The wing spars of both planes are of the box form, although not, as indicated in the sections, made up in the usual way of two channel sections joined by a hardwood tongue and grooves. The flanges of the spars are of spruce, and of the section shown in the illustration. Front and rear faces of the spars are formed by plies of wood made up of two thin outer layers of three-ply with a thicker layer of spruce in between them. At points where the spars are pierced by bolts for the attachment of inter-plane struts or internal compression tubes, the space between top and bottom flanges is filled up solid by packing pieces. The attachment of the spar webs to the

(Continued on page 565)





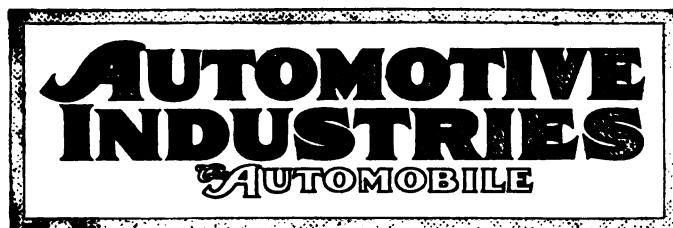
## Two Things That Women Didn't Do Before the War

THESE photographs, taken in the Packard plant, show how women have been trained as welders in the Liberty Engine Department. Experience has shown that while welding is an operation which women learn more slowly than they do most others, they nevertheless acquire gradually a high degree of skill, and are, as a class, more careful with their work than men.



At the left are shown new women employees at the Packard plant being trained for places in the body trimming department. Training and production go along together.





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## Tractor Sales Representatives

A RECENT investigation of the tractor sales situation in the Middle West disclosed the fact that the majority of tractors are being sold by automobile dealers. Many of these in the past were implement dealers, but when automobile development made possible the sale of large numbers of these vehicles among farmers these dealers recognized the opportunity and took advantage of it with the results that now their automobile business greatly exceeds their implement business. The advent of the automobile in the agricultural sections put the implement trade through a process of natural selection. The wide-awake, enterprising, progressive implement men became automobile dealers, while the slow, conservative element in the implement trade stuck to its old line and to the somewhat out-of-date service methods peculiar to it.

When, later on, the farm tractor became a practical proposition it was an easy guess which of the two classes of dealers would be first to take up its

sale. The automobile dealer not only was most eager to embrace the opportunity offered, but was most sought after by the tractor manufacturers, because of his familiarity with the service methods current in the automobile business and his ability to render similar service to tractor customers.

So much for conditions in the Middle West. In the Eastern territory tractor sales development has presented a somewhat different aspect, owing to the predominance of our city population. Passenger cars have been sold mainly in the cities, and until recently our metropolitan dealers did not think of taking on more "essential" lines, to use a term made familiar by war conditions. Motor trucks, too, have been sold chiefly in the large cities, but, with a certain number of exceptions, truck sales agencies have been kept separate from passenger car agencies. The average metropolitan truck dealer has probably done as good a business during the past year as during any previous period and has not been looking for new lines. Business in passenger cars has fallen off greatly, but neither his location nor his previous business experience fit the metropolitan automobile dealer specially as a tractor sales representative.

These remarks are not made to disparage those people who have established general distributing agencies in New York from which to organize local agencies. But the opportunities for direct sales from a city branch are very slight, as experience in the West, where most tractors have been sold so far, has shown that farmers almost invariably buy from their nearest dealer, no doubt because from him they can expect the promptest service. During the period of the war we may materially expect to see certain abnormal developments, but after the return of normal peace times we do not expect to see any tractor salesrooms along Broadway.

Tractor manufacturers who cater particularly to the Eastern trade have found that agents for popular-priced cars in country towns make the most successful tractor dealers. They are close to the farmer, they have the necessary service facilities, and since the curtailment of passenger car production they have been looking for new lines.

## The Employer's Responsibility

THE fact that the Government has organized the United States Employment Service does not by any means relieve the employer of the very great responsibility of putting his employment practices on a scientific basis. His local employment board will not consider it a recommendation for any employee to learn of him that he still adheres to the antiquated hiring and firing method of handling his labor problems. In expecting the co-operation of the Government employment agencies, he must know that he is expected to do his utmost to keep turnover at the lowest possible point and to maintain proper working conditions. It has been demonstrated repeatedly that the surest way to secure these results is to install a central employment department equipped for the prompt discovery and analysis of unfavorable working conditions.



## \$6,000,000,000—The Civilian Soldier's Task

**T**HERE is no higher spirit in man than that of self sacrifice.

It is a sublime gift bestowed by the Creator on man.

The time has arrived, as never before in our lives, when we can show this spirit of self sacrifice.

The Fourth Liberty Loan offers this opportunity.

Each manufacturer must consider it his especial opportunity. It is akin to the tide of opportunity that Shakespeare speaks of which comes in the life of every man and which if taken advantage of leads on to fortune, but if neglected lands us in shallow shoals.

The three former Liberty Loans have been mere training schools for this grand and glorious opportunity. This is the opportunity supreme and to many it will be the test supreme.

Six billions is a good round sum, but a sum that is as nothing when the object for which it goes is considered.

In the past Liberty Loan drives we have purchased bonds, but that is only passing credit to us. They have been good investments. We did not have to purchase until the purchase pinched and pinched hard, but in this six billion drive there is going to be some pinching.

There may be pinching but there must be no flinching

No civilian soldier at home living in his house of comfort, living amidst his friends as he has done for years, using his automobile six days in the week, going to the theatre or movies as he has been in the habit of going, and in general eating more sanely for his own benefit, can even think of flinching.

These six billions are needed for those who in khaki are ready without a whimper, without a flinch, without an excuse and with a smile on their faces to make the supreme sacrifice.

They have left the comforts of home behind. They have severed family circles. They have sacrificed good positions. Some of their families have moved from good homes into smaller and more humble ones. Some of their families have moved from front apartments in good streets of our cities into very inferior ones.

They have done theirs, and now it is our turn.

Manufacturers must not only do their duty in this Liberty loan so far as their corporation is concerned, but also so far as every employee is concerned. Wages have increased 80 per cent and living expenses have increased but 60 per cent. Such employees cannot flinch.

Every factory organization should card index every employee.

His capacity to purchase Liberty Bonds should be investigated to the last syllable.

We expect every soldier in France, in Russia, or in any other country where we are fighting, to take his place in the ranks. He must answer the roll call.

At home, every factory employee must answer to the Liberty bond roll call.

Any employee who does not buy should show the reason why.

In a democracy, we cannot have one rule in war time for soldiers and another code of ethics for civilians.

The army in the factories at home must do its duty as faithfully to the very letter as the army at the front or in the training camps.

Every workman who owns a Liberty bond is a better workman for owning it. He becomes a stockholder with Uncle Sam in this country. Every stroke of efficiency comes back to him in dividends.

For the next four weeks it is our duty to civilization to do our utmost to successfully put the six billion loan across.

This is our opportunity.

# Latest News of the

## Truck Curtailment Protest

Many Makers Call Plan Unjust  
—Would Benefit Those Having War Work

WASHINGTON, Sept. 21—Protests from truck manufacturers regarding the ruling of the War Industries Board, limiting the production of motor trucks during the last 6 months of 1918, to one-third of the total production for the 18 months preceding that period, are still being made. Individual truck makers have in many cases laid their complaints before Washington authorities, and from many sections of the country come representatives giving indications of how the allotment is going to affect them.

So far as a great many makers are concerned the situation is very serious. Take the case of a manufacturer who has been allowed approximately 1200 trucks from July 1 to December 31, and who has already shipped over 900. This means that he cannot possibly retain his organization during the remaining months of the year on a 300 truck program. Such a manufacturer has pretty nearly his complete stock on hand, and while it has been suggested that he could hold the stock and not use it until after January 1, it must not be forgotten that the stock has to be paid for. This introduces a financing problem which is not a very easy one.

Many similar examples could be cited, which would seem to indicate that the allotment for the truck companies for the 6 months is such that the organization could hardly be kept intact during the remainder of the year. The overhead would be so heavy as to make this scarcely possible.

This reduction program, in view of the fact that motor trucks have been declared essential, seems certain to work special injury to truck companies not engaged and filled up on Government truck work. These companies have been preparing for the commercial demands of the country, which the companies going 100 per cent on Government work have not been able to take care of. The ruling seems to play strongly into the hands of these truck makers, as it can only be interpreted as cutting down the commercial field of the manufacturer who has not the Government work. In other words, while one group of truck makers is engaged on profitable war work, rulings are made to restrict the business of those who are taking care of the commercial field. With trucks classed in the essential column, it is difficult to see the underlying reason for this action.

C. C. Hanch, chief of the Automotive Products Section, stated yesterday that he has been given latitude by the War Industries Board, which will allow him to enlarge or decrease the apportionments for production for truck makers during the last half of 1918. By this means he expects to give aid to the truck makers who have only been in business a short time, and also to make reasonable adjustments to those manufacturers who believe that their apportionments under the original ruling of one-third of the last 18 months' business would be unfair. Truck manufacturers are hoping that through Mr. Hanch's efforts a reasonable adjustment can be effected.

A number of unjust results are reported by the truck makers who object to the ruling. They cite the instance of the manufacturer who has only been in the truck making business for the last year or the last year and a half, and who, under the ruling, would be allowed only a very small amount of trucks at this time. Again, there is a manufacturer who was unable to secure his materials because of the many difficulties during the last winter, and consequently had to cut down his production. He now has the materials after much expenditure of effort and money, and also has the orders, but owing to the ruling, is limited in his output.

This ruling came as a great surprise to the general industry. Following all of the previous declarations of the War Industries Board affirming the essentialness of the motor truck, it has been difficult to understand the exact reason for this latest move. Inquiry at the Automotive Section of the Board developed two possible reasons: (1) It was said that the motor truck is not, outside of war work, declared essential by the War Industries Board.

(2) It was stated that patriotic manufacturers engaged in truck work for the Government should be protected during the war against manufacturers building trucks for commercial purposes.

The latter reason scarcely deserves consideration. It is hardly believed that this was stated seriously. It is well known that all of the truck manufacturers have been anxious to secure Government work, and have patriotically, and for excellent business reasons, endeavored to secure war contracts. Also, it is a question whether it is within the function of the War Industries Board to control general industrial and commercial business for the sole reason of "protecting" war manufacturers.

The first assertion that motor trucks for commercial or industrial purposes had not been declared essential by the War Industries Board is a surprise. As early as June 26 the War Industries Board stated in a letter signed by the Vice Chairman of the Priorities Committee:

"We beg to advise that the Priorities Committee views the motor truck in most instances as being a helpful medium, particularly at this time, and are not disposed to hamper the production of same."

Later, on Aug. 8, the War Industries Board issued Circular No. 11, stating:

"Careful consideration has been given to the several problems, and a decision reached that motor trucks, in so far as they are used directly or indirectly for war purposes, are

(Continued on page 567)

## Glover Heads Motor Division

Has Charge of Procurement of Motorized Vehicles—Three Separate Branches

WASHINGTON, Sept. 25—Organization of the Motors Division of the Quartermaster Corps, which has charge of motor propelled vehicles, has been completed. This division procures the motorized vehicles for the Motor Transport Corps, which has charge of maintenance, operation and engineering.

Colonel Fred Glover of the Quartermaster Corps, formerly general manager of the Emerson-Brantingham Agricultural Implement Manufacturers, Rockford, Ill., is the chief of the Motors Division. Major Guy Hutchinson, formerly an automobile dealer in New York City, is the executive officer. Colonel E. S. George is the assistant chief of the division. Major A. H. Zacharias, who several years ago was connected with a pressed steel company, is the production assistant. Major C. S. Dahlquist, formerly of the Timken Detroit Axle Co., is the technical assistant.

The division comprises three branches, procurement, administrative and district offices. The procurement branch is organized in sections as shown below.

Captain Finkenstadt, given herewith, was formerly assistant to Christian Girl, president of the Standard Parts Co., assistant to Mr. Girl when he was in charge of Army truck production, and later was in charge of B truck production, following Mr. Girl's resignation. By this new organization he has been placed assistant to Major A. B. Browne. Mr. Morrison was connected with the Highland Body Co. Mr. Hess was formerly with the Cleveland Motorcycle Co. All of these men named here together with their connections were formerly connected with the Motor Transport Service under Christian Girl.

The administrative branch is under Captain S. P. Dean and includes: Office control, under Captain A. D. Stansell; personnel, W. A. Dickey; clearances, D. G. Blair; finance and statistics, A. G. Drefs; trucks, Captain H. M. Lowy.

(Continued on page 567)

### Organization of the Motors Division of the Quartermaster Corps

Section	Officer in Charge	Assistants
A and B trucks	May. A. H. Browne	Capt. E. R. Finkenstadt
Military trucks	Capt. A. C. Keleher	A. D. Bolton
AA trucks, ambulances, automobiles	May. W. T. Fishleigh	Capt. W. G. Stoner
Special vehicles, motorcycles, bicycles	May. R. Miller, Jr.	Capt. C. O. Miller
Spare parts, accessories, tires	Guy Morgan	E. S. Church
Trailers	P. W. Tracy	R. W. Irwin
Bodies	James Morrison	Lt. T. A. Clarke
Orders	Lt. W. J. Kennedy	Lt. L. J. Bulkley
Priorities	D. F. Hess	
Gauges	Capt. E. P. Hanglitter	

# Automotive Industries □

## Trucks Hold Destiny of Industry

### Highways Transport Committee Meeting Emphasizes Importance of Highway Haulage

WASHINGTON, Sept. 21—"The world is never more than 60 days ahead of famine between harvests, and great starvation areas will develop in Europe.

"Fifty per cent of our perishables raised on the farms never reach the consumers. We lost 40 to 60 per cent of our potatoes yearly. The producers are too remote from the markets."—Herbert Hoover.

"Following the war we will develop a nation of small farming communities on new land open or reclaimed, and cultivated largely by America's war veterans. These centers will all be united by motor rural express vehicles operated over our highways. The Government intends to furnish farming opportunities for the soldiers, and we must have highways to complete such a program."—Franklin K. Lane, Secretary of the Interior.

#### A Trinity of Usefulness

"Our means of transportation, waterway, railway and highway are not hostile but a trinity of usefulness, but you may put six tracks on each side of the Hudson and fill it with steamships, and unless you put the inland farmer in touch with the docks and the depots neither will be useful to him."—William C. Redfield, Secretary of Commerce.

These were some of the high thoughts that are to come about because of the war and a more efficient control of highways transportation, and were given vent to at the meeting of the Highways Transport Committee held here last week, when the regional chairmen of the committee spent three days going over the work and listening to various addresses. Chairman Roy D. Chapin met with the eleven regional chairmen present and laid broad plans for a pushing of the work.

One of the possible outcomes of the meeting is action leading toward a more positive system of gasoline economy by motor vehicles. Up to date the gasoline economy program has been one of curtailment, a negative program, so to speak. The possibilities of a positive program of curtailment were outlined. This will consist of keeping motor vehicles in better operating condition so that great quantities of gasoline will be saved. Some of the regional chairmen are already arranging plans whereby

they will carry on a campaign along this line through their entire area.

Herbert Hoover pledged his entire food administration back of the highway movement. "Europe is exhausting the candle of present and future resources at both ends," said Mr. Hoover, "and for 10 years after peace comes the productivity of the United States will be called upon to aid the Allies and the millions of people exploited by Germany. One of the results of a perfected highways use would be to cut down the waste of perishable foods. Besides stopping this terrific waste a highly developed rural express would work to establish lower prices. Europe has an intimate system of railway lines and canals to transport these products to nearby markets. Where the rural express has been developed in this country it has operated to these ends. I should say that the failure of public markets in this country is due to the tremendous loss of perishables shipped from remote distances. A network of rural deliveries will provide the economic basis for a successful public market.

"A further effect would be to bring into productive activity the large potential of labor now on the farm but not actively producing. Wherever mechanical transports can be employed there will be a decrease of work animals necessary. Our 25,000,000 to 40,000,000 work animals are eating the crops of an acreage that, planted to food, would sustain 40,000,000 more people."

Joseph D. Baker, of the Priorities Division of the War Industries Board, discussed the feasibility of federal license of motor car and truck drivers to conserve fuel, steel, lubricants and manpower employed in service stations. It will be recalled that earlier issues of AUTOMOTIVE INDUSTRIES predicted a probable federal license plan of this sort operated by the Priorities Division. It has been rumored for some time.

Reports made by the regional chairmen show tonnage moved over the highways increasing at a tremendous rate. In some States as much as four hundred per cent increase over last year being shown. The Cleveland-Akron-Canton area reported sixty-

(Continued on page 558)

#### Tom Jones Killed in Seaplane Accident

NEW YORK, Sept. 25—Tom Jones, formerly connected with J. B. Crockett & Co., exporters, and previously advertising manager of the Empire Automobile Co., who last year traveled through the Orient for the United States Government making investigations on automobile conditions, was killed yesterday at Pensacola, Fla., in a seaplane accident.

## Cut Iron and Steel for Tractors

### War Industries Board Limits Quantity for Next Year to 75% Used Last Year

CHICAGO, Sept. 21.—The quantity of pig iron and steel which manufacturers of tractors and other farm implements may use in the year commencing Oct. 1, 1918, and ending Oct. 1, 1919, has been limited to 75 per cent of the quantity used in the year ending Oct. 1, 1918. This action has been taken by the War Industries Board following conferences which were held last week in Washington between the War Service Committee of manufacturers of agricultural implements and farm operating equipment and Priorities Division of the War Industries Board.

Although this limitation of iron and steel will mean curtailment in the production of tractors to some extent, it is not possible to state at the present just how much the curtailment will amount to. The War Industries Board has not specifically limited the production of tractors and other implements to 75 per cent of the production during the year ending Oct. 1, 1918; instead it has merely limited the quantity of iron and steel which manufacturers of these implements may use. It is estimated that this action will release 500,000 tons of iron and steel.

#### Expect Relief

In its circular to the trade, the Farm Implements Committee, of which C. S. Brantingham is chairman, states that "possibly some relief may be obtained by substantial reduction of inventories by the end of the year Oct. 1, 1919," and adds "that it becomes the obligation of the manufacturer to adjust himself in the way that will serve his trade and the farmer best out of the materials allotted him."

The War Industries Board urges that a full assortment and stock of repair parts be supplied to the farmer as a means to assist and encourage him to continue to use the equipment he now owns.

#### Streator to Quit

OTTAWA, ILL., Sept. 20—A decree of foreclosure and sale has been entered against the Streator Motor Car Co., formerly of Streator, Ill. The sale is set for Thursday, Oct. 10, at Ottawa, and will involve real estate in Streator.



## May Be Less Gasoline in 1919

### War Demands During Coming Months May Prevent Accumulation of Surplus

Washington, Sept. 21.—The gasoline situation is serious not so much because of a present shortage as because of shortages that will occur early next year. There is a serious discrepancy between gasoline production and consumption at present, but this is not critical, as the motoring season is practically at an end and the stocks of gasoline will from this time on increase. However, it is probable that heavy drafts on the stocks of gasoline for war purposes both at home and abroad, during the winter and the spring, will prevent the usual large stocks that accumulate through the winter and will thus create a serious gasoline shortage for 1919. For this reason voluntary conservation must be practised constantly and every step must be taken not only to conserve gasoline but to increase the future supply and the supply of crude oil. These are the salient points of a report submitted by Van H. Manning, Director of the Bureau of Mines, Department of Interior, to the Senate, as a result of a resolution presented by Senator Lodge.

Figures were presented in the report showing that the monthly consumption, including exports of gasoline for August, amounted to 9,500,000 barrels as compared with a monthly production of 8,000,000 barrels, creating a shortage of 1,500,000 barrels per month comparing the demand with the production. Following is the major part of Director Manning's statement:

These figures, said Director Manning, show gasoline consumption to be seasonal, with the greatest demand in the summer, with the demand decreasing in the winter as the storage stocks increase. During the summer of 1917 storage was at a minimum and reached its maximum in March, 1918. At present gasoline stocks are falling off because the entire output of the refineries is not enough to meet the increasing demand. August is expected to show the same demand as July so that the stocks at the end of August, 1918, will probably be between 6,000,000 and 7,000,000 bbls. September will witness the culmination of that period of greatest consumption and close the heavy drafts on stocks unless exports increase at a greater rate than is now expected.

"In normal times," continues the report, "such a discrepancy between production and consumption during the summer months would cause no undue consternation for sufficient gasoline would be stored during the winter months to more than overbalance the heavy summer demand. At present, however, conditions are abnormal and it is difficult to forecast the future. The domestic demand for gasoline during the coming winter will probably be reduced by a falling off in automobile production and the neces-

sity for economy among the people. On the other hand our war demand for gasoline both at home and abroad will probably be tremendous, especially with the advent of spring, so that the situation is really serious but not so much because of present shortage as because of the forthcoming shortage of next year.

"We are not now producing enough crude oil to supply refineries, gasoline stocks have been reduced to a two weeks' or three weeks' supply, and although the present situation has been well taken care of by the Fuel Administration we are facing a tremendous demand next spring and a demand as inflexible as it is great for we must have adequate supplies of gasoline for our own overseas forces and for those of our Allies. The need for conservation is apparent and the American people should voluntarily forego the pleasure of needless automobile touring during these times. Such voluntary conservation may now prevent the necessity of more serious action later. Furthermore, every step should be taken by the people and their representatives not only to conserve our present supply of gasoline but also if possible to increase our future supply and the supply of crude oil from which gasoline is made."

### Licenses for Experimental Flights to Be Submitted to Army and Navy

WASHINGTON, Sept. 21.—Applications for flying licenses to conduct experimental flights must hereafter be submitted to the proper Army and Naval authorities before being filed with the Joint Army and Navy Board on Aeronautic Cognizance, Building D, Sixth and B Streets, Washington, D. C.

Applications should be made either by individuals or airplane companies making new types of navy airplanes to Captain N. E. Irwin, U. S. N., Director Naval Aviation Division, New Navy Building, Washington, D. C., and for flying army aircraft to the Technical Section, Division of Military Aeronautics, Dayton.

## Gasoline Stock Down 68,531,749 Gal.

### July's Production Figures Satisfactory, But Stock Low at End of Month

Production			
	July, 1918	June, 1918	
Crude oil (bbl.)	29,170,718	28,140,479	
Gasoline (gal.)	332,022,095	315,023,445	
Stocks on Hand			
	July 31, 1918	June 30, 1918	
Crude oil (bbl.)	14,026,525	11,956,151	
Oils purchased to be re-run (bbl.)	1,548,971	932,561	
Gasoline (gal.)	349,928,604	418,440,353	
Kerosene (gal.)	432,807,129	426,285,676	
Gas and fuel (gal.)	519,012,839	550,704,759	
Lube. gal.)	136,460,207	158,316,257	
Wax (lb.)	176,539,564	169,424,428	
Coke (ton)	17,943	17,148	
Asphalt (ton)	92,597	97,631	
Miscellaneous (gal.)	450,086,589	273,877,024	

WASHINGTON, Sept. 23.—During July, 1918, the daily production of gasoline was 10,710,390 gal. against a daily average for the previous month of 10,500,781 gal. The improvement is slightly better than indicated by the figures as July had 31 days compared with 30 in June.

The stock of gasoline on hand at the end of July shows a decrease of 68,531,749 gal. when compared with the end of June stock and is no less than 110,708,875 gal. below the stock at the end of May. Obviously some reduction is expected during the summer months, and doubtless the temporary stoppage of the use of passenger cars on Sundays will help to bring back the stock figures to normal.

The crude oil position is slightly better, both as regards production and stock,

### Production and Consumption of Gasoline

Increase in crude oil consumption by refineries:	
Daily average 1917.....	863,374 bbl.
Daily average first 7 months 1918.....	874,964 bbl.
Increase.....	11,590 bbl.
Daily average increase for July, 1918.....	940,991 bbl.
Increase over July, 1917.....	77,617 bbl.

The following tabulation shows the changes in stocks of the principal refined products except gasoline from Jan. 1, 1918, to Aug. 1, 1918:

Kerosene.....	127,744 bbl. decrease
Gas and fuel oils.....	737,882 bbl. decrease
Lubricating oils.....	171,878 bbl. decrease
Paraffine wax.....	21,790,190 lb. increase

The following tabulations show the approximate production, consumption and stocks of gasoline for the first 8 months of 1918:

Months	(b) Production, Bbl.	(c) Stocks at End of Month, Bbl.	(d) Decrease or Increase for Month, Bbl.	(e) Average Daily Increase or Decrease in Stocks, Bbl.	(f) Total Con- sumption, Including Exports
December, 1917.....	9,815,000	11,160,000	+	1,345,000	4,235,000
January, 1918.....	5,580,000	12,350,000	+	1,190,000	4,180,000
February.....	5,370,000	12,550,000	+	200,000	6,210,000
March.....	6,410,000	12,120,000	—	430,000	7,420,000
April.....	6,990,000	10,950,000	—	1,020,000	8,620,000
May.....	7,800,000	9,960,000	—	990,000	8,490,000
June.....	7,500,000	8,330,000	—	1,630,000	9,530,000
July.....	7,900,000	6,830,000	—	1,500,000	9,500,000
August.....	8,000,000				

The month of August, as shown in the above figures, was an estimate as the figures from the refineries are not yet available.

Column (d) shows an excess of production over consumption or in other words amounts that had to be taken from storage to meet the demand.

Column (e) shows that during July the average daily gasoline shortage was 52,600 bbl.

and there is a substantial improvement in the item of re-run oil. This is given separately for the reason that it represents crude or distillate which has been included in the regular crude oil production figures at some prior date.

Owing to the abnormal demands of the naval and merchant marine, the largest item in the stock list is that covering fuel oil. During July the average daily production of this was no less than 21,239,990 gal.—nearly double that of gasoline.

#### Packard Has Graduated 1259 Women

DETROIT, Sept. 20—The Packard Motor Car Co. has graduated 1259 women and girls from its training school which was established last spring. Approximately two-thirds of the Packard women employees, of which there are more than 1000, were trained in this school. The present school enrollment is 250.

#### Powell Buys Omaha Auto Supply

OMAHA, Sept. 23—The Powell Supply Co., of which the president is Clark G. Powell, has purchased the entire stock of the Omaha Auto Supply Co., a concern which has been in existence for seven years. The stock is said to be worth \$50,000. Part of the Omaha organization goes with Powell, including Manager Wilson.

#### Canada Wants Gasoline Cards

MONTREAL, Sept. 23—The Montreal Automobile Association, through Secretary Thomas C. Kirby, has petitioned the authorities at Ottawa for the issuance of gasoline cards to our owners instead of the establishment of regulations which forbid the use of cars on Sunday.

## Gasoline Men to Be Licensed

### Oil and Gasoline Makers and Dealers Having Business Over \$100,000 Affected

WASHINGTON, Sept. 21—Importers, manufacturers, distributors and transporters of crude oil, fuel oil, gas oil, kerosene or gasoline whose annual businesses exceeds \$100,000 will be required to operate under a license on and after Oct. 1, 1918, according to a proclamation issued to-day by President Wilson.

The licenses can be secured from the United States Fuel Administration, Oil Division, Washington, D. C. Special blank forms will be provided by the Fuel Administration for that purpose. Holders of existing licenses already issued by the United States Fuel Administration are not required to secure new licenses.

The proclamation issued by the President is under the authority of the Congressional Act, "to provide further for the national defense by encouraging the production, conserving the supply, and control the distribution of food products and fuel," which was approved by the President, Aug. 10, 1917.

Any individual, firm, corporation or association which continues to carry on a business or importing, manufacturing or trading in crude oil or its products or natural gas, and whose business exceeds \$100,000 yearly, will be liable to penalties prescribed by this act.

#### Employers Should Help Draft Boards

WASHINGTON, Sept. 21—Employers are called upon by the Provost Marshal General of the War Department to assist

the Local Boards and District Boards in making decisions on industrial exemptions under the new draft. In the first draft of 1917 out of more than 3,000,000 registrants called only 140,000 filed occupational claims or 4.7 per cent. Ninety-five per cent of all registrants raised no question of such deferment. Under the next draft it is expected that conditions will be considerably reversed, and that numerous occupational claims will be made.

#### New Army Purchasing Department Appointments

WASHINGTON, Sept. 20—Under the reorganization of the General Staff, Brigadier General Hugh S. Johnson and Gerard Swope have been appointed assistants to Major General George W. Goethals, Director of Purchase, Storage and Traffic.

The Quartermaster General of the Army is made Director of Purchase and Storage and will be responsible for and have authority over storage, distribution and issue within the United States of all supplies for the Army. Colonel William H. Rose of the Corps of Engineers is designated to act under him as Director of Purchase, while Colonel F. B. Wells will act as Director of Storage, with L. M. Bicolson as his assistant.

#### Skilled Men Wanted for War Department

WASHINGTON, Sept. 19—Manufacturers and business men have been requested to co-operate with the General Staff of the War Department to aid in securing skilled office men for War Department work. There is a pressing need for men who have demonstrated their qualifications and ability in statistical work, factory production, accountancy, purchasing, merchandising and warehousing.

### Total Output of Refineries in the United States for 1917

1917	Crude (bbl.)	Other Oils (bbl.)	Gasoline (gallons)	Kerosene (gallons)	Gas and Fuel (gallons)	Lubricating (gallons)	Wax (pounds)	Coke (tons)	Asphaltum (tons)	Miscellaneous (gallons)	Losses (bbls.)
January	24,839,772		203,618,724	137,248,370	469,596,208	60,941,062	39,558,627	44,627	49,894	27,331,019	941,924
February	23,083,433	no account	184,602,595	129,074,504	446,964,925	54,631,765	36,370,297	42,047	40,619	23,685,686	941,110
March	26,230,138	1st 6 mo.	220,523,571	159,028,978	494,855,838	64,345,221	40,868,930	48,839	52,823	26,977,824	870,380
April	25,994,938	1917	228,945,164	157,826,945	462,846,339	63,218,215	41,037,511	46,099	52,849	30,959,901	957,533
May	27,253,391		238,816,209	147,894,846	504,859,695	65,926,007	38,686,364	43,535	67,612	31,086,377	979,245
June	26,453,210		233,671,746	151,477,333	496,742,434	61,045,757	38,075,280	42,513	67,931	30,205,172	1,011,568
July	26,776,856	2,435,533	244,145,292	161,679,053	599,454,966	64,335,905	40,158,033	42,641	65,272	32,359,401	1,111,511
<b>Total first seven months</b>	<b>180,631,738</b>		<b>554,323,301</b>	<b>1,034,230,029</b>	<b>3,475,320,405</b>	<b>434,443,932</b>	<b>274,755,042</b>	<b>310,301</b>	<b>397,000</b>	<b>262,604,890</b>	<b>6,813,271</b>
August	27,900,623	2,376,580	254,464,491	149,528,513	632,151,971	64,107,817	38,999,341	46,240	73,878	92,708,312	1,286,141
September	27,529,022	2,632,988	256,132,050	143,203,644	629,914,572	60,757,049	48,200,033	42,986	62,520	80,386,471	1,182,560
October	27,698,023	2,863,518	271,891,234	140,559,542	621,492,374	68,516,071	41,181,400	48,849	73,886	91,804,160	1,355,219
November	26,215,979	2,519,700	264,888,709	125,893,202	592,490,037	64,861,375	39,694,595	45,815	73,289	87,115,002	1,203,110
December	25,155,996	2,069,351	248,846,638	123,354,046	561,954,921	61,090,596	38,269,670	45,175	58,852	87,548,408	1,233,528
<b>Total</b>	<b>315,131,681</b>	<b>14,897,670</b>	<b>2,850,546,423</b>	<b>1,726,768,976</b>	<b>6,513,324,280</b>	<b>753,776,840</b>	<b>481,200,081</b>	<b>539,366</b>	<b>739,425</b>	<b>702,167,243</b>	<b>13,073,829</b>

### Total Output of Refineries in U. S. for First Seven Months of 1918

1918	Crude (bbl.)	Other Oils (bbl.)	Gasoline (gallons)	Kerosene (gallons)	Gas and Fuel (gallons)	Lubricating (gallons)	Wax (pounds)	Coke (tons)	Asphaltum (tons)	Miscellaneous (gallons)	Losses (bbls.)
January	23,842,587	2,300,324	242,632,044	119,358,184	547,866,248	56,625,425	39,238,858	41,216	54,854	70,995,829	1,078,181
February	23,386,676	2,298,333	234,324,619	121,218,320	510,165,397	58,300,914	35,087,337	42,371	42,033	75,134,088	883,992
March	26,239,662	3,696,872	269,647,968	151,228,007	587,985,804	69,308,351	43,597,019	44,248	56,901	94,865,148	1,097,489
April	26,201,544	3,956,244	293,396,162	153,703,682	578,255,341	71,022,204	40,178,524	45,674	51,242	89,242,012	1,182,020
May	28,510,698	4,112,023	319,391,202	160,590,760	631,586,209	79,589,755	42,544,633	48,564	60,449	88,627,491	1,269,281
June	28,140,479	3,483,270	315,023,445	151,840,252	628,842,033	74,420,996	41,317,794	46,605	50,321	81,110,922	1,282,177
July	29,170,718	5,951,537	332,022,095	156,828,826	658,439,682	79,303,107	41,691,551	48,914	58,433	159,374,139	1,338,304
<b>Total</b>	<b>185,492,364</b>	<b>25,798,613</b>	<b>2,006,417,535</b>	<b>1,014,768,031</b>	<b>4,143,140,714</b>	<b>488,568,732</b>	<b>283,650,716</b>	<b>317,892</b>	<b>374,233</b>	<b>659,349,629</b>	<b>8,231,444</b>

## British Organize Industrial Research

Four Industries Now Have Associations, and Thirty More Will Soon

LONDON, Sept. 10—The establishment of research associations is rapidly increasing among British industries. Four industries have already established such associations and 30 more are now preparing to do so, according to the third annual report of the British Research Department, which was organized recently by the Government for the purpose of encouraging research and assisting the scientific investigation of industrial problems.

The industries which now have their research associations are the photographic, scientific instrument making, Portland cement and woolen and worsted industries. There is abundant evidence that the movement is to receive the unqualified support of all industries, as the need for organized research in connection with industries is being increasingly realized. The supply of research workers, however, may cause a serious setback if it cannot be expanded rapidly to meet increasing demands.

The formation of an industrial fatigue research board, which was accomplished with the help of the medical research committee, is one of the most interesting developments of the past year. The function of this board is to consider and investigate the relation of the hours of labor to other working conditions, and their effect on production.

### Privy Council's Policy

The report of the research department was preceded by a supplementary report of the committee of the Privy Council for Scientific and Industrial Research. In this supplementary report the Privy Council stated its policy and said:

"The department has found in the course of its conversations with leading manufacturers that there is sometimes a certain hesitancy to establish relationship with the Government for the purpose of research because of fear that the department will interfere in the work of the new association, and will use its powers in such a way as to prevent the results of research from reaching the firms which have subscribed to its cost, or to give the results to competing firms which have not joined or have left the association."

The council points out that such a result would be fatal to the success of the scheme, and that it is the intention to permit the associations to manage their own affairs, and benefit by their own discoveries. It is thought that the departments can help each association by keeping it in touch with all work.

### War Service Committee for M. A. M. A.

NEW YORK, Sept. 23—At a meeting of the Motor and Accessory Manufacturers' Association Friday it was voted

that President C. W. Stiger appoint a War Service Committee, and that this committee request the War Industries Board for a hearing on the affairs of the parts makers.

The parts makers were included in the industrial committee which operated in Washington at the beginning of the war, but since the committee was reorganized some time ago have not had an official representation for contact with governmental agencies.

The association is sending to members and other parts and equipment makers a statement as to the detail of how the automobile and truck industries are being handled by the War Industries Board, including priority plans and other matters.

### Trucks Hold Destiny of Industry

(Continued from page 555)

one per cent as much freight being moved by motor express now as the railroads are carrying. High development of the returnloads bureau, which insures most economical operation of highways transport, was noted in the State of Connecticut, with Hartford acting as the central bureau. In Cincinnati and Omaha, livestock are being carried to stockyards over the highways in increasing numbers. Rural express has reached its highest efficiency in Maryland, New Jersey, eastern Pennsylvania and southern New York. Arrangements have been made to connect New York State Barge canal ports with the farming communities back from it by rural express.

Edward Chambers, former vice-president of the Santa Fe Railroad, now Director of Traffic in the National Railroad Administration, urged the chairmen to promote the trucking of less-than-carload shipments from the manufacturing centers to communities thirty and forty miles out, and the co-operation of the highways regional chairmen with the railways regional traffic directors, to facilitate the clearing of the terminals in the larger cities. Mr. Chambers announced that in conjunction with the Highways Transport Committee, the Railroad Administration is trying out the store-door delivery system in New York, with hopeful results. If it meets expectations there, it will be extended to other large centers.

The Highways Transport Committee is completing countrywide organization that will number more than 15,000 committeemen, manufacturers, farmers and consumers, all working through contact with the State Councils of Defense and with the committee's regional chairmen.

### Ford Transfers Labor for Ships

DETROIT, Sept. 23—More than 3000 laborers from the Ford Motor Co.'s plant have been transferred to the Ford shipbuilding plant to work on Eagles within the past 3 months. Between fifteen and thirty men are leaving the plant daily to take their places in the ranks of the army or navy. Nearly 6000 employees have left the factory for national service during the last year.

### Franklin to Make Hispano-Suiza Parts

SYRACUSE, Sept. 22—The H. H. Franklin Mfg. Co. has received a contract from the Wright-Martin Aircraft Corp. for parts of Hispano-Suiza engines.

## 8 Hour Day Adopted by Steel Corp.

More Than 275,000 Workers Affected—Midvale Co. Announces Co-operative Plan

NEW YORK, Sept. 24—The eight-hour day has been adopted by the United States Steel Corporation as a basis for calculating wages and working periods for its employees. The new plan will go into effect on Oct. 1. Something more than 275,000 workers in rolling mills, blast furnaces, mines and transportation organizations affiliated with the corporation and operated by it will be affected.

Elbert H. Gary, Chairman of the Board, made the following announcement after a meeting of the directors to-day:

The Finance Committee of the United States Steel Corporation to-day unanimously approved the recommendation of the Chairman and President of the corporation and of the Presidents of the subsidiary companies to adopt the eight-hour basic day, to become effective Oct. 1, 1918. The open-shop plan heretofore in force throughout the works will be continued.

### An Increase of 42 Cents

It is believed, following the lead of the largest unit in the industry, other steel manufacturing concerns will shortly announce the adoption of the eight-hour day.

A day laborer working ten hours under the new schedule will get \$3.36 for eight hours and an additional \$1.26 for the two remaining hours, or \$4.62 all told as against \$4.20 at present.

The increase of 42 cents over the present pay for ten hours is equal to 10 per cent. Applied to the balance available for dividends, the experts calculate that at the current rate of earnings and under the expected Federal taxes, the increase of wages will cause a reduction in the balance of not more than 2 per cent.

### Midvale Adopts Labor Co-operation

The Midvale Steel & Ordnance Co. has invited its employees to co-operate with the officials of the company for the purpose of working out plans for mutual benefit. A committee of employees of the Midvale Co. and the Cambria Steel Co., a subsidiary concern, will meet with a committee consisting of vice-presidents of the Midvale Co. in Philadelphia to arrange details of the plan.

On Monday morning notices were posted throughout the plant of the Midvale Co., signed by President A. C. Dinkey, which read as follows:

We recognize the right of wage earners to bargain collectively with their employers, and we hereby invite all employees to meet with the officers of their respective companies for the purpose of considering and, if practicable, adopting a plan of representation by the employees, which shall be thoroughly democratic and entirely free from interference by the companies, or any official or agent thereof. It is hoped that every employee will respond to this invitation and meet with the officers of the company in the spirit of fair dealing and mutual helpfulness.



## Iron and Steel Price Unchanged

### President Approves Agreement Maintaining Present Figures with Few Exceptions

WASHINGTON, Sept. 24—The President has approved the agreement made by the Price-Fixing Committee of the War Industries Board with representatives of the iron ore, pig iron and steel interests, and the maximum prices now prevailing on these products will be continued in effect for the three months ending Dec. 31, 1918, with the following exceptions:

Lake Superior iron ore base prices delivered to the lower lake ports are increased 25 cents per gross ton, effective Oct. 1, subject to increase or decrease in event that rail or lake rates increase or decrease.

Basic iron base prices have increased to \$33, f.o.b. furnace. The base price on No. 2 foundry iron is increased to \$34, f.o.b. furnace. Standard Bessemer iron is fixed at \$35.20, f.o.b. furnace. These prices are subject to the following changes from previous practice as regards delivery:

(a) Pig iron produced in the Virginia, Tennessee, and Birmingham districts and the scattering districts south of the Ohio and Potomac Rivers, including furnaces at St. Louis, Mo., but not including furnaces bordering on the Ohio River, shall be sold on a f.o.b. Birmingham, Ala., basis.

(b) Pig iron produced in the Eastern district, i.e., from all blast furnaces located east of the Allegheny Mountains and north of the Potomac River, shall be sold on a f.o.b. Pittsburgh basis.

(c) Pig iron from all other producing districts or furnaces shall be sold f.o.b. furnace as heretofore.

No new contracts calling for delivery of any of the above commodities or articles on or after Jan. 1, 1919, are to specify a price unless coupled with a clause making the price subject to revision by any authorized United States Government agency, so that all deliveries after that date shall not exceed the maximum price then in force, although ordered or contracted for in the meantime. It is expected that all manufacturers and producers will observe the maximum prices now fixed.

### Form Marine War Service Committee

WASHINGTON, Sept. 25—W. H. Manass, Director of the War Service Executive Committee of the United States Chamber of Commerce has called a meeting of manufacturers of marine internal combustion engines and accessories, to be held on Sept. 27 at 2 p. m. A War Service Committee of the trade is to be formed.

### N. A. C. C. Meeting Oct. 3

NEW YORK, Sept. 25—Hugh Chalmers, vice-president of the N. A. C. C., will report on the Washington situation as it affects the automobile industry at the regular monthly meeting of the N.

A. C. C., which is to be held at the general offices in New York on Thursday, Oct. 3.

C. C. Hanch, chief of the Automotive Products Section of the War Industries Board, will answer questions relating to priorities, materials, etc. A meeting of the motor truck manufacturers will be held at 2 p. m. George M. Graham, chairman of the National Motor Truck Committee, will speak on "How the Motor Truck Industry Is Affected by Developments in Washington," and will cover such questions as priorities, materials, preference list, classification of employees in the draft, and the best methods of retaining essential men without interfering with the war program.

Other matters to be considered at this meeting are: "Taxes Levied Against Motor Trucks in the New Revenue Bill," "War Orders for Trucks," "Rural Motor Express," "Need for Uniform Laws," "Action on Plan to Standardize Truck Tires," "Work of Highways Transport," and "Increasing Need for Improved Highways to Increase Motor Truck Haulage."

### Range of Travel Governing Factor in Airplane Future

DETROIT, Sept. 21—Range of travel is the greatest problem which must be solved in determining the future of the airplane industry, according to C. F. Kettering, president of Delco and the S. A. E. President Kettering's address was given on the occasion of the first Detroit Section meeting for the year, held at the Hotel Pontchartrain last night.

The topic, "The Future of the Airplane Industry After the War," was of popular interest in this section, as shown by an attendance of 600 local S. A. E. members and their friends. Mr. Kettering largely repeated the address he gave before the Cleveland Section.

A committee was appointed to co-operate with the legislative body in Lansing to frame suitable laws covering headlight glare. This committee was appointed at the request of Governor Sleeper of Michigan, and consists of the following:

W. E. Metzger, president Detroit Automobile Club; Charles E. Godley, engineer of Edmunds & Jones; J. B. Replogle, engineer of the Remy Electric Laboratory; H. J. Platts, engineer of the C. M. Hall Lamp Co.; F. E. Watts, chief engineer of Hupp Motor Car Co.; and J. E. Schipper, chairman Detroit Section, S. A. E., ex-officio member.

### Russel on War Credits Board

WASHINGTON, Sept. 25—Albert W. Russel, formerly president of the Russel Motor Axle Co. and treasurer of the Russel Wheel & Foundry Co. of Detroit, has been appointed a member of the War Credits Board by the Acting Secretary of War, Benedict Crowell, to fill a vacancy caused by the resignation of F. P. Neal.

## Essential Truck Use Defined

### N. A. C. C. Issues List of Industries That May Purchase Vehicles

WASHINGTON, Sept. 23—A list of essential truck users has been compiled by the truck committee of the National Automobile Chamber of Commerce, to be used by makers, distributors and dealers as a guide in the sale of motor trucks.

The list has been approved by the War Industries Board. Motor trucks may be sold to any user included in the lists. They cannot be sold to anyone not engaged in the trades or industries listed without special permit from the War Industries Board.

Truck manufacturers have already filed their pledges to observe these regulations and have exacted similar pledges from their distributors and dealers. Consequently, hereafter the only necessary procedure in making truck sales is to make certain that the prospective buyer is one of the essentials as named by the lists. If his trade or industry is so named no further formality is necessary and the sale can be made. The industries and trades that are essential, besides those named in the War Board's preferential list, are:

Seeds  
Refrigeration.  
Bridge builders.  
Contractors, building, road, paving, sand, gravel, cement, bridge steel and garbage.  
Farm wagon manufacturers.  
Public haulage companies.  
Drayage concerns.  
Transfer companies.  
Casket makers.  
Cemeteries.  
Department stores.  
Elevator makers.  
Hardware manufacturers.  
Heating and ventilating concerns.  
Hotels.  
Hotel supply manufacturers.  
Linoleum manufacturers.  
Plumbers' supplies manufacturers.  
Stove manufacturers.  
Tent and awning manufacturers.  
Tire makers.  
Typewriter manufacturers.  
Warehouses.

### Foreign Missions Members Requested to Return Home

WASHINGTON, D. C., Sept. 26—Members of the foreign military missions, British, French and Italian, who are acting in an advisory capacity to the American army in this country, have been requested by the War Department to return to their own country as soon as convenient and not later than Nov. 1. Only those who are very necessary will be retained temporarily. This request which came in the form of an order from the War Department, created surprise and some feeling on the part of the foreign experts who were aiding our army on such matters as aviation, ordnance, motorized vehicles, etc. The various missions when landing in this country reported to their ambassadors and are surprised because they were not notified that their services were no longer required through the same source.

## To Develop New Oil Lands

Millions of Acres of Federal Territory May Be Available If Bill Passes

WASHINGTON, Sept. 20—There are 6,524,834 acres of land either known to contain oil and gas or believed to contain them, which would be valuable for exploration and development if Senate Bill 2812 is enacted, according to Van H. Manning, Director of Mines. Mr. Manning filed this statement together with other data with the Senate in answer to a resolution requesting his opinion if passing of this bill would alleviate the so-called gasoline shortage. This bill, as told in a previous issue of *AUTOMOTIVE INDUSTRIES*, will allow the Secretary of Interior to grant individuals the right to prospect for oil or gas on Government land.

Director Manning stated in his letter that the enactment of this law will allow for development of vast areas of land in this country, and undoubtedly result in the discovery and development of new oil fields and deposits, will permit the leasing of new land actually proved to contain valuable deposits of oil, permit the further development of existing claims in withdrawn areas which have on them one or more producing wells, and which are equipped with pipe lines and facilities for transportation of oil. He recommends the passing of the bill as highly desirable and believes it will prove an important war measure. Following is Director Manning's letter and that portion of Senate Bill No. 2812 relating directly to the oil and gas land developments:

Sir: In connection with resolution passed by the Senate asking whether the enactment of S. 2812 would help the oil situation, the following is submitted:

Prior to September 27, 1909, public lands in the United States and the Territory of Alaska were subject to exploration, location and purchase under the placer-mining laws of the United States (secs. 2329-2331, R. S., Acts of Feb. 11, 1897, 29 Stat., 536, and Feb. 12, 1903, 32 Stat., 825). Under these laws any citizen of the United States or person who had declared his intention to become such, could go upon the public lands and explore for oil, and upon discovery apply for and receive patent as prescribed in the mining laws. September 27, 1909, the President of the United States withdrew from exploration, location and entry large areas of public lands known or believed to contain valuable deposits of petroleum for the primary purpose of withholding same until Congress could consider legislation designed to secure the exploration for and development of deposits of oil and gas under a leasing law. Similar withdrawals had been made from time to time until at the present there are withdrawn from all exploration, location and entry 6,524,834 acres of land either known to contain oil and gas or believed to possess possibilities thereof. This acreage is not all public lands, as considerable areas within the exterior limits of withdrawals were patented under the various public-land laws prior to dates of withdrawal. There are also withdrawn 132,024 acres of land known to contain valuable deposits of oil shale. The withdrawals cover lands in the States of Arizona, California, Colorado, Louisiana, Montana, North Dakota, Utah and Wyoming. In addition all lands containing deposits of oil in the Territory of Alaska are likewise withdrawn.

Most of the lands so withdrawn are free

from claims and would, if S. 2812 or other legislation providing for their disposition were enacted into law, be subject to exploration and development in accordance with its provisions. A minor portion of the area, comprising valuable proved oil territory was, however, covered by locations made under the mining law prior to withdrawal and the claims so asserted have not been disposed of, but are pending in the Land Department or in the courts. Most of these claims have upon them one or more producing oil wells, but increased production through the drilling of additional wells is practically halted by the withdrawal. The so-called relief provisions of S. 2812 are designed to adjust these controversies and secure the development of the lands.

In my opinion the enactment of a law providing for the development of the oil lands of the United States would (1) open to exploration and development the vast areas of public land in the United States and Alaska now absolutely withdrawn from exploration and development, thereby resulting in the discovery and development of new oil fields and deposits, thus adding to the oil and gas supply of the United States and Alaska; (2) permit of the leasing of lands now withdrawn and actually proved to contain valuable deposits of oil and gas by the existing wells upon the lands or upon adjoining tracts; these fields are principally located in California, Wyoming, Montana and Louisiana; and (3) permit of the further development of existing claims within withdrawn areas which have upon them one or more producing oil wells. These areas are already equipped with pipe lines and facilities for developing and transporting oil, and many of the interested individuals and corporations have equipment in the way of casing and other supplies which could be immediately utilized in the drilling of additional wells.

The most immediate results would be obtained from the lands mentioned in the above items 2 and 3, namely, proved lands which have not been developed by oil wells and lands within withdrawals but which have within their limits one or more producing oil wells at the present time.

During the past few years I have made a number of reports and suggestions to the Public Land Committees of Congress with respect to legislation of the character involved, and bills have passed one of the bodies of Congress, but none has received concurrent approval. I do not feel that I should at this time specifically indorse any particular measure, and consequently this report is designed to explain briefly why I believe the enactment of legislation for the development of the oil resources of the public domain would materially aid in obtaining an increased fuel supply in the immediate future. It must be obvious to anyone familiar with the situation that the existing withdrawals and controversies prevent the bringing of the oil from underground and into use, and the conditions described in the report of the United States Fuel Administrator in his report to the Senate, dated Sept. 10, 1918, document 277, and in my report responding to Senate resolution 301, which gave in some detail the present situation with special reference to gasoline, emphasize the importance and desirability of the enactment of legislation which will, while properly preserving the public interest, stimulate and encourage the production of oil from our public lands.

I am of the opinion, therefore, that viewed from any angle the passage of a leasing bill is desirable, and conditions possibly will arise that will make it distinctly a war measure. Respectfully,

VAN H. MANNING, Director.

### Shipments to Denmark Allowed

WASHINGTON, Sept. 20—The War Trade Board has concluded an agreement with a special Danish mission, allowing for the following annual quantities of supplies (in metric tons) for shipments to Denmark. The following list contains only those commodities which are of interest to the automotive industries:

Kerosene, gasoline, lubricating oils, and greases, crude petroleum and dark refuges, including not over 7000 tons lubricating oils.....	80,000
Copper and manufactures of (including brass).....	3,500
Brass wire.....	34
Brass wire screens for paper making..	20
Brass screws.....	36
Iron and steel products, including shipbuilding material (shipbuilding material to be subject to special agreement).....	150,000
Electric lamps.....	70
Nickel and manufactures.....	14

## War Board Controls Pig Tin

Users and Dealers to Be Licensed and Inventories to Be Made

WASHINGTON, Sept. 20—Control of domestic pig tin under a license system has been assumed by the War Industries Board. All users and dealers in pig tin will be licensed and a complete inventory of stocks on hand and unfilled contracts will be made and, if necessary, supplies will be redistributed to equalize them, according to essential uses. Full details of the licensing plan will be announced later. More than 2000 questionnaires have been sent to individuals and plants asking for information as regards the stocks of pig tin on hand and the unfilled contracts.

This action by the War Industries Board was forecast when announcement was made by B. M. Baruch, chairman of the board, that an inter-Allied pig tin pool had been arranged in conferences held in London between the L. L. Summers Commission, representing the War Industries Board, and representatives of Great Britain and other Allied nations.

Under this pool, which is in the nature of a beneficent monopoly, the world's supply of pig tin is allocated and distribution is made among the Allied countries according to the supply and their needs. The United States will get about 80,000 tons of pig tin, or approximately two-thirds of the world production.

The War Industries Board will supervise the allowance to this country. All imports of pig tin, tin ores and concentrates will be consigned to the American Iron and Steel Institute, and will be distributed to the licensees through the United States Steel Products Company. Prices will be regulated by the War Industries Board, and will be uniform and at a level that will encourage production in the tin mining countries, which are chiefly Great Britain and the Straits Settlements.

Aluminum and manufactures.....	132
Lead and manufactures.....	3,000
Tin and tin plate. Quantity to be later agreed	
Zinc sheets.....	390
Zinc and manufactures.....	2,700
Silver and manufactures.....	14
In addition various instruments for technical, scientific and nautical purposes (if approved), motors, automobiles and parts (excluding tires), electrical machinery, bicycles and bicycle parts (excluding tires), typewriters, accounting machines, office equipment, supplies, sundry machinery and parts (if approved) hand tools of various kinds, hardware, in quantities in accordance with actual Danish requirements for home consumption.	
Crude rubber.....	130
Bicycles tires.....	100
Motor and motorcycle covers and tubes..	250

### Patent Granted to Chevrolet Men

FLINT, MICH., Sept. 21—A patent has been granted Arthur C. Mason and T. Sturt, assignors to the Chevrolet Motor Co., on an automobile engine.

## War Board Controls Ocean Shipments

### Will Issue Both Import Licenses and Import License Numbers

WASHINGTON, Sept. 19—Changes in import ruling governing the certification of invoices for shipments by the American consular officers have been made by the War Trade Board. American consular officers will certify no invoices for ocean shipments to be made on or after Oct. 1, 1918, to the United States except on receipt of official notification from the War Trade Board of the issuance of an import license and import license number. After Oct. 1 consular officers are not permitted to accept import license numbers furnished by shippers as heretofore.

The number of any such import license, together with all necessary information, will, at the request and cost of the applicant for import license, be cabled or mailed by the War Trade Board to the Consular Officer whose consular district is designated by the applicant as the district from which the shipment to the United States will be made.

New forms of application for import licenses will soon be available, which will contain a blank to be filled out by the applicant for the purpose of indicating whether the applicant desires official notification of the issuance of the import license and of the number thereof to be sent by cablegram or by mail. The applicant designates in such blank the appropriate American Consular Officer. If the applicant is not able to supply the information at the time of the filing of his application, he should do so as soon thereafter as possible, either before or after the issuance of the license. All requests for such official notification made after the filing of the application should be, whether mailed or telegraphed, addressed as follows:

"Bureau of Imports,  
War Trade Board,  
Washington, D. C."

Such request should refer to the application or license number and should designate the appropriate Consular officer.

Import licenses will continue to be issued valid for a period of 90 days, but, under the new regulations, import licenses issued on or after October 1, 1918, will be valid if ocean shipments thereunder are made within 90 days from the date of such license. It will no longer be necessary, as in the case of licenses issued prior to October 1, 1918, that entry into the United States be made within the 90 days. This change will be of benefit to shippers and importers, who, heretofore, in many cases, have found it difficult to prepare merchandise for shipment, arrange for freight space, and obtain entry into the United States within 90 days.

With respect to import licenses which are outstanding and unused on October 1, 1918, if the shipments covered by such licenses have not been consigned by that date and the ocean shipments thereunder will be made on or after October 1, 1918, it will be necessary that official instructions be cabled to the appropriate Consulate officer at once by the War Trade Board. That there may be no delay in such shipments, the holders of such outstanding licenses should immediately notify the War Trade Board that they desire the appropriate American Consular officers to be officially notified by the War Trade Board, either by cablegram or letter, of the issuance of such outstanding licenses and of their numbers.

The date of ocean shipment, for purposes of these regulations, will be the date of a through ocean bill of lading to the United States.

Inasmuch as Consular officers will be governed, when consulting invoices, by the dates of the licenses and the dates of the through ocean bills of lading, importers are cautioned to keep accurate record of the expiration of dates of licenses in order that they make certain that the through ocean bills of lading are issued to them within the 90-day period, or, in the event that such through ocean bills of lading are not issued within such period, that they may apply in due time for extensions or new licenses, thus

avoiding delays and possible loss. Applications for extensions of expired licenses and for reissuances may be filed and will be disposed of according to the circumstances of each case.

It will be possible, as heretofore, to make partial shipments against a license, provided such shipments are made during the life of the license. All such partial shipments will be governed by the same rules as those that govern complete shipments.

Invoices for shipments of commodities covered by general import licenses known as "PBF" licenses will continue to be certified by Consular officers under the general license numbers, without official instructions governing each individual shipment (except that shipments covered by a general license "PBF" No. 1 require no certified invoices).

Following is a list including a number of the outstanding general or "PBF" import licenses:

PBF No. 12. Covering the importation of all commodities of the origin or destination specified below which arrive at any port of the United States or which are conveyed in transit through the territory of the United States either in bond or otherwise, as follows:

(a) Commodities originating in Canada or Newfoundland and destined for any country in the world; or originating in Great Britain, France or Italy or any of their European or West Indian possessions and destined for Canada or Newfoundland.

(b) Commodities originating in Great Britain, France or Italy and destined for any West Indian colony, possession or protectorate of said countries, or originating in any of said West Indian colonies, possessions or protectorates and destined for Great Britain, France or Italy, except (c) below.

(c) Commodities originating in Canada or Mexico and destined for another point in the same country, passing through the United States en route, except (e) below.

(d) Commodities of whatever origin or destination not now or hereafter placed on the restricted list, except (e) below.

(e) Shipments under paragraphs (b), (c) and (d) are not to be included in the general license when such shipment would cross the United States from an Atlantic to a Pacific or Gulf port, or from a Pacific to an Atlantic or Gulf port, or from a Gulf to an Atlantic or Pacific port.

PBF No. 14. Covering the importation of iron ore from Sweden and Spain when coming as ballast in vessels returning from these countries.

PBF No. 18. Covering the importation when shipped from Yarmouth, Nova Scotia, to Boston, Massachusetts, by vessel approved by the War Trade Board, of all commodities the importation of which is permitted without individual license overland or by the Great Lakes from Canada.

PBF No. 25. Covering the importation of all commodities arriving at United States ports in bond in transit to Canada, provided the Canadian import license covering the shipments or proper proof of the issuance of such license is presented to the Collector of Customs. (This supersedes PBF-12 as to in bond transit shipments to Canada.)

### Platinum Used Extensively for War Purposes

WASHINGTON, Sept. 19—Congressional discussion about the use of platinum yesterday developed that it is one of the very important commodities used in the war. The Signal Corps uses 500 ounces yearly for telephone, telegraph and radio work. The greatest use of platinum however, is in the manufacture of explosives, in the production of trinitrotoluol, gun cotton, dynamite and picric acid, which latter in turn is made with the use of nitric acid. Nitric acid is manufactured with the aid of sulphuric acid. Sulphuric acid is manufactured through two processes: Contact process and chamber process. Contact process is most frequently used and this requires platinum. A plant producing 20 tons of sulphuric acid in a day will require 350 or 400 ounces of platinum yearly. It is estimated that when our synthetic nitrate plants are completed they will need 20,000 ounces of platinum yearly.

## Use of Highways Advocated

### Fuel Administration Endorses Intensive Employment of Roads

WASHINGTON, Sept. 20—The United States Fuel Administration has endorsed the most extensive and efficient use possible of the highways in a letter to the Highways Transport Committee emphasizing the importance of the committee's program in connection with movement of coal from wagon mines. This letter from Cyrus Garnsey, Jr., Assistant Fuel Administrator, stated:

"We are also convinced that transportation resources can be greatly increased and larger tonnage movement of coal from wagon mines direct to consumers effected by applying all possible vehicles, horses and the necessary labor in line with national policies promulgated by you, and operating over suitable highways constantly maintained in efficient condition.

"For this reason we ask that you convey to our field organization our very real interest in this part of their work and assure them we desire to support their organization to the limit in their efforts to effect greater tonnage movement of coal over the highways from wagon mines to consumer.

"We suggest also that whenever conditions of roads, local legislation, lack of suitable equipment, and so forth, tend to impede the most effective and efficient movements, you will promptly bring these matters to our attention.

"To expedite the handling of these questions the Fuel Administration has committed them to its Mine Track Committee, composed of Frank G. Jones, chairman; Robert L. Ireland and S. A. Taylor."

### McGraw Advances Some Prices

EAST PALESTINE, OHIO, Sept. 22—The McGraw Tire & Rubber Co. has made a slight advance in the prices of certain sizes of its tires. There has been no change in the dealers' discounts.

### Commodities on Export Conservation List

WASHINGTON, Sept. 21—The following commodities have been placed on the export conservation list and will hereafter require special licenses for exportation:

Metallic aluminum and all articles containing 10 per cent or more (in weight) of metallic aluminum (individual licenses not required to Canada and Newfoundland), bichloride of tin, lead, lead pipe, lead sheet, oxide of tin, radium ores, radium salts, radium luminous compounds, tin salts, sundry articles either made of tin plate or coated or dipped in tin, titanium alloys, titanium compounds, titanium ores, uranium alloys, uranium ores, uranium salts.



Graham W. Brogan has been appointed advertising manager of the Duesenberg Motors Corp., Elizabeth, N. J. He was formerly assistant to the general sales manager.

A. C. McKibbin has retired as secretary of the Missouri State Highway Board. He retains his position as a member of the State Highway Board.

Frank H. Ball, formerly engineer of the Penberthy Injector Co., Detroit, has been made manager of the carburetor department of that company.

C. L. Fox, for 3½ yr. assistant sales manager of the Saxon Motor Car Corp., Detroit, has received an appointment to the officers' training camp at Jacksonville, Fla. He will report for duty about Oct. 1.

H. S. Ketchum, formerly New England district sales manager for the Cleveland Tractor Co., has been appointed by the McCord Mfg. Co., Detroit, as district sales manager for the Heath-Duplex folding delivery body. He will cover territory extending from Texas in the southwest to Florida in the southeast, and North Carolina in the northeast to Oklahoma in the northwest.

Frank C. Kip, sales manager of the Motor List Co., Detroit, and at one time sales promotion manager of the Packard Motor Car Co., has entered into Government work. Mr. Kip has been appointed to the Industrial Service Division of the Bureau of Labor Statistics, Department of Labor.

Ralph J. Handy, former distributor of the Tonford truck attachments in Detroit, has been appointed sales manager of the Lutton Truck Co., Youngstown, Ohio.

J. L. Hibbard, for 5 yr. associated with the Studebaker Corp. in its sales department, in charge of foreign sales, has been appointed foreign sales manager of the Cleveland Tractor Co.

W. H. Miller, for a number of years assistant manager of the South Bend Studebaker Corporation, has resigned to accept the position of district representative for the Garford Motor Truck Co., with headquarters at Kansas City.

H. S. Ketcham has resigned as New England district sales manager for the Cleveland Tractor Company and becomes southeastern and southwestern district sales manager for the Heath Duplex division of the McCord Manufacturing Company, Inc., Detroit.

John E. Garland, who has been in charge of motor car production of the Harroun Motors Corp., Wayne, Mich., has resigned to become assistant superintendent of production in the Ordnance Division. His former position has been filled by the promotion of E. Menke, formerly general foreman of automobile assembly.

## Men of the Industry

### *Changes in Personnel and Position*

#### Ellis on War Board

DETROIT, Sept. 23—Guy W. Ellis, formerly sales manager of the Maxwell-Chalmers factory branch, has been appointed secretary of the Wayne County War Board. He is also captain of the 550th machine gun company of the Michigan State troops.

Bruce A. Ott has been appointed general factory manager in charge of all plants of the Maxwell Motor Co. at Dayton, Ohio. Joseph H. Cooper remains as factory superintendent of Plant No. 1; I. B. Swegles as superintendent of Plant No. 2; J. C. Peil as superintendent of Plant No. 3, and Perry Kreitzer as factory superintendent of plant No. 4.

S. W. Monroe has been appointed manager of the Detroit branch of the Harroun Motors Corp. He has served the Harroun organization as middle western sales representative since the inception of the company, prior to which he was a district executive for the Maxwell Motor Co.

J. H. Gould, formerly of the J. H. Gould Co., Detroit, has been appointed chief engineer of the Buffalo Pressed Steel Co.

Leander J. Hoover, president of the Hoover Steel Ball Co., Ann Arbor, Mich., is dead after an illness of a month. Among the concerns he organized and of which he was president are the King Trailer Co., the Evertight Nut Co., Detroit, and the Fords Products Corp. He also organized the Parker Mfg. Co., manufacturer of chucks and arbors, and was its vice-president. He was also interested in a large number of other smaller concerns.

George A. Robson, formerly assistant advertising manager of the Chalmers Motor Co., Detroit, is now connected with the service staff of the Detroit *Saturday Night Press*.

J. E. Grady, sales manager of the Studebaker Corp. of Canada, Ltd., and manager of the Detroit branch, has resigned to become associated with R. T. Hodgkins, vice-president and general manager of the Cleveland Tractor Co., Cleveland.

J. L. Hibbard has been appointed foreign sales manager for the Cleveland Tractor Co., Cleveland. For the past five years he has been in charge of foreign sales for the Studebaker Corp.

Charles G. Percival, Captain, Ordnance Department, and Post Ordnance Officer, is editor of "The Bomb," which is published at American Military Camp 704, A. E. F.

#### Phelps Joins Duesenberg

WAUKESHA, WIS., Sept. 23—Fredrick Phelps, Waukesha, Wis., has accepted the position of director of the procurement division of the Duesenberg Motors Co., Elizabeth, N. J., and assumed his new duties Sept. 15. Phelps is head of the Arcadian Spring Co., Waukesha, one of the largest mineral water concerns in the world, which has closed its plant temporarily because of conditions arising out of the war.

#### Harroun Directorate Re-elected

WAYNE, MICH., Sept. 23—At the annual meeting of the Harroun Motors Corp., held in Wilmington, Del., the entire directorate was re-elected, including the following: President, John Guy Monihan; vice-president, Ray Harroun; secretary-treasurer, Howard F. Lea; John J. Plath, R. Ward Macey, A. L. Harroun, L. E. Moses, F. W. Vollbrecht, George G. Worthley, L. H. Rogers and Paul Hale Bruske.

#### Motor Transport Corps Wants Men

WASHINGTON, Sept. 23—The Motor Transport Corps needs the services of at least 200 men qualified to act as instructors in its training schools. Men of mature age who are either lawyers or teachers are requested to apply. Applicants will be given intensive training for 2 months with opportunities to secure commissions. Men versed in mechanical lines are preferred, but this knowledge is not necessary.

The Corps will open 10 new schools in various army camps shortly which will require 5000 officers, 30,000 non-commissioned officers and 100,000 men, and in these schools the enlisted men will secure intensive special training to fit them for the motor transport work.

Men who feel they can meet the qualifications and who desire to join the Corps, should communicate with the Chief of the Motor Transport Corps, 7th and B streets, Washington, D. C. Minor physical defects will be overlooked in men qualified mentally.

#### Expect Rise in Canadian Prices

VANCOUVER, B. C., Sept. 20—An increase of at least 10 per cent in the price of automobiles can be looked for in a very short time, according to the heads of several local automobile concerns. More than one head office has notified its branches to this effect, and it is expected that the increase will affect all the popular makes of cars. Shortage of cars, consequent upon the restriction of the government on raw materials, the scarcity of labor and the bending of the efforts of many companies toward the filling of war contracts are given as the chief reasons for the increase.

**Kuenz Radiator Co. Incorporated**

DETROIT, Sept. 23—The Kuenz Radiator Co. has been incorporated with a capital stock of \$100,000, the manufacturing plant being located in Toledo. The incorporators and officers are: President, J. H. Armstrong, of Cutting, Armstrong & Smith, Detroit, manufacturers of automobile parts; vice-president, J. A. Kuenz; secretary, S. C. Cobin; assistant secretary and general manager, E. C. Shields; treasurer, Charles D. Cutting, also of Cutting, Armstrong & Smith. The company has received a contract for 1500 radiators for De Haviland airplanes, the cost of which approximates \$250,000. Work will begin on this order Oct. 1, and is to be completed in 2 months.

**Oakland Making Additions**

PONTIAC, Mich., Sept. 20—The Oakland Motor Car Co. is erecting two additions, one on each side of the main entrance of the plant. The enlargement is designed to supply more room for lockers for men and women, to provide more office space, and to make possible expansion of the hospital ward. There will also be a lunchroom added for the benefit of workers who carry their lunches. The new quarters will be ready for occupancy within the next 6 weeks, it is expected.

**Another Ford Plant Taken by Government**

DETROIT, Sept. 23—Arrangements have been completed for the taking over by the Government of the Cincinnati plant of the Ford Motor Co. The plant will be devoted exclusively to the production of war materials.

**To Make New Lens**

NEWARK, N. J., Sept. 21—Edward S. Schmidt and J. H. Knox, 238 Central Avenue, trading as the S. & K. Specialty Co., have purchased the manufacturing and selling rights for the International lens, which is an anti-glare device for headlamps. It consists of a galvanized iron wire mesh covered with a semi-transparent coating which is non-breakable, waterproof and fireproof. The lenses are fitted inside the ordinary plain glass and sell for 75 cents a pair in any size. The factory is located at Irvington, N. J.

**Kales Stamping Expanding**

DETROIT, Sept. 19—The Kales Stamping Co., manufacturer of pressed metal parts, is erecting a two-story addition to its factory building on Lafayette Boulevard. The new structure is 47 by 67 ft. and contains 6000 sq. ft. of floor space. It will be used for storage and handling of stock. The work is expected to be completed this month.

**Columbia to Make Trucks and Trailer Service Parts**

DETROIT, Sept. 21—Production of the initial order of 500 1-ton trucks given the Columbia Motors Co. recently by the

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

government will begin early in October and twenty-five are expected to be completed within the month. The company has also received an order for making all the service parts for the trailers it recently built for the government and also for those produced by other companies.

**To Market New Drive**

INDIANAPOLIS, Sept. 21—The Positive Drive, Inc., is a company incorporated to market or manufacture an automobile power transmission device invented by William H. Harris, 1226 Central Avenue. The company is capitalized at \$60,000, with incorporators named as William T. Rasmussen, Charles R. Yoke and Fred Davis. Other stockholders named in the incorporation papers are Dr. David L. Kahn and Leo Traugott. The device is one for the direct transmission of power to the wheels of automobiles whereby all wheels run at the same time with differential effect at corners and turns. The company may offer the invention on a royalty basis or decide later to manufacture it in Indianapolis.

**Dividends Declared**

The Michigan Drop Forge Co., Detroit, has declared its regular monthly dividend on common stock, payable Oct. 1 to stockholders of record Sept. 15.

The Willys-Overland Co., Toledo, has declared its regular quarterly dividend of 1½ per cent on preferred stock, payable Oct. 1 to stockholders of record Sept. 20.

The Chandler Motor Car Co., Cleveland, has declared its regular quarterly dividend of \$3 a share, payable Oct. 1 to stockholders of record Sept. 20.

The Hydraulic Pressed Steel Co., Cleveland, has declared the quarterly dividend of 1½ per cent on preferred stock and 2 per cent on common, payable Sept. 30 to stockholders of record Sept. 20.

The Standard Parts Co., Cleveland, has declared the regular quarterly dividend of 1½ per cent on preferred stock, payable Oct. 1. Books close Sept. 20.

The Cleveland Automatic Machine Co., Cleveland, has declared a 1½ per cent dividend on preferred stock, payable Oct. 1 to stockholders of record Sept. 20.

The Portage Rubber Co., Barberton, Ohio, has declared a quarterly dividend of 1½ per cent, payable Oct. 1 to stockholders of record Sept. 20.

The Goodyear Tire & Rubber Co., Akron, has declared the regular quarterly dividend of 1½ per cent on preferred stock, payable Oct. 1 to holders of record Sept. 20.

**Clutches Coming from Racine**

RACINE, WIS., Sept. 23—The Twin Disc Clutch Co. has been organized with an authorized capital stock of \$100,000 and is establishing a factory in the former plant of the Racine Auto Tire Co., at Fourteenth and Clark Streets, for the manufacture of clutches and other transmission devices and parts for motor vehicles and tractors. The incorporators include W. T. Shaughnessy, A. Francis, G. F. Garbutt, Julian Olds, J. A. Dietrich and Arthur B. Due, of the law firm of Quarles, Spence & Quarles, Milwaukee. The names of the actual stockholders in the new corporation are not divulged, but it is stated that several men associated with the Modine Mfg. Co., Racine, will have the actual control and management of the business.

**To Make Airplane Parts**

MILWAUKEE, WIS., Sept. 23—The Lochman-Mayhew High Speed Propeller Co. has been organized at Milwaukee to engage in the manufacture of aircraft and hydroplane parts. Articles of incorporation have been filed and give the capital stock as \$1,000, which is to be increased later. The principals in the new organization are Emil R. Lochman, owner of the Lochman Machine Co., and William H. Mayhew, first vice-president of the Mayhew company, cabinet and furniture manufacturer.

**Indicator Company Reorganizes**

GRAND RAPIDS, MICH., Sept. 20—The Auto Indicator Co. has been reorganized with a capitalization of \$50,000. The factory and salesrooms occupy the entire building at 209-217 Ottawa Avenue, northwest, formerly known as the Kent State Garage. The corporation is now manufacturing the Four-In-One Auto Indicator Safety Signal, a safety device for the rear of passenger cars or trucks to warn following cars of the driver's intentions.

The directors of the new corporation are: President, W. W. Huelster; vice-president, I. C. Cilley; secretary and treasurer, Joseph Renihan; general manager, V. I. Cilley; James Ritzema and Dr. E. O. Cilley.

**Addition for Detroit Twist Drill**

DETROIT, Sept. 21—The Detroit Twist Drill Co. has built an addition to its plant particularly to accommodate the increasing number of women employees. The new structure is 33 x 70 ft. with 6100 sq. ft. floor surface. The first floor will be used for steel storage and receiving room; the second floor for women's locker and lunch rooms and first aid room, and the third floor for the metallurgical laboratory, drafting room and women's instruction room. The building is of reinforced concrete.

**Delion Tire Increases Capital**

TRENTON, N. J., Sept. 21—The Delion Tire & Rubber Co. has increased its capital from \$700,000 to \$1,000,000.

## Coal Storage Limits Arranged

### Fuel Administration Schedules Storage Regulations for Essential Industries

WASHINGTON, Sept. 20—The United States Fuel Administration has arranged a schedule of coal storage for those industries which have been named essential and placed on the War Industries Board preference list. The regulations allow certain numbers of days of storage dependent upon the locality of the industry. There is also a set of regulations for consumers not on the preference list, allowing them a specific number of days storage.

The list is divided into 4 groups—each group comprising the same industries as named in the 4-group arrangement of the War Industries Board preferential list. The manufacturer, as for example a tractor maker, in group 3, with his factory in lower Michigan, will, according to the list, be allowed 60 days coal storage. A tractor maker in Maine will be allowed 105 days storage.

There is no restriction on the stocks of screenings which may be accumulated by either preferential or non-preferential consumers in Ohio, or lower Michigan, and there is no restriction on the stocks of Indiana, Illinois or western coal which consumers may obtain.

Following is the list showing the number of days of coal storage allowed various essential and non-essential industries, this list conforming strictly with the War Industries Board statement of preferential industries:

#### GROUP 1.

Maine, 135 days.  
Massachusetts, Vermont, New Hampshire, Northern New York, 105 days.  
Connecticut, Rhode Island, Southwestern New York, 90 days.  
Southeastern New York and New Jersey, 60 days.  
Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, Florida and Western Ohio, 45 days.  
Western Pennsylvania, West Virginia, Eastern Kentucky, Eastern Ohio, 35 days.  
Lower Michigan, 90 days.

#### CONSUMERS IN GROUP 2.

Maine, 120 days.  
Massachusetts, Vermont, New Hampshire, Northern New York, 90 days.  
Connecticut, Rhode Island, Southwestern New York, 75 days.  
Southeastern New York and New Jersey, 50 days.  
Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, Florida, Western Ohio, 40 days.  
Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 30 days.  
Lower Michigan, 75 days.

#### CONSUMERS IN GROUP 3.

Maine, 103 days.  
Massachusetts, Vermont, New Hampshire, Northern New York, 75 days.  
Connecticut, Rhode Island, Southwestern New York, 60 days.  
Southeastern New York and New Jersey, 40 days.  
Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, Florida, Western Ohio, 35 days.  
Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 25 days.  
Lower Michigan, 60 days.

#### CONSUMERS IN GROUP 4.

Maine, 90 days.  
Massachusetts, Vermont, New Hampshire and Northern New York, 60 days.

Connecticut, Rhode Island and Southwestern New York, 45 days.  
Southeastern New York and New Jersey, 30 days.  
Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, Florida and Western Ohio, 30 days.  
Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 20 days.  
Lower Michigan, 45 days.

#### CONSUMERS NOT ON THE PREFERENCE LIST ARE LIMITED TO THE FOLLOWING STOCKS:

Maine, 45 days.  
Massachusetts, Vermont, New Hampshire and Northern New York, 30 days.  
Connecticut, Rhode Island, Southwestern New York, 20 days.  
Southeastern New York and New Jersey, 20 days.  
Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, Florida and Western Ohio, 15 days.  
Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 15 days.

#### 7579 Fordsons Sold by One Distributer in 22 Days

DEARBORN, MICH., Sept. 20—E. M. Vanderslice of Tulsa, Okla., distributor of Fordsons, has made a record in the distribution of tractors. He received his appointment as Fordson distributor July 3 and on July 25, only 22 days later, he had booked orders and signed contracts for 7579 tractors. This represents orders valued at \$5,500,000. Vanderslice recently visited the factory with a view of urging the company to immediately ship as many tractors as could be had for present distribution. A carload of 300 was started south last week. Because of the protracted drought throughout the south plowing for fall wheat had been impossible until now. This stimulated the demand for farming equipment and caused the Oklahoma State Council of Defense to send Henry Ford & Son a telegram urging the company to start a shipment to this territory as soon as possible. Another urgent call was received from Texas and a carload of 500 was dispatched.

#### Iron Ore Producers Granted Price Increase

WASHINGTON, Sept. 20—Iron ore producers were granted a slight increase in prices for the quarter beginning Oct. 1 by the price fixing committee of the War Industries Board last night after an all-day conference with representatives of the American Iron and Steel Institute. The extent of the increase was not announced. Decision as to new prices on pig iron was postponed until to-day.

The present price of iron ore is \$5.50 a ton, lower lake ports; pig iron \$32 a ton and foundry iron \$33. Steel prices average about 3¼ cents a pound.

#### 800,000 Tons of Steel Saved by Ford Action

DETROIT, Sept. 20—The suspension of passenger car manufacture at the Ford Motor Co. alone will effect a saving of 800,000 tons of high grade steel for the government. Had production at the plant continued to the limits allowed by the government for the remainder of the calendar year a total of 123,000 cars would have been produced during the last 6 months and each car would have required 1300 lb. of steel.

## Standard Contracts for War Work

### These Are Designed to Speed Up Production and Guard Against Fraud

WASHINGTON, Sept. 21—Standardized contracts will be used by the War Department hereafter, in so far as is possible, in making purchases. Clauses have been standardized and will be used in every form of contract. They are designed to speed up production, guard against fraud, protect labor interests and assure both the Government and the contractors against legal complications. All previous forms of contracts have been examined and used for compiling the new standardized ones.

To speed up settlements of disputes arising between the Government and the contractor regarding the adjustment of claims which might delay production during the settlement and further to make unnecessary the filing of lawsuits in the Court of Claims, a clause provides the means for the immediate adjustment of all such differences. In the event of the arising of any claims, doubts, or disputes as to the performance or non-performance of the contract which cannot be settled by mutual agreement, the question is placed before the Secretary of War or his duly authorized representative or representatives for adjustment. In the event that the matter is placed before a board, a majority decision of the latter shall be final but permission to appeal directly to the Secretary of War within a limited time is allowed.

The Government retains the right to terminate any contract in the public interest, and if it finds that the need for any contracted supplies no longer exists it can terminate the contract within a specified time. Definite provision is made for the payment of existing stocks and raw materials on hand for the completion of the contract and provision is made for the adjustment of all obligations assumed by the contractor for fulfilling this agreement. Arrangements are also made for the disposal of special facilities provided for the execution of the contract.

Three clauses are devoted to labor. One provides that in the cases specified by law the wages of laborers, operatives and mechanics doing any part of the work contemplated by the contract, in the employ of the contractor, shall be computed upon a basic day rate of eight hours' work, with overtime rates to be paid for not less than time and one-half time for all time in excess of eight hours.

In the event that labor disputes should arise directly affecting the performance of the contract or delaying its execution, the contractor may appeal to the Secretary of War for adjustment of the difficulty. The contractor is obligated to comply with such adjustment as may be made by the Secretary. If such a settlement involves an increase of wages, thereby placing a burden on the contractor, he will be compensated for the extra outlay. Likewise, in the event of a reduction of labor cost, the amount involved will be deducted from the cost in favor of the Government.

Contractors are obliged to comply with existing state laws and are also obligated not to employ in War Department contracts any minor under the age of 14 years or permit any minor between the ages of 14 and 16 years to work more than eight hours in any one day, more than six days in any one week, or before 6 a. m. or after 7 p. m. The employment of convict labor is prohibited, except in the event of an executive order and then only under the terms of such an order.

On cost-plus contracts provision is made for a rigid inspection of costs and the Government retains at all times the right to make checks and audits on materials and prices as well as setting up machinery of inspection to insure full value received. The accounting books of the contractor are always to be open to the Government's officers. The decision of the Accounting Officer in regard to proper costs shall prevail. The right to appeal directly to the Secretary of War is given to the contractor. The con-



tractor must comply with the ruling that in all cost-plus contracts proposed expenditures for labor and materials shall be approved in advance.

In this connection the War Department will follow its policy that wherever possible fixed price contracts shall be used, but where it is to the advantage of the Government to use a cost-plus contract, a cost-plus fixed compensation contract will be used. All such contracts are subject to review by the Superior Board of Contract Review of the General Staff. The covenant against contingent fees as prescribed by executive direction will be incorporated in the new contracts. In this the contractor expressly warrants that he has not employed a third person to solicit or obtain the contract in his behalf and that he has paid no fee to secure it.

Contractors are obliged to provide protection to their plants against espionage, fire, explosion, acts of war, and acts of enemy aliens. The contractor shall, when required, report to the Government the citizenship, country of birth or alien status of any or all of his employees. The Government retains the right to prevent the employment of suspected persons or to demand their discharge from the employment of the contractor.

If at any time the Government is able to provide materials to the contractor, the latter is obliged to accept them, if he has not already made commitments, arrangements being made for satisfactory compensation.

The various supply bureaus of the Army are now preparing to adopt the new contract form.

#### Washington-New York Air Mail Is 100 Per Cent Efficient

WASHINGTON, Sept. 21—The aerial mail service to Washington, Philadelphia and New York has scored 100 per cent daily thus far for September, despite the rainy weather period. The worst day was Sept. 18, when the airplanes left Washington and New York in the midst of storms. The machine leaving Washington had to be started in the hangar, and the landing gear of the plane sank into the mud up to the hubs before making the take-off from the ground. Notwithstanding this weather the trip from Washington to New York was made in 3 hr. and 5 min. The entire journey was made through rain and storm and landings in rain were effected in Philadelphia and New York.

Aviator Max Miller left New York on Sept. 19 for Clarion, Pa., to chart a more favorable route across the mountains in Pennsylvania than is found on the air line from Belmont to Cleveland. He will return from Clarion to-morrow.

#### U. S. Rubber to Issue Notes

NEW YORK, Sept. 22—The United States Rubber Co. probably will issue \$6,000,000 of 5-year 7 per cent notes. It is understood that the company has applied to the Capital Issues Committee for permission to make the issue. The new notes would be used in connection with the refunding of the \$9,000,000 General Rubber Co. debentures due Dec. 1.

#### On Export Conservation List

WASHINGTON, Sept. 23—The following commodities have been placed on the Export Conservation list, effective Sept. 24, 1918, and will hereafter require permits for exportation: Cadmium alloys, cadmium compounds, cotton airplane duck, ferrozirconium, zirconium alloys, zirconium compounds, zirconium metal, zirconium ores or concentrates.

## Better Bearings for Farm Equipment

### Experiments Being Made with Anti-Friction Bearings on Power Farm Equipment

CHICAGO, Sept. 20—Power farm operative equipment fitted with anti-friction bearings will be on the market next year if experiments now under way are completed in time. The new machinery will include both tillage and harvesting equipment. At various implement factories experiments are under way looking toward the early production of plows, cultivators, mowers, binders, threshing machines and other equipment, all with anti-friction bearings in place of the rough or babbitted bearings with which farm equipment of the past has been fitted.

Development in this direction has been made necessary by the demand for heavier and sturdier machines for use behind tractors. Experience has shown conclusively that farm operative equipment of the horse-drawn types will not stand up under tractor farming conditions. The greater speed of the tractor, and the greater concentration of power, together with the strains of continuous work, racked horse-drawn machinery to pieces and made the rapid depreciation on such machines a fact of great economic importance to the farmer.

Most pieces of farm operative equipment are kept for an entire year only to be used for a few days. When needed it is all important that they be in good working condition and that they be able to meet the demands which will be made upon them. With equipment of the old design there has been a loss of time amounting sometimes to as much as 25 per cent for oiling and otherwise preparing the machines for service. Also it developed that where machines, with the crude bearings which have been the rule, were used with tractors, frictional resistance increased tremendously and the machines soon became useless.

While the substitution of roller bearings for the old style bearings will increase the cost of the machines to the farmer to some extent, this will be far more than offset by the saving effected in time and in lengthening the life of the machines. An authority on this subject says that by the substitution of anti-friction bearings for the old style babbitted bearings in a threshing machine, for instance, there will be a saving of 10 hp. on the power required to operate it and a saving of at least four hours per day in oiling and attention. Of course, it is impossible at this time to say to what extent the life of machines will be extended, but it must be obvious that it will be considerable.

#### Mexican Oil Exports

TAMPICO, MEXICO, Sept. 21—Complete figures of the oil exportations through the ports of Tampico and Tuxpam for the month of August are now

available. The Penn-Mex Fuel Company's shipments did not come up to earlier estimates by about 200,000 barrels, but the total shipments of all the companies through the two ports exceeded the 5,000,000 barrel mark by 36,140 barrels. The exports were as follows:

Huasteca Petroleum Company, 1,563,759; Aguila (Eagle) Oil Company, 709,772; Penn-Mex Fuel Company, 448,724; Freeport Oil and Transportation Company, 448,771; Island Oil Company, 246,300; National Petroleum Company, 56,014; Mexican Gulf Petroleum Company, 258,099; the Texas Company, 177,868; East Coast Oil Company, 331,750; Cortez Oil Company, 309,500; Standard Oil Company, 485,584.

#### The Pfalz Single-Seater Fighter

(Continued from page 550)

flanges is by gluing only, no tacks or screws being employed. The spar is afterward covered for its entire length by fabric, to prevent moisture from attacking the internal glued joints and to reduce the risk of splitting. The fabric is not wrapped around the spar spirally but is laid on straight, finishing off along one corner of the spar. As in most machines, the spars are not placed with their vertical faces at right angles to the chord line but at right angles to the line of flight.

Reference has already been made to the struts connecting the body with the top plane, and to the fact that these struts are pivoted as shown in an accompanying illustration. A circular base plate is bolted to the body formers where these are crossed by the upper body rails. The base plate has welded to it a cup or socket into which fits a spherical male portion secured to a sheet steel shoe surrounding the lower end of the body struts. A taper pin passing through socket and ball secures the strut in place. The slot through the ball is of elliptical section to allow a certain amount of play for alignment.

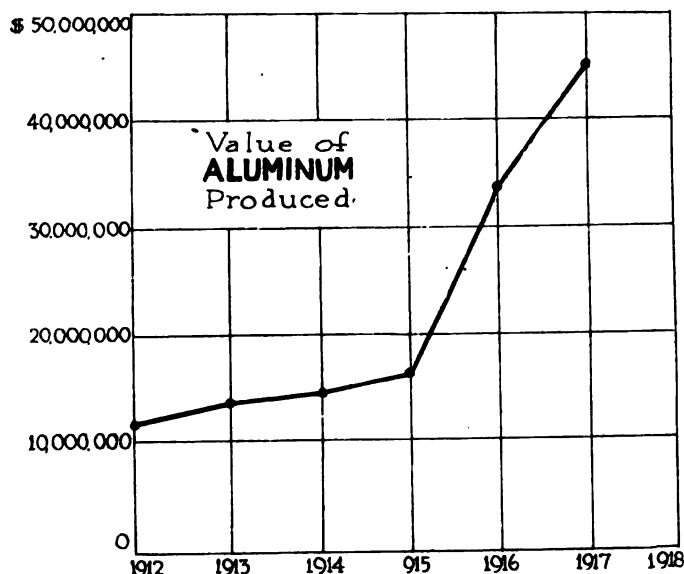
Another sketch shows how the lower spars are attached to the wing roots formed integrally with the body. The fixed spar inside the body is rounded off at its outer end to a circular section. A steel cap surrounds the end of the spar root, to which it is secured, as far as we have been able to ascertain, by a single pin. This cap is surrounded by a collar incorporating a fork for the attachment of the lift cable, and terminates at its outer end in a steel piece shaped like an eyebolt. The inner end of the wing spar is also surrounded by a sleeve, this, however, being secured by two bolts, the inner of which is an eyebolt that serves as an anchorage for the internal drift wiring. The wing spar sleeve carries at its inner end the female portion of the joint, a forked end, which engages with the eyebolt of the fixed spar, the two being held together by a quick-release pin as shown. The ribs have been omitted in the larger drawing for the sake of clearness, but they are indicated in the smaller inset.

(To be concluded)

## AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>		<b>Copper:</b>	
Muriatic, lb. ....	.02-.03	Elec., lb. ....	.26
Phosphoric .....	.35-.39	Lake, lb. ....	.26
Sulphuric (60), lb. ....	.009		
<b>Aluminum:</b>		<b>Fabric, Tire (17½ oz.):</b>	
Ingot, lb. ....	.33	Sea ls., combed, lb.1.65-1.70	
Sheets (18 gage or		Egypt, combed, lb.1.25-1.35	
more), lb. ....	.40	Egypt, carded, lb.1.20-1.30	
Antimony, lb. ....	.13%- .137%	Peelers, combed, lb.1.05-1.20	
<b>Burlap:</b>		Peelers, carded, lb. .95-1.05	
8 oz., yd. ....	.17½-.17½	<b>Fibre (¼ in. sheet</b>	
10½ oz., yd. ....	.22 .22½	base), lb. ....	.50



The annual value of aluminum produced in the United States has increased largely during the past two years. The price is now officially fixed at 33 cents per lb.

<b>Graphite:</b>		<b>Brown, crepe, thin,</b>	
Ceylon, lb. ....	.07½-.25	clear, lb. ....	.60
Madagascar, lb. ....	.10 -.15	Smoked, ribbed	
Mexican, lb. ....	.03%	sheets, lb. ....	.59 -.61½
<b>Lead, lb. ....</b>	.08 -.09	<b>Para:</b>	
<b>Leather:</b>		Up River, fine, lb. .68	
Hides, lb. ....	.18 -.35½	Up River, coarse,	
Nickel, lb. ....	.40 -.43	lb. ....	.40
<b>Oil:</b>		Island, fine, lb. ....	.59
Gasoline:		Island, coarse, lb. .27	
Auto., gal. ....	.24½	Shellac (orange), gal. .74	-.76
68 to 70 gal. ....	.30½	<b>Spelter</b> .....	.09½-.09¾
<b>Lard:</b>		<b>Steel:</b>	
Prime City, gal. .230		Angle beams and	
Ex. No. 1 gal. ....	1.60	channels, lb. ....	.03
Linseed, gal. ....	1.90	Automobile sheet	
Menhaden (Brown)		(see sp. table).	
gal. ....	1.30-1.31	Cold rolled, lb. ....	.06½
Petroleum (crude),		Hot rolled, lb. ....	.03½
Kansas, bbl. ....	2.25	<b>Tin</b> .....	.80
Pennsylvania, bbl. 4.00		<b>Tungsten, lb. ....</b>	2.45-2.50
<b>Rubber:</b>		<b>Waste (cotton), lb. ....</b>	.12½-.17
Ceylon:			
First latex pale			
crepe, lb. ....	.61 -.63		

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping .....	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping .....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
Black Sheet Extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
Ajax Rubber Co. ....	57	60½	-3½
J. I. Case T. M. Co., pfd. ....	81½	90	+½
Chalmers Motor Co., com. ....	4	5½	..
Chalmers Motor Co., pfd. ....	20	30	..
Chandler Motor Car Co. ....	84	85	-2½
Chevrolet Motor Co. ....	117	122	+2
Fisher Body Corp., com. ....	35¾	36	-¼
Fisher Body Corp., pfd. ....	84	87½	..
Fisk Rubber Co., com. ....	60	62	..
Fisk Rubber Co., 1st pfd. ....	97	103	..
Firestone Tire & Rubber Co., com. ....	104½	106½	-½
Firestone Tire & Rubber Co., pfd. ....	94	96	..
General Motors Co., com. ....	116	117	+1¼
General Motors Co., pfd. ....	77½	78½	-½
B. F. Goodrich Co., com. ....	45	46	-1½
B. F. Goodrich Co., pfd. ....	99½	101	..
Goodyear Tire & Rubber Co., com. ....	152	155	..
Goodyear Tire & Rubber Co., 1st pfd. ....	99½	100½	..
Grant Motor Car Corp. ....	2¼	3	-¼
Hupp Motor Car Corp., com. ....	3	3¾	..
Hupp Motor Car Corp., pfd. ....	78	82	..
International Motor Co., com. ....	34	37	+2
International Motor Co., 1st pfd. ....	62	66	..
International Motor Co., 2nd pfd. ....	36	41	..
Kelly-Springfield Tire Co., com. ....	46¾	47½	-1½
Kelly-Springfield Tire Co., 1st pfd. ....	79	87	..
Lee Rubber & Tire Corp. ....	18½	20	-1½
Maxwell Motor Co., Inc., com. ....	25½	26¾	-¼
Maxwell Motor Co., Inc., 1st pfd. ....	57	57¾	+½
Maxwell Motor Co., Inc., 2nd pfd. ....	20½	21½	+½
Miller Rubber Co., com. ....	106	108	..
Miller Rubber Co., pfd. ....	95	96	..
Packard Motor Car Co., com. ....	117	123	-3
Packard Motor Car Co., pfd. ....	90	93	..
Paige-Detroit Motor Car Co., com. ....	15	17	-½
Peerless Truck & Motor Corp. ....	13	17	-1
Portage Rubber Co. ....	105	109	..
Reo Motor Car Co. ....	14¾	15¼	..
*Saxon Motor Car Corp. ....	5	7	..

	Bid	Asked	Net Ch'ge
Standard Motor Construction Co. ....	12½	13½	..
Standard Parts .....	..	62	..
*Stewart-Warner Speed, Corp. ....	58½	60½	+2
*Studebaker Corp., com. ....	45¾	46¾	-½
*Studebaker Corp., pfd. ....	85	90	..
Swinehart Tire & Rubber Co. ....	50	60	..
United Motors Corp. ....	28½	28¾	+¾
*U. S. Rubber Co., com. ....	60	61	..
*U. S. Rubber Co., pfd. ....	102¾	104	-¾
*White Motor Co. ....	43½	45½	-1¼
*Willis-Overland Co., com. ....	19¾	20¾	+½
*Willis-Overland Co., pfd. ....	81	83	..

\*At close Sept. 21. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE  
ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co. ....	..	7	..
Bower Roller Bearing Co. ....	17½	..	..
Chevrolet Motor Co. ....	116	122	+1
Continental Motor Co., com. ....	5½	..	+½
Continental Motor Co., pfd. ....	..	..	..
Edmund & Jones, com. ....	..	17	..
Edmund & Jones, pfd. ....	..	90	..
Ford Motor Co. of Canada. ....	148	150½	-2
Hall Lamp Co. ....	..	14	..
Michigan Stamping Co. ....	..	..	..
Packard Motor Car Co., com. ....	116	120	..
Packard Motor Car Co., pfd. ....	90	92½	..
Paige-Detroit Motor Car Co. ....	15¾	17	..
Prudden Wheel Co. ....	10¾	10¾	..
Reo Motor Car Co. ....	14¾	15	..

## INACTIVE STOCKS

Atlas Drop Forge Co. ....	..	25	..
Kelsey Wheel Co. ....	25	..	..

## Control of Moline to Overland

### Plow Company to Be Operated as Separate Concern—To Build Tractors in Toledo

TOLEDO, Sept. 25—The Willys-Overland Co. has obtained control of 51 per cent of the stock of the Moline Plow Co., Moline, Ill., which manufactures the Moline-Universal tractor and an extensive line of other farm implements. It is the plan of the Willys-Overland company to retain the Moline company practically intact except that Vice-President and General Manager Frank G. Allen will become president and general manager.

The Moline company will be operated as a separate organization, and according to John N. Willys no merger is contemplated, nor will there be any change in the financial status of the Moline company.

It is planned eventually to concentrate all manufacture of tractors at Toledo, and to this end the production of tractor engines will be commenced there at once. Steps are now being taken to transfer some of the machinery and manufacture of engines will be begun soon on a large scale. Within a year the entire tractor will be built in the Toledo shops, with the Moline and other shops to be devoted to the production of agricultural implements. The Moline company has eight plants, located in Moline, Chicago, Rock Island, Freeport, Poughkeepsie, Stoughton, Wis., and Minneapolis.

The Moline company was established in business in 1865 and incorporated as the Moline Plow Co. in 1870. In 1906 the Mandt Wagon Co., Stoughton, Wis., and the Henny Buggy Co., Freeport, Ill., were acquired. In 1909 the Monitor Drill Co., Minneapolis, was taken over, and in 1911 the Acme Steel Co., Chicago, and in 1912 the Adriance-Platt Co., Poughkeepsie. In the spring of 1916 the company commenced production of passenger cars, using one of the new factories at Freeport. In the fall of 1915 the business, good will and patents of the Universal Tractor Co. were acquired and a factory erected in Rock Island for their production.

The Moline company is capitalized at \$21,000,000 common, \$7,500,000 7 per cent cumulative first preferred and \$1,500,000 non-cumulative second preferred. Late in August an issue of \$6,000,000 serial notes was placed on the market.

At the time of the sale of these notes it was stated that the company's sales for the 11 months ending July 31, 1918, totalled \$17,315,036, as compared with \$13,140,450 for the preceding 12 months. At no time in its history has the Moline company been physically able to supply the demand for tractors. At the present time the production is running 54 a day and the company is 4800 machines in order.

It is likely that the selling forces of

the Overland and Moline companies will be combined. The Moline company has 22 branch houses and 30,000 dealers. The Overland company has more than 100 distributors and 8000 dealers.

The acquisition of the Moline company places the Overland company in a position where it is able to supply its representatives not only with passenger cars and motor trucks, but with tractors and also with airplanes. The latter includes the control of substantial interests in the Curtiss Aeroplane & Motor Corp., Buffalo, thus making the automotive field complete in so far as Overland is concerned.

### Truck Curtailment Protest (Continued from page 554)

war essentials, and that their production for such purposes must be facilitated; and further that in so far as motor trucks are employed in civilian industries for essential uses they constitute an important transportation medium, and any curtailment of such uses should be avoided as far as practicable."

As was shown in meetings previous to the issuance of this circular, more than 80 per cent of the truck consumers in this country are engaged in what can be called direct or indirect war work, or essential civilian industries. Consequently, the raising of this question of the essentialness of the motor truck by the War Industries Board at this time seems unreasonable to the truck makers. They declare that the essentialness of the truck has been proved and accepted by the War Industries Board.

### Glover Heads Motor Division (Continued from page 554)

The district offices organization includes the Chicago office, under Major M. B. Edgerton; Cleveland, under Captain D. S. Devore; New York, under Major E. L. Jacob, and Detroit, under Major G. D. Wilcox.

### Fair Success Follows Chicago Show

CHICAGO, Sept. 23—A fair degree of success from a standpoint of accessory business, a failure from a standpoint of general attendance and from truck and tractor business, is the only conclusion that can be reached regarding the Second Annual National Truck, Tractor and Accessory Exposition, which closed Saturday night after a run of a week at the Municipal Pier. A large proportion of the accessory exhibitors expressed themselves as being quite satisfied with the business results obtained. Many of them found a better business than they anticipated.

This seeming paradox of good business for many of the accessory dealers and a discouragingly small attendance comes about through the fact that the show was staged expressly for jobbers and dealers and set at a time when the jobbers and dealers are closing up their accessory lines for the coming season. Inasmuch as it appealed to the trade, the fact that there were not many people there who were solely sight-seers, from whom nothing could be expected more than a few retail orders, the lack of a crowd made it possible for those who came there direct for business to make their inspection of the different lines and conduct their negotiations without the jam of people with which we are accustomed to find the aisles crowded at the national shows.

## Tax Plan Unchanged by Congress

### Some Knots Regarding Tax on Used Cars Untangled—Each Buyer Must Pay Impost

WASHINGTON, Sept. 19—There has been no change in the proposed tax on passenger cars, trucks and gasoline in the new revenue bill, although there has been considerable discussion on the part of the House regarding the tax.

Some suggestions have been received by congressmen in favor of a yearly tax on the use of passenger cars based on their value instead of on the horsepower and suggesting the use of the used car lists used by the Chicago Automobile Trade Association as the basis of taxation. In discussion of the tax Congressman Treadway explained that the yearly tax will not apply to an automobile owned by an individual and left in the garage unused during the entire year, because the bill specifies that the tax will be collected on the use of automobiles.

Congressman Ellsworth stated that a number of dealers in used cars complained that under the horsepower tax plan a \$200 machine will pay the same tax as a \$5,000 one. Congressman Kitchin explained that while the machine is in the hands of the dealers for repairs, equipment or resale it is not subject to the tax, but as soon as it is purchased by an individual for his use and is used he will have to pay the license tax and not the sales tax. It was also explained that if automobiles changed hands four or five times in the course of the year each new user would have to pay the yearly license tax.

### New Directors for Standard Aircraft

ELIZABETH, N. J., Sept. 25—Joseph A. Bower, vice-president of the Liberty National Bank of New York, and Henry J. Fuller, vice-president of the Fairbanks-Morse Co., have been elected directors of the Standard Aircraft Corp. and the Standard Aero Corp. of New York.

The one truck exhibitor who sold a truck at the show said the sale was the result of a lead he had gotten outside and that the prospect came in at his telephoned request, although the opportunity of showing the truck at the Pier to the prospect permitted him to close the deal.

Foote Bros., exhibiting a planetary transmission for tractors, were the only people in the truck and tractor business that found the show worth while. They said the show gave them an opportunity to get some good factory prospects that they might not have gotten otherwise.

Opinions among the accessory exhibitors are divided. Those who exhibited with general publicity as one of the principal reasons were sadly disappointed, because the public was not on hand



## Bureau of Aircraft Purchases

WASHINGTON, Sept. 20—Following is a list of purchases contracted for by the Bureau of Aircraft Production:

Aug. 22, 1918

Dayton-Wright Airplane Corporation, Dayton, Ohio, spares for planes.  
Tennessee Valley Iron & Railroad Co., Collinswood, Tenn., wood.  
Frank P. Jones, 807 Liberty Building, Philadelphia, Pa., lumber.  
Standard Aircraft Corporation, Elizabeth, N. J., lumber.  
William Whitman & Co. (Inc.), 25 Madison Avenue, New York City, balloon cloth.  
The Lawton Mills Corporation, care of E. N. Morris, P. O. Box 1057, 86-88 Worth Street, New York City, balloon cloth.  
Wellington Sears & Co., 66 Worth Street, New York City, N. Y., balloon cloth.  
Wellington Sears & Co., 66 Worth Street, New York City, N. Y., balloon cloth.  
Coventry Co., Anthony, R. I., balloon cloth.  
West Woodworking Co., 308 North Ada Street, Chicago, Ill., propellers.  
Standard Aircraft Corporation, Elizabeth, N. J., airplane.  
Splitdorf Electrical Co., 98 Warren Street, Newark, N. J., magneto parts.

Aug. 24, 1918

Dayton Wright Airplane Co., Dayton, Ohio, spares for planes.  
Gray Tractor Co., (Inc.), Minneapolis, Minn., spare parts for tractors.  
F. S. Webster Co., 332-342 Congress Street, Boston, Mass., typewriter ribbon cloth.  
A. H. Wells & Co., Waterbury, Conn., copper tubing.  
Cyclemotor Corporation, Rochester, N. Y., engine spares.  
Howell & Lesser, San Francisco, Cal., airplanes.  
U. S. Aircraft Corporation, Red Wood City, Cal., airplanes.  
Livingston Radiator & Manufacturing Co., New York, N. Y., radiators.  
Union Switch & Signal Co., Swissvale, Pa., engines and spares.  
Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., reimbursement erecting and equipping building at Buffalo.

Aug. 26, 1918

Whittaker-Glessner Co., Portsmouth, Ohio, steel drums.  
Liberty Iron Works, Sacramento, Cal., airplanes.  
Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., spares for planes.  
American Propeller Co., Baltimore, Md., propellers.  
The Marlin-Rockwell Corporation, New York, N. Y., radiators for planes.  
Splitdorf Electrical Co., Newark, N. J., engine spares.  
Jones Metrola (Inc.), 29-31-33 West Thirty-fifth Street, New York City, N. Y., tachometers.  
Burke & James (Inc.), 240-258 East Ontario Street, Chicago, Ill., camera turret suspensions.

Aug. 27, 1918

Oxygen Gas Co., Kansas City, Mo., hydrogen gas.  
Wellington Sears & Co., 66 Worth Street, New York City, N. Y., finished balloon cloth.  
Wellington Sears & Co., 66 Worth Street, New York City, N. Y., balloon cloth.  
Wellington Sears & Co., 66 Worth Street, New York City, N. Y., balloon cloth.

## Contracts

Aug. 28, 1918

Wright-Martin Aircraft Corporation, New Brunswick, N. J., engine spares.  
Russell & Cowles, 99 Johns Street, New York, N. Y., motor boat.  
Field Mfg. Co., Owosso, Mich., crating machine shop truck bodies.  
Willard Storage Battery Co., Cleveland, Ohio, batteries.  
Electric Storage Battery Co., 1823-33 L Street, N.W., Washington, D. C., batteries.  
Sperry Gyroscope Co., Brooklyn, N. Y., air compasses.

Aug. 29, 1918

The Wood Mosaic Co., New Albany, Ind., lumber.  
Amos Lumber Co., Edinburg, Ind., lumber.  
Park Drop Forge Co., Cleveland, Ohio, crankshaft forgings.  
Livingston Radiator & Mfg. Co., Seventy-fifth Street and Amsterdam Avenue, New York, N. Y., radiators.  
Union Switch & Signal Co., Swissvale, Pa., engines.  
Standard Gauge Steel Co., Beaver Falls, Pa., connecting rods.

Aug. 30, 1918

Breese Veneer Co., Keneva, W. Va., lumber.  
John A. Roebbling's Sons Co., Trenton, N. J., balloon cable.  
American Steel & Wire Co., 30 Church Street, New York, N. Y., balloon cable.  
Union Switch & Signal Co., Swissvale, Pa., services and material in repairing engines.  
Niagara Motors Corporation, Dunkirk, N. Y., engine spares.  
Ford Motor Co., Detroit, Mich., cylinders.

Aug. 31, 1918

The Burd High Compression Ring Co., Rockford, Ill., engine spares.  
Trumpbour-Whitehead Brass & Copper Co. (Inc.), Canal, Mercer and Howard Streets, New York, N. Y., copper radiator tubes.  
Eastman Kodak Co., Rochester, N. Y., drum-developing machine.

Sept. 3, 1918

The Wright-Martin Aircraft Corporation, New Brunswick, N. J., camshafts.  
Wright-Martin Aircraft Corporation, New Brunswick, N. J., engine spares.  
Cincinnati Milling Machine Co., Cincinnati, Ohio, milling machine and attachment.  
The Steel-Alderfer Co., Cuyahoga Falls, Ohio, lumber.  
Burd High Compression Ring Co., Rockford, Ill., piston rings.  
Burd High Compression Ring Co., Rockford, Ill., piston rings.  
Burd High Compression Ring Co., Rockford, Ill., piston rings.  
The Hess-Bright Mfg. Co., Philadelphia, Pa., engine spares.

## Quartermaster Purchases

WASHINGTON, Sept. 20—Following is a list of contracts placed by the Quartermaster Department:

Aug. 24, 1918.

Chicago Flexible Shaft Co., Chicago, Ill., spare parts.  
Haverford Cycle Co., Philadelphia, Pa., bicycles.  
Kniffin & Demarest Co., New York City, lantern globes.  
Emerson - Brantingham Implement Co., Rockford, Ill., tractors.

## Navy Supply Bureau Contracts

WASHINGTON, Sept. 20—Following is a list of contracts placed by the Bureau of Supplies and Accounts of the Navy:

Aug. 23, 1918

Goodyear Tire & Rubber Co., Akron, Ohio, dynamite gas valves.

Aug. 24, 1918

Goodyear Tire & Rubber Co., Akron, Ohio, training students.

Aug. 30, 1918

J. B. Swomball Co. (Ltd.), Chatham, New Brunswick, aeroplane spruce.  
O'Brien (Ltd.), Nelson, New Brunswick, aeroplane spruce.  
Geo. Birchill & Sons, South Nelson, New Brunswick, aeroplane spruce.  
J. B. Ritchie Co., New Castle, New Brunswick, aeroplane spruce.  
Shires Lumber Co., Campbellton, New Brunswick, aeroplane spruce.  
Fraser Lumber Co., Edmeston, New Brunswick, aeroplane spruce.  
Richards Lumber Co., Campbellton, New Brunswick, aeroplane spruce.  
Wm. Rutherford & Son, Montreal, Quebec, aeroplane spruce.  
Geo. B. Goodfellow, Montreal, Quebec, aeroplane spruce.  
Colonial Lumber Co., Pembroke, Quebec, aeroplane spruce.  
P. Q. Lumber Co., care of Geo. B. Scott, 705 Sears Bldg. (Dalhousie, New Brunswick), Boston, Mass., aeroplane spruce.  
United States Light & Heat Corp., Niagara Falls, N. Y., batteries.

## Army Engineer Depot Places Contracts

WASHINGTON, Sept. 18—The following contracts were placed by the General Engineer Depot of the Army:

Aug. 23, 1918

International Harvester Corp., Chicago, Ill., tractors.  
Ford Motor Co., Detroit, Mich., parts for searchlight carriages.  
Adams & Westlake Co., Chicago, Ill., switch lamps.

## Hart-Parr Brake Tests

CHASE CITY, IOWA, Sept. 21—The Hart-Parr 30 tractor at the Salina National Demonstrations in the brake horsepower test on the prony brake carried a load of 31.13 brake horsepower for 30 min. The engine speed during this official trial averaged 731.8 r.p.m. This test was made with the thermometer at 109 deg. Fahr. in the shade.

## Calendar

## ENGINEERING

Nov. 14-15 New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

## ASSOCIATIONS

Oct. 7-12—Milwaukee. American Foundrymen's Assn. and 5 allied organizations. Milwaukee Auditorium.

## SHOWS

Sept. 23-28—Boise, Ida. Tractor demonstration (State Fair). J. C. Wooley, Moscow, Ida.

Oct. 1-5 — Washington, Ga. (Wilkes Co.). Tractor demonstrations, State Fair.

Oct. 12-19 — Atlanta. Tractor demonstrations Eastern State Fair and Automobile Exhibition.

Oct. 14-27—Dallas, Tex., Seventh Annual Texas Automobile Show. Texas State Fair.

Sept. 17-20 — Riverhead, L. I. Tractor demonstration (County Fair). Harry Lee, Secy.

Sept. 30-Oct. 4—Trenton, N. J. Tractor demonstration (Trenton Fair). Harry B. Salter, Supt.

Oct. 16-18—Ottawa, Ont., International Plowing Match. Tractor and Farm Machinery Demonstration. Experimental Farm.

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration. State Fair.

Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.

## RACING

Oct. 5 — Cincinnati. Cincinnati Speedway.



# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

Vol. XXXIX  
Number 14

PUBLISHED WEEKLY AT 239 WEST 39th STREET  
NEW YORK, OCTOBER 3, 1918

Fifteen cents a copy  
Three dollars a year

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UNIV. OF MICH.

Engineering  
Library

## Hudson Dealers Are Ready for the Future

*"We have no other intention than to operate our service and parts station to give Hudson owners the best possible attention."*

Thus writes one Hudson dealer in response to the Hudson 100% war-work announcement. His answer is typical of practically all the rest.

They show a determination to "carry on," realizing that to preserve their identity and their connection with Hudson will be their greatest asset for the future after the war is won.

They know that the Super-Six has already undergone endurance tests which for severity cannot be

surpassed even if the war is prolonged far beyond present prospects.

Their confidence is complete that when peace comes again and more automobiles can be made, the 57,000 Super-Sixes now in service will have added irresistible evidence of super-quality to the prestige and good - will that Hudson has already earned.

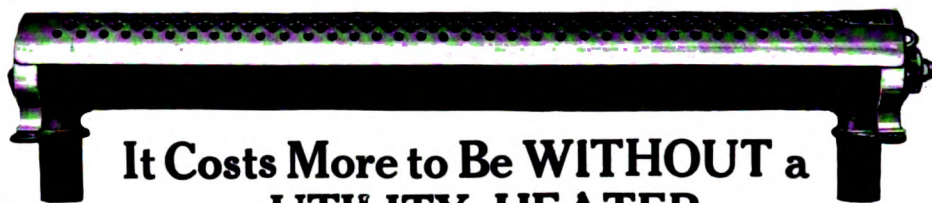
In this certainty of Hudson Super-Six performance is their assurance of permanence and progress after the war.

HUDSON MOTOR CAR CO.

DETROIT, MICH.







## It Costs More to Be WITHOUT a UTILITY HEATER



Cold feet—cold all over—cold in the head—continuous, nagging discomfort—bad temper—lowered efficiency. These are a few things a cold passenger car or truck costs.

*Truck Manufacturers:* Utility Heaters are humane. Think of the man who drives the truck winter in and out. Make the Utility standard or at least optional equipment. Write us.

### A Model For Every Car

Utility Protected Heater for all enclosed 5 or 7 passenger cars. Price \$20.00.

Utility Front Seat Heater for roadsters, driving compartments of large cars and trucks. Price \$12.50.

Utility, Jr., Protected Heater for Fords and other small cars. Price \$9.00.

Utility De Luxe Protected Heater for 8-cylinder cars. Price \$25.00.

Handled by good dealers everywhere.  
Dealers: Stock from your jobber. Get your share of heater business this next six months.

## HILL PUMP VALVE CO.

*Mfrs. of UTILITY Products*

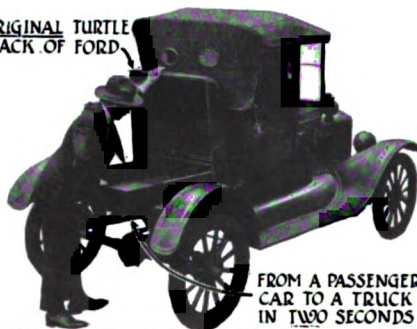
Archer Ave. and Canal St., Chicago

Sales Department

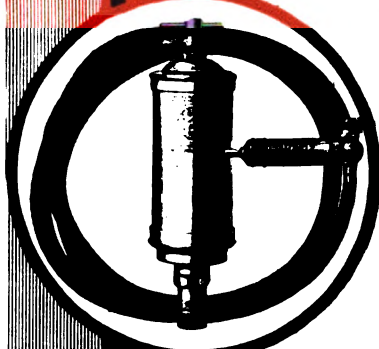
THE ZINKE CO., 1323 S. Michigan Ave., Chicago

UTILITY DISAPPEARING TRUCK BODY  
FOR FORDS. PRICE \$38.50.

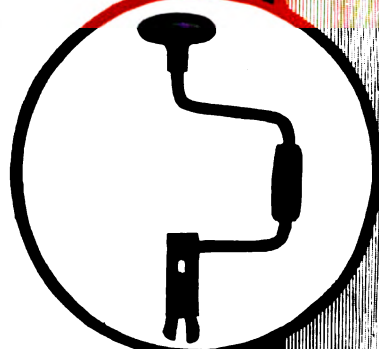
ORIGINAL TURTLE  
BACK OF FORD



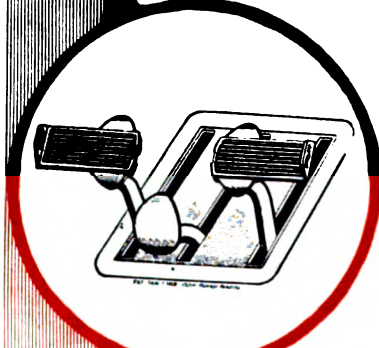
FROM A PASSENGER  
CAR TO A TRUCK  
IN TWO SECONDS



UTILITY PUMPS  
for All Cars  
\$12.00.  
For Fords \$7.50



UTILITY RIM  
Wrench for All Cars  
\$1.35



UTILITY PEDALS  
for Fords \$1.25



UTILITY  
UNIVERSAL  
Wrench for All Cars  
\$3.50

# UTILITY

## Automotive Products



# AUTOMOTIVE INDUSTRIES

## THE AUTOMOBILE

VOL. XXXIX

NEW YORK, THURSDAY, OCTOBER 3, 1918—CHICAGO

No. 14

## Aircraft Board Purposely Created Without Power

Its Sole Function Was Advisory, Not Executive—Its Great  
Mission Was to Make the Army and Navy  
Co-operate in Aviation

By David Beecroft

**N**EW YORK, Oct. 1—In the interim between the aircraft report of the subcommittee of the Senate Military Affairs Committee and the Hughes report, which is expected in a few weeks, it might be well to clear up a few misconceptions generally held regarding the aircraft organization as it existed up until this spring when Howard E. Coffin resigned and John F. Ryan was appointed to take his place.

The Aircraft Board from its inception was entirely an advisory organization rather than an executive one. It never possessed any executive power such as needed in placing a contract for Liberty engines or deHaviland 4 planes, but exercised only advisory power relating to such, the executive power for placing of orders or making decisions resting with the Army or Navy.

### Clearing House for Army and Navy

In the act creating the Aircraft Board, Oct. 1, 1917, it was very specifically stated that the board was to be purely advisory. It was always a clearing house for the Army and Navy. The inception of the board was to get the Army and Navy to play ball together if the phrase may be used, and the board has proven successful in this regard.

The Army and Navy were both apparently very zealous of their power and authority and this power

and authority were carefully protected in the act of Oct. 1, 1917, creating the Aircraft Board, for it specifies "that the board is hereby empowered under the direction and control of, and as authorized by, the Secretary of War and the Secretary of the Navy respectively, on behalf of the Department of War and Navy, to supervise and direct, in accordance with the requirements prescribed or approved by the respective departments, the purchase, production and manufacture of aircraft engines, etc. Provided, that the board *may* make recommendations as to contracts and their distribution in connection with the foregoing, *but every contract shall be made by the already constituted authorities and the respective departments.*"

### Limits Prescribed by the Board

This clearly shows the limits prescribed for the Aircraft Board. It is very specific that all contracts must be made by the Army and Navy which are the "already constituted authorities of the respective departments."

The act of Oct. 1, 1917, went further and very specifically placed not only limits on the power of the Aircraft Board but saw to it that the Aircraft Board would not have any opportunity to build up an organization that would in any wise take power from the army and navy. The act stated that there

## Text of the Act Creating An Aircraft Board

(Public—No. 48—65th Congress.)

(S. 2705.)

An Act to create the Aircraft Board and provide for its maintenance.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That for the purpose of expanding and co-ordinating the industrial activities relating to aircraft, or parts of aircraft, produced for any purpose in the United States, and to facilitate generally the development of air service, a board is hereby created to be known as the Aircraft Board, hereinafter referred to as the board.

Sec. 2. That the board shall number not more than nine in all, and shall include a civilian chairman, the Chief Signal Officer of the Army, and two other officers of the Army, to be appointed by the Secretary of War; the Chief Constructor of the Navy and two other officers of the Navy, to be appointed by the Secretary of the Navy; and two additional civilian members. The chairman and civilian members shall be appointed by the President, by and with the advice and consent of the Senate.

Sec. 3. That said board and tenure of office of the members thereof shall continue during the pleasure of the President, but not longer than six months after the present war. The civilian members of the board shall serve without compensation.

Sec. 4. That the board is hereby empowered, under the direction and control of and as authorized by the Secretary of War and the Secretary of the Navy respectively, on behalf of the Departments of War and Navy, to supervise and direct, **IN ACCORDANCE WITH THE REQUIREMENTS PRESCRIBED OR APPROVED BY THE RESPECTIVE DEPARTMENTS**, the purchase, production and manufacture of aircraft, engines, and all ordnance and instruments used in connection therewith, and accessories and materials therefor, including the purchase, lease, acquisition or construction of plants for the manufacture of air-

craft, engines and accessories: **Provided**, That the board may make recommendations as to contracts and their distribution in connection with the foregoing, but every contract shall be made by the already constituted authorities of the respective departments.

Sec. 5. That the board is also empowered to employ, either in the District of Columbia or elsewhere, such clerks and other employees as may be necessary to the conduct of its business, including such technical experts and advisers as may be found necessary, and to fix their salaries. Such salaries shall conform to those usually paid by the Government for similar service: **Provided**, That by unanimous approval of the board higher compensation may be paid to technical experts and advisers. The board may rent suitable offices in the District of Columbia or elsewhere, purchase necessary office equipment and supplies, including scientific publications and printing, and may incur necessary administrative and contingent expenses, and for all of the expenses enumerated in this paragraph there shall be allotted by the Chief Signal Officer of the Army for the fiscal year nineteen hundred and seventeen and nineteen hundred and eighteen the sum of \$100,000, or so much thereof as may be necessary, from any appropriation now existing for or hereinafter made to the Signal Corps of the Army, and such appropriation is hereby made available for these purposes: **Provided further**, That except upon the joint and concurrent approval of the Secretary of War and the Secretary of the Navy there shall not be established or maintained under the board any office or organization duplicating or replacing, in whole or in part, any office or organization now existing that can be properly established or maintained by appropriations made for or available for the military or naval services. **Provided further**, That a report shall be made to Congress on the first day of each regular session of the salaries paid from this appropriation to clerks and employees by grades, and the number in each such grade.

Approved, Oct. 1, 1917.

should be no organization of the Aircraft Board that would duplicate a single existing organization of either the Army or the Navy.

Here is how the act expressed it: "Provided further: that except upon the joint and concurrent approval of the Secretary of War and the Secretary of the Navy, there shall not be established or maintained under the board any office or organization duplicating or replacing, in whole or in part, any office or organization now existing that can be properly established or maintained by appropriations made for or available for the military or naval services."

This expressly forbade the board either to establish or maintain any office that would duplicate a single activity of either the Army or Navy.

But the act of Oct. 1, 1917, put a further restriction on the Aircraft Board and made it very certain that its powers would never be more than advisory.

It appropriated only \$100,000 for the Aircraft Board so that the Board had no funds to buy airplanes, develop airplane engines, engage aircraft engineers, erect testing laboratories or build experimental stations for aircraft development. There was only \$100,000 for the board.

Note the act of Oct. 1, 1917, on this financial aspect:

"The board is empowered to employ, either in the District of Columbia or elsewhere, such clerks and other employees as may be necessary to conduct the business, including such technical experts and advisers as may be found necessary, and to fix their salaries. Such salaries shall conform to those usually paid by the Government for similar service. **Provided**, that by unanimous approval of the Board higher compensation may be paid to technical experts and advisers. The board may rent suitable offices, purchase necessary office equipment and sup-

plies, including scientific publications and printing, and may incur necessary administrative and contingent expenses, and for all of the expenses enumerated there shall be . . . allotted \$100,000 for the fiscal year of 1918."

This clause of the act put the final possibility of any large or elaborate Aircraft Board organization entirely out of being. It was never intended that there should be such and there never has been such. The Aircraft Board was to be purely advisory and it has always remained so.

#### What Was Its Mission?

If the Aircraft Board was not to have any executive power, why was it created? What was its special mission? What was it designed for? As already stated, its leading mission was to get the Army and Navy to play ball together on matters relating to aviation. Here is how this was accomplished:

All technical decisions regarding aircraft matters in 1917 and 1918 were made by the joint Army and Navy technical committee composed of three representatives from the Army and three from the Navy. These six representatives were all regular Army and Navy men and no civilians were included.

Making technical decisions was the work of this joint technical committee, and no type of airplane was ever brought into production that was not approved by this joint technical committee. The programs for engines, planes and other activities were brought before the Aircraft Board by representatives of the Army and Navy after having been approved by the joint committee of the Army and Navy. When these programs were laid before the board it gave or withheld its approval as it saw fit.

The Aircraft Board had to deal entirely with this joint committee on all matters relating to aircraft design, engines, selection of types, etc. There seemed no possibility of getting the aviation departments of the Army and Navy to work together except through some civilian organization as the Aircraft Board. Such a situation was not confined to America.

#### England, Too, Had Trouble

From the beginning of the war England had troubles between her army and navy on matters relating to aviation. In England the formation of the Air Service, putting all aircraft activities under one head, brought this to an end. In America the

civilian Aircraft Board accomplished the desired end. The Army and Navy really played ball so far as aviation was concerned. The Aircraft Board was a success.

The Aircraft Board, although created by act, Oct. 1, 1917, was never given half an opportunity to show what it could do. Its three civilian members were not all appointed until late in February, so that although the board accomplished its mission it did so under a severe handicap.

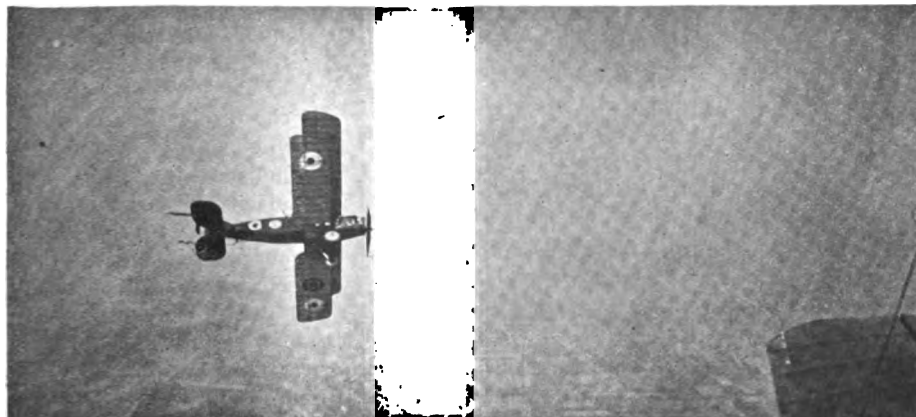
Howard E. Coffin was not appointed chairman for some time and the two other civilian members were not appointed for months; in fact, it was February before the final appointment was made. Undoubtedly politics was largely responsible for the delay as numerous good names were offered but none of them was accepted. In the meantime, other names were brought up and one or another dropped without the Aircraft Board being even consulted.

Previous to the creation of the Aircraft Board on Oct. 1, 1917, the Aircraft Production Board had existed as a committee of the Council of National Defense, and as such possessed only advisory powers. The board was then largely civilian in its make-up and consisted of \$1 per year men. During this time Coffin was assisted by E. A. Deeds, S. D. Waldon and R. L. Montgomery.

It was in August, 1917, or near that time, when Deeds, Waldon and the others, except Coffin, went into the Signal Corps and as representatives of such had executive power which they did not have as members of the Aircraft Production Board. Some of these men filled dual capacities. At one hour of the day they were working as members of the Aircraft Production Board in a purely advisory capacity and the next hour may have been placing contracts and exercising other executive powers as a representative of the Signal Corps. They could not do such as a member of the board.

This may have been the reason why the Aircraft Production Board and later the Aircraft Board were blamed for a hundred things that they had no right to be blamed for. The acts were not committed by members of the Aircraft Board but by members of the Signal Corps.

In times of investigation and dispute we should give the devil his due and so the board must not be loaded with abuses over which it had no authority or control.



#### A British Airplane

*forming one of a squadron operating on the Western Front, shown sharply banked in order to make a rapid turn. The photo was taken from the machine of which one aileron is visible in the foreground on the right*



# Analysis of Automobile Merchandising in New Zealand

## PART I

### Advent of American Car in 1915 and 1916 Created' New Mode of Business—American Car Now Dominant— Service the Important Factor

### WOOL INDUSTRY AFFORDS GOOD TRUCK POSSIBILITIES —FOREIGN TRADE DEPARTMENT

By G. A. Worrall\*

**W**ELLINGTON, N. Z., Aug. 1—The war established the American motor car industry in New Zealand. It was the volumes of money that started to flow into the country in the latter half of 1915 and the first half of 1916 from the sale of wool for war purposes that started the stimulation that has continued almost up to to-day, at which time the American automobile is dominant in New Zealand. Approximately every nine out of ten automobiles met in the two islands are American cars.

In New Zealand as in America everything now dates from the war, that eventful August day in 1914. Events happened either before the war or since it started. The American car came after the war, and its entry was due to two factors: First, it was in 1914 and 1915 that production of the American car rose to unprecedented figures. The American production for 1914 was 573,114 automobiles. For 1915 it was 892,618; for 1916 it was 1,617,708, and for 1917 it was 1,938,778.

The second factor was the entry of European countries into the war. England dominated the New Zealand market in pre-war days. France had a slight foothold and Germany had a very small following. The American car was a very limited factor in New Zealand motoring previous to the war, Ford being the pioneer.

\*Mr. Worrall spent 11 months in New Zealand as special representative of the foreign department of the White Co. He traveled on both islands and studied conditions for automobiles and trucks.

To-day the American automobile is the only make being sold in New Zealand, in fact only American cars have sold since 1914, when the war automatically withdrew the European nations.

The coming of the American automobile to New Zealand in 1915 started what has become a veritable upheaval in the distribution and maintenance of automobiles. A new group of dealers has sprung up. This group is fashioned very largely after the American pattern of dealer. He is an exclusive dealer who sells one, two or perhaps three makes of American automobiles and also handles motor trucks, accessories and soon will be selling farm tractors and unit lighting outfits.

Simultaneously with the upgrowth of this new pattern of importer or distributor there has sprung up in New Zealand a complete new line of salesrooms for the trade. The modern automobile salesroom is seen in Wellington, Auckland, Christ Church, Dunedin and other cities

here, just as it is seen in Richmond, Va., in Ithaca, N. Y., or in Hutchinson, Kan. In some cities ten or eleven of these new salesrooms have been built since 1915. In smaller places five or six of such places have sprung up.

The development of the exclusive automobile and truck dealer housed in his new place of business brought with it a new chapter in service in New Zealand. Previous to the war, automobile service as you know it in America scarcely existed in New Zealand. - -



*Typical wool and dairy farmers of New Zealand. This group make up the board of directors of a dairy in Taranaki. They are in the truck market*

Very few if any of the dealers or importers carried an adequate supply of spare parts, so that very frequently automobiles were laid up for a month or two waiting for spares to arrive from England, France or Italy.

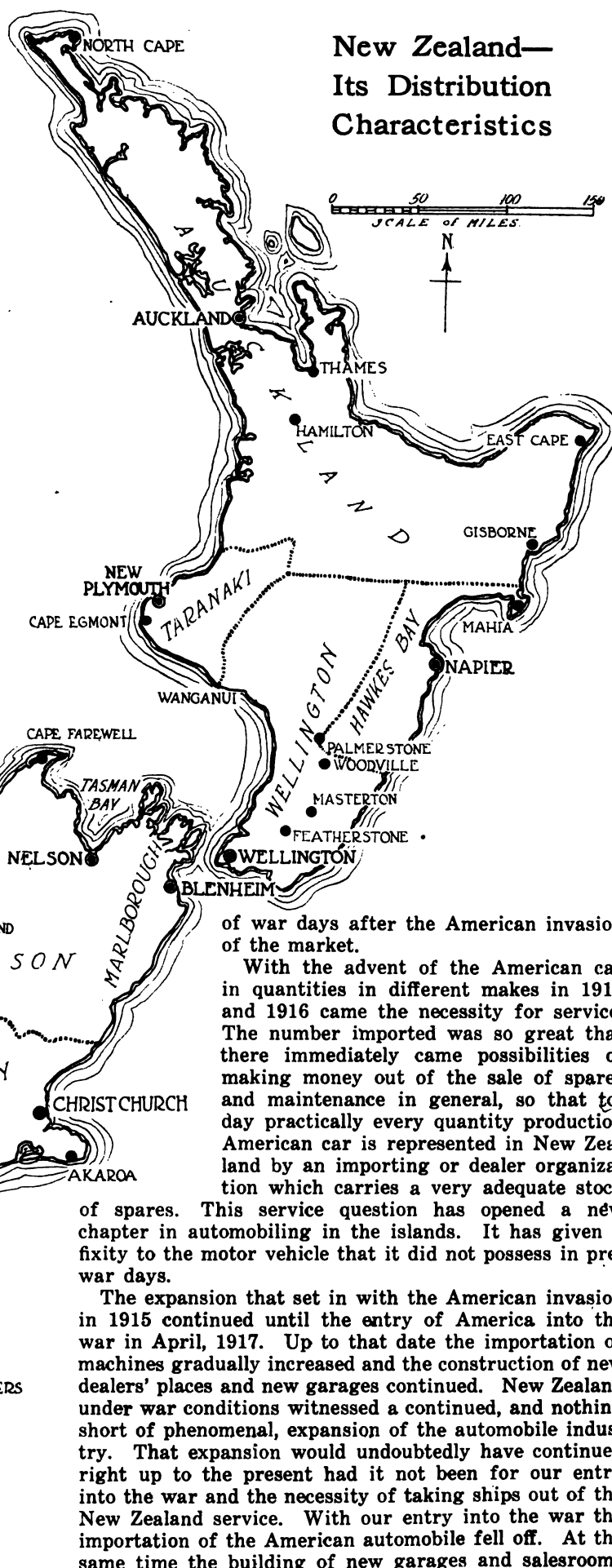
The New Zealand importer did not busy himself as he should have on this service problem, and it was equally remarkable that the European manufacturer did not insist on service as is being done today. The reason rested on two conditions:

One—The European maker had sold so few cars in the two islands that make up New Zealand that the necessity of adequate service had not existed.

Two—The automobile dealer was literally not a dealer but just an importer. He imported perhaps a hundred different lines of merchandise, and one of these was the automobile. He had no more right to be called an automobile importer than he had to be called a drug importer or a boot and shoe importer or an importer of merchandise of any character.

This importer got his 2.5 per cent commission on the automobile and passed it on to some agent who sold it. This importer or middle man was one of the worst enemies to the automobile industry in New Zealand. He did not take enough specific interest in the automobile to give it that attention which it merited. The importer got his commission out of the transaction and cared no more for the future welfare of the car than he cared for a stick of shaving soap. He failed to recognize that keeping the car in good running condition was a bigger factor than making the original sale. Naturally to such an importer the thought of service was almost foreign. He did not care to invest and tie up money in a stock of spares, and he was not sufficiently interested to demand that the dealers he sold to should stock up. As a matter of fact, the service end failed to exist and as a direct consequence the sale of cars in pre-war days was never on a scale with that

## New Zealand— Its Distribution Characteristics



of war days after the American invasion of the market.

With the advent of the American car in quantities in different makes in 1915 and 1916 came the necessity for service. The number imported was so great that there immediately came possibilities of making money out of the sale of spares and maintenance in general, so that today practically every quantity production American car is represented in New Zealand by an importing or dealer organization which carries a very adequate stock

of spares. This service question has opened a new chapter in automobiling in the islands. It has given a fixity to the motor vehicle that it did not possess in pre-war days.

The expansion that set in with the American invasion in 1915 continued until the entry of America into the war in April, 1917. Up to that date the importation of machines gradually increased and the construction of new dealers' places and new garages continued. New Zealand under war conditions witnessed a continued, and nothing short of phenomenal, expansion of the automobile industry. That expansion would undoubtedly have continued right up to the present had it not been for our entry into the war and the necessity of taking ships out of the New Zealand service. With our entry into the war the importation of the American automobile fell off. At the same time the building of new garages and salesrooms



## New Types of New Zealand Salesrooms Due To American Car Influence



*Salesroom of the Dominion Motor Vehicle Co. in Wellington. Chevrolet agents*



*Mangus-Sanderson, Ltd., handle Dodge cars and U. S. tires in this building in Wellington*



*The garage entrance of the Dominion Motor Vehicle Co. in Wellington*



*The Nattrass & Harris Motor Co., Ltd., entered the business in Wellington 2 years ago and now has a branch in Napier*



*The Colonial Motor Co., Ltd., is Ford agent for all New Zealand. The company assembles all cars here and will soon have a large assembling plant at Auckland*



*This is the establishment of the Buick sub-agent in Palmerstone on the North Island*



*A. Hatrick & Co., Ltd., of Wellington handle Overlands, Garford trucks and Hupmobiles*



## Typical New Zealand Roads and Truck Work in Wool Industry



*A 3-ton truck with a four long ton (2240 lb.) load 30 miles out of Wellington*



*Typical country carrier on a farm one mile off the main highway. This is a sheep station*



*A stretch of the 250-mile road from Wellington to Napier on the North Island. This part is between Wellington and Palmerstone*



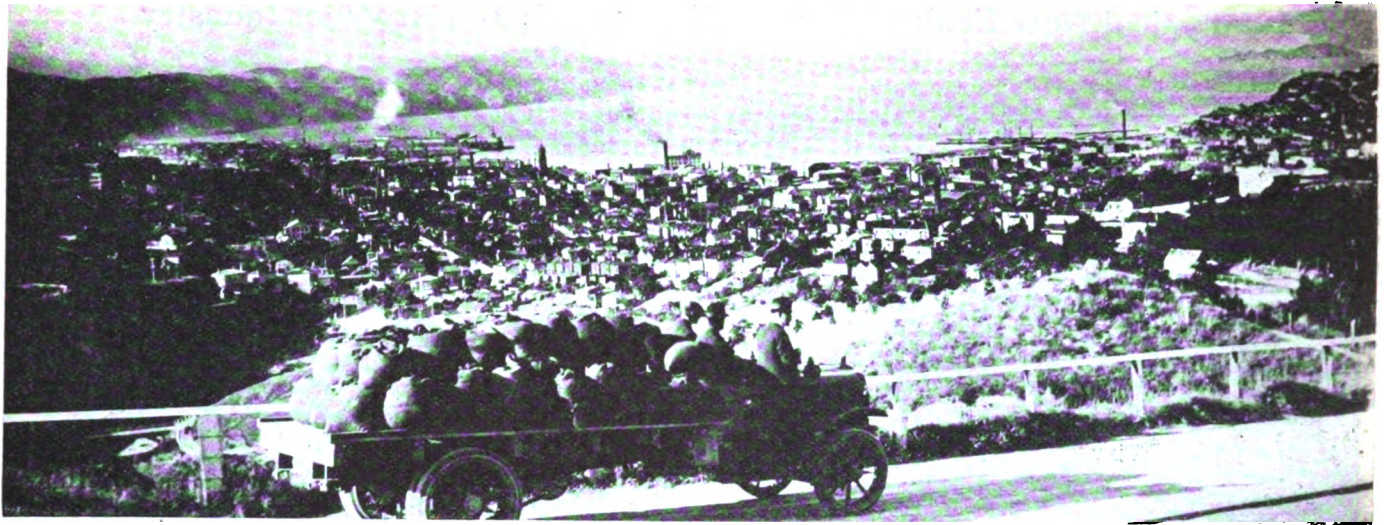
*This Wellington carrier hauls all the coke from there to Petone, 20 miles away. He has 5 trucks and 40 horses*



*A specimen of Taranaki roads. There are 150 miles like this in the province running through dairy country*



*Typical Hawkes Bay road between Hawkes Bay and Palmerstone—a section between Napier and Wellington*



*Brooklyn Hill, overlooking Wellington. It is 1¼ miles long and has a gradient of 12 per cent. It is used as a truck and car demonstration hill by local dealers. It has a brick surface*

began falling off, until to-day it is practically at a standstill.

New Zealand is being particularly hard hit at present with the war. The two islands have a population of 1,100,000, and it has sent an army of 100,000 men to France. One out of every ten of the population has gone to France. At present New Zealand is drafting married men with two children. This shortage of men, which has been very acute during the last 2 years, has naturally cut into the demand for automobiles, a situation which is also certain to exhibit itself in America.

America might draw a parallel on the New Zealand man power question by attempting to visualize the American nation when it has over 10,000,000 men in France. When the American army reaches that figure American representation on the French field will bear the same relationship to the present army of New Zealand in France. The loss of man power in America will scarcely be so apparent when America has her army of 10,000,000 in France as in New Zealand to-day, because America as a country is better fitted with man-conserving machinery than New Zealand. New Zealand is essentially a pastoral country with wool, live stock and dairy products the main staples of the nation. Naturally such a nation, which is not in any sense a manufacturing nation, is not so well fitted mechanically to fit women into varied fields of industry as America with her leadership in mechanics and manufacture.

Although New Zealand is to-day to all appearances entirely within the grasp of the American automobile industry, due to the withdrawal of England from the market, many of the large distributors, or importers as they are preferably called here, have maintained strong affiliations with their British houses. One of the large importers recently admitted that he has orders for over 100 of a particular make of British car, and it is only natural to expect that just as soon as the war is over and British automobile makers get off their munition program and get back on automobiles, orders from many New Zealand dealers will start pouring in. The day war was declared New Zealand voted to send its army to support that of the British Empire, and ever since its energies have been centered on that goal. The 4 years of war have linked the New Zealander closer to the Britisher. It must be expected that these relationships will follow the signing of peace.

It is for this reason that the American manufacturer



*The road leading out of Wellington. It's a 14-mile climb on this road to the top of the hills beyond the city*

will have to look carefully to his New Zealand representation if he hopes to retain his hold on this market. It is expected that cheaper American prices will have a certain selling influence, but offsetting this will be the preferential import duties on British goods. At present the American pays 10 per cent more customs duty than the Britisher, and it will not be surprising if a still greater preference is given England and the other British colonies. In this connection Canada is bound to demonstrate its strength as a manufacturing country. The increase in manufacture in Canada due to munitions and war products in general has to a large extent established production manufacture there as was not known in pre-war days. This is bound to have an effect on after-war manufacture.

New Zealand, notwithstanding the war, will be a potential buying country, notwithstanding its small population, which is little more than Uruguay in South America, and only one-fifth of Australia or one-eighth of Canada. The two islands, with their 1,100,000 population, have practically all of this as a possible buying field. The entire population is white and almost exclusively descended from English, Irish, Scotch and Welsh stock. There are 45,000 natives known as Maoris—Mow-rees. These are the aborigines. They are intelligent but perhaps lazy. A percentage of them are

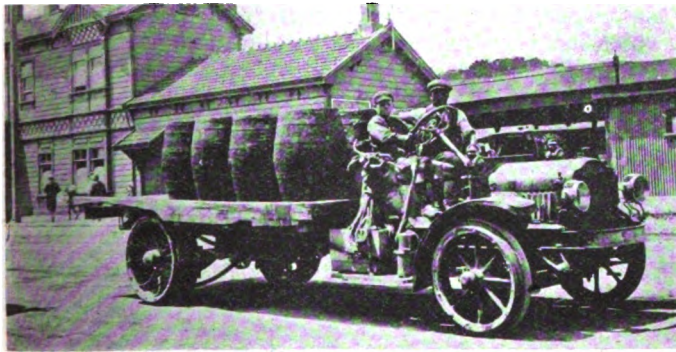


car buyers. They are all land settlers, and their property is protected by the government to such an extent that it cannot be sold and they cannot be dispossessed of it. In addition, the population includes 4000 Germans and perhaps 3000 Chinese.

With these people the five and seven-passenger touring cars are the dominating vehicles. You rarely see a limousine in any of the New Zealand cities. You never see a sedan. The runabout is not nearly so popular in proportion to numbers as in America. The New Zealander is a man of relatively large family and the family car is practically as popular as in Argentina or Brazil.

The greatest class of buyers is the farmer, which in New Zealand is a much broader term than in America. The largest farmers are sheep raisers, as sheep raising is the first industry in New Zealand. These sheep raisers are termed station owners, a term parallel to ranchman in America or estanciero in Argentina. Some of them have over 100,000 sheep, but the average small station owner will have 5000 sheep. Recently the government has taken a hand in the sheep raising work and is reducing the size of the sheep ranches, so that each year finds an increasing number of station owners.

These station owners invariably live on their stations or sheep farms. Some of them have their city homes,



*This 12-year-old boy of Taranaki regularly drives this 3-ton White over the one-mile stretch from and to the railroad depot*

but in general they may be from 50 to 75 miles from a city. These small station owners have always been the buyers of cars. You see many of these station owners with such English cars as Talbot, Rolls Royce, Daimler, Rover, Swift, Crossley and such other European makes as Minerva, Renault and Peugeot. Fiat and Lancia both have a good following. These small station owners have been and still are big buyers of American cars. They use their cars exclusively in the country, and 65 per cent of the car use is over metal or macadam roads and 35 per cent over dirt roads.

The second class of buyers is the city owner, which is made up of the same kind of buyer as an American city of 100,000 population. There are garages in every city of 1000 population up. There are salesrooms in every town of 5000 up, although there are quite a few smaller towns that have salesrooms. Gasoline is on sale in every village, although just at present the sale of it is being curtailed. Many dealers are only getting 50 per cent as much gasoline now as they got a year ago. The price has risen from \$5 for a case of 8 imperial gallons up to \$8 and \$10 for the same quantity. A price of \$1 per gallon has not been unusual during the past 4 months. The most of the gasoline comes from Sumatra and America. The Sumatra product is known as Shell spirit. It all comes in cases of two tins, each tin containing 4 imperial gallons. The imperial gallon is one-fifth larger than the American gallon.

The generally good roads of New Zealand have been a potent factor in the sale of automobiles to date. Only the main roads are metal or macadam. There is a linkage of metal roads connecting practically all cities of 5000 and up. Take an example: The City of Wellington, 73,000, is one of the two main cities in the northern island. From Wellington good roads radiate to Featherstone, 30 miles, and thence on 50 miles to Masterton and thence 50 miles further to Woodville. There is a good road radiating in another direction to Palmerston, 100 miles, and from here it continues 150 miles further into the interior. The road situation radiating out of Wellington is typical of that radiating out of such other cities as Christ Church and Dunedin in the South Island.

*(To be continued)*



*On this road out of Wellington it is a 1½-hour steady climb in a touring car. Wool comes down this 25-mile hill from the outlying country*



# The Army's Ambulance Program

**Automotive Equipment Comprises Ambulances on G. M. C. and Ford Chassis  
—Spare Parts Trailer—Collapsible Motorcycle—A Field Litter  
Which May Be Towed or Pulled by Men**

WASHINGTON, Sept. 27.—With the completion of the designs for the several standard machines necessary for the Medical Department Ambulance Service, the program has been definitely settled and production has started. In some instances, as with the standard ambulance, quantity production is under way. The ambulance program comprises:

1—The standard army ambulance, which is made up of the General Motors Co.  $\frac{3}{4}$ -ton truck No. 16 chassis combined with an especially designed body.

2—The U. S. Army service ambulance, which is a Ford chassis slightly redesigned together with an especially constructed body.

3—A spare parts trailmobile.

4—The Indian motorcycle, military type.

5—A specially constructed litter carrier trailer.

At the beginning of the war the only type of ambulance was a G. M. C. chassis equipped with an open stake

body. The new standardized ambulance, which is built on what is known as the AA chassis, which is the G. M. C. No. 16, is known in the service as type B 1918. The body panels are made of agasote. The dash is entirely of steel. It is so designed that it is shipped knocked down in four units on which the fixtures are already assembled. All of the holes in each unit are jig drilled, allowing for interchangeability of parts and for quick repairs.

The ambulance has a capacity for four wounded men prone and for eight sitting. The bodies are being manufactured by the Elkhart Carriage Co., Elkhart, Ind., and the Anderson Electric Co., Detroit, Mich. Doors are so arranged in the sides that medical attendance can be given to the wounded soldiers while they lie prone.

The Ford ambulance, which is known as the service ambulance, is radically different from the original type which has been supplied to the Allies and the Red Cross. The body is made of agasote and is sufficiently long to

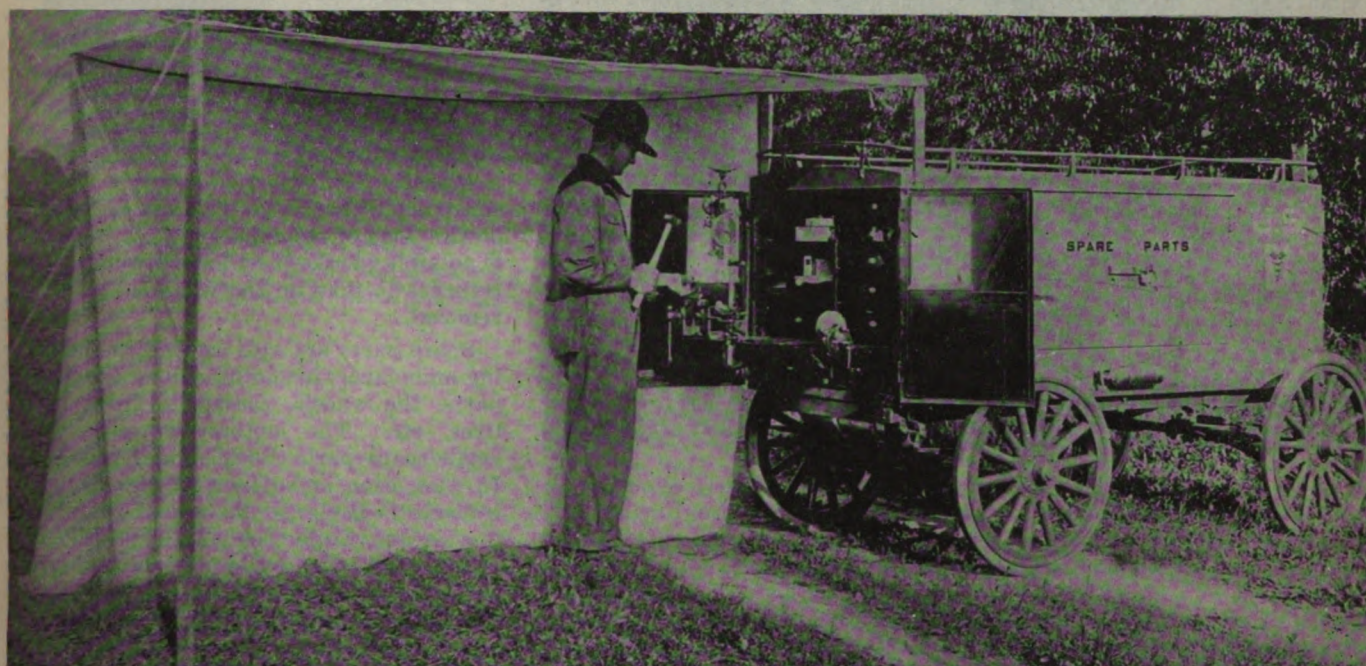
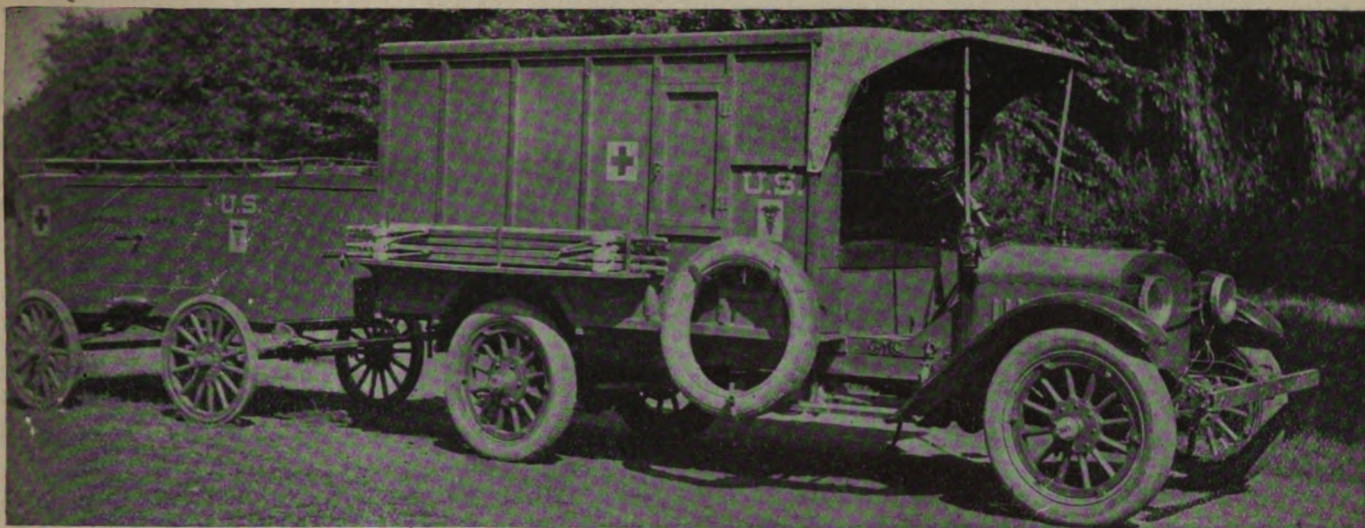


*Two views of the new standard Ford ambulance provided the U. S. Army following designs by the Motor Ambulance Service section under Major Fishleigh. The body is made of agasote throughout, is long enough to accommodate the litters, and a redesign of the spring suspension allows an extra 15 in. of wheelbase*



*The original Ford ambulance which has been supplied in great numbers to the Allies and to the Red Cross. The canvas hoods sticking out in the rear were arranged to care for the ends of the litters. The bodies on these were made of paper, cardboard, wood, or cotton and the tops, of cloth held in place by wooden slats*





Above—The new model B 1918 standard U. S. Army ambulance. The body is made of agasote. The chassis is the G. M. C.  $\frac{3}{4}$ -ton model No. 16. The spare parts trailer can be seen attached to the truck. Below—The rear of the spare parts trailer with the doors open and the shelf let down, making a mobile repairshop

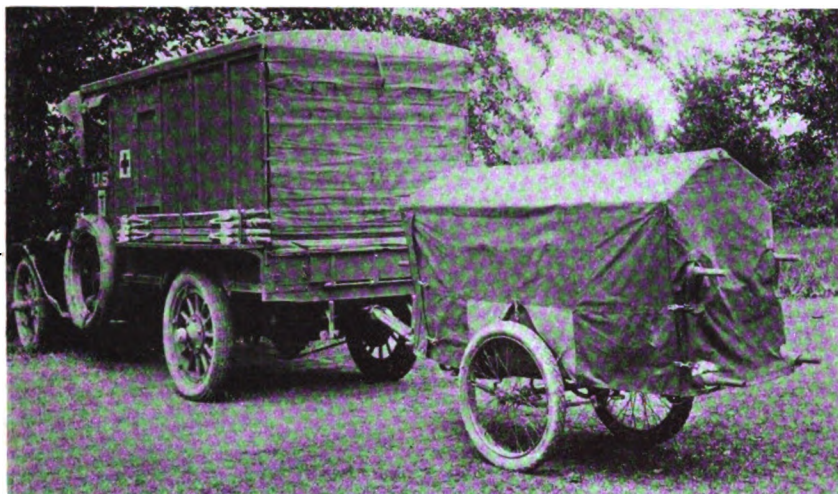


A rear view of the standard U. S. Army ambulance, loaded



A test of the U. S. Army standard ambulance, the B 1918, carrying 2300 lb., an overload of 800 lb.





*Above, the standard U. S. Army litter carrier trailer, attached to the towing ambulance and, below, the standard litter carrier trailer with the curtains up showing the wounded soldiers lying prone and the method of using manpower*

completely allow for the litters. In the original type the litters extended beyond the body. The Medical Department under the direction of Major W. T. Fishleigh redesigned the chassis to secure 15 inches more wheelbase and in that way eliminated the great amount of spring trouble which had previously been encountered. Gabriel snubbers are used. The steel dash has been changed to a larger size, affording more protection to the driver.

#### Can Accommodate Six Men

The capacity of the Ford is three men prone, two lying on the floor and one in a litter swung on straps, or four sitting. All in all, the new type of Ford service ambulance is an exact duplicate of the standard B 1918 ambulance except that it is smaller.

Spare parts for a complete company of 12 ambulances are carried in a trailer made by the Sechler Co. The trailer, which is towed by one of the ambulances, has a body made by the Glascock Co., Muncie, Ind., which, in addition to operating as a storehouse for parts, is so constructed that the rear can be opened and protected by a tarpaulin and converted into a work-

shop. The larger parts are carried in the forward body of the trailer, while the rear is divided into bins that are movable and arranged on shelves. Each bin is numbered. Each small part is tagged and numbered and an index card is fastened to the inside of the rear door, which shows the exact location of each part in the bin.

The Indian military model motorcycle, which forms a part of the standard equipment, is collapsible and consequently saves shipping space. This motorcycle differs from the 1917 type in that it carries a separate magneto instead of a magneto dynamo.

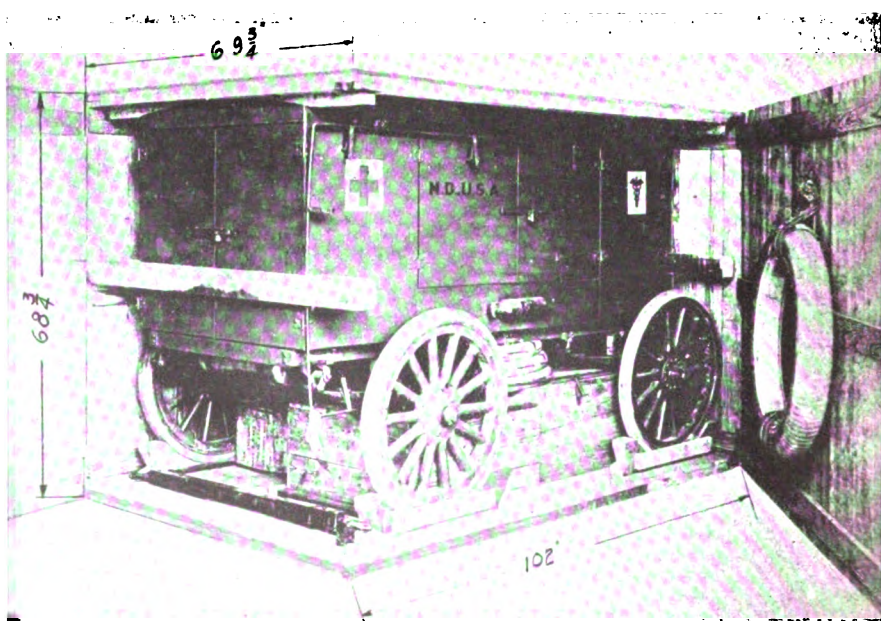
#### Litter Trailer Holds Two Men

The field litter carrier, which is constructed in the form of a trailer and is either towed by a truck or by the soldiers, is being manufactured by Mitchell Motor Car Co., Racine, Wis. The wheels are interchangeable with the wheels of the motorcycle side car. The litter trailer has a capacity for two men prone. It is so constructed that it can be shipped knocked down. One of its chief features is that it is possible to take it by handpower into the trenches to take up the wounded awaiting removal.

Spare parts are also carried in the towing ambulance, including chiefly the larger parts, the wheels, radiators, front axles, tires, etc. The motorcycles also carry small spare parts stocks under the seats. In fact, each ambulance, trailer and motorcycle is designed to be self-sustaining to a degree, while each company of 12 ambulances and the trailer is intended to be entirely self-sustaining and independent

of garages or base service stations which were necessary heretofore.

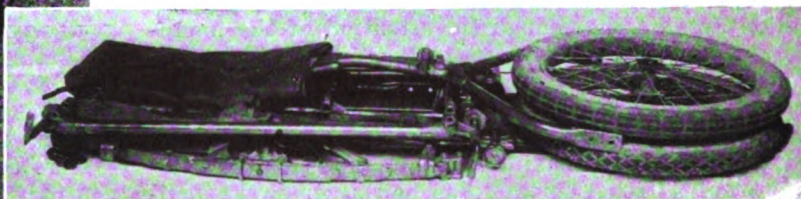
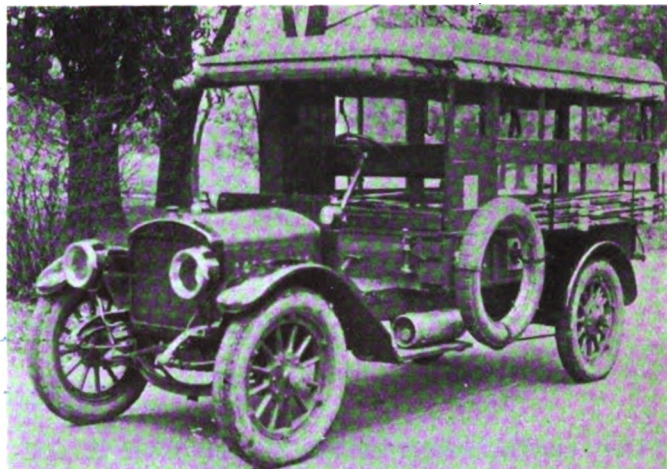
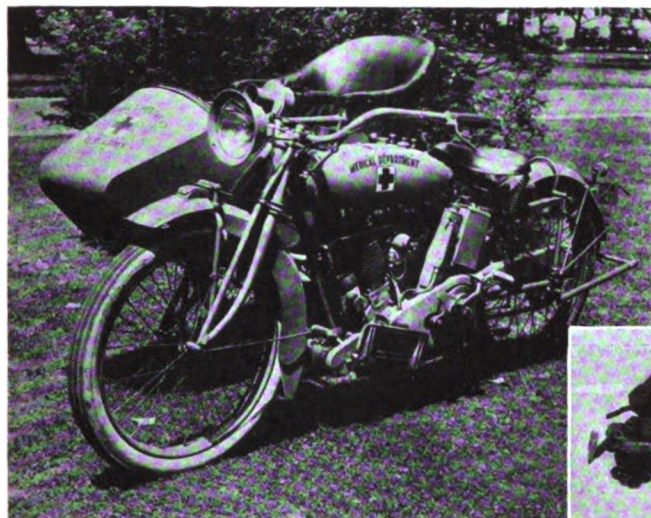
The companies are trained as self-sustaining units.



*The spare parts trailer in the crate as it is shipped abroad. The boxes beneath the trailer are hauled in the towing ambulance and contain the larger repair parts*



Right—The original type of U. S. Army ambulance, with the open stake body mounted on a G. M. C. chassis. Below—The U. S. Army Medical Department standard motorcycle, set up and also ready for shipment



## Utah Shale Beds Provide Large Oil Supply

**T**HAT there are vast resources of oil in shale beds throughout the United States is indicated by a report estimating that 42,800,000,000 barrels of crude shale oil and 500,000,000 tons of ammonium sulphate by-product are located in the Utah portion of the Uinta basin, lying in the northeast section of the State. The report of D. E. Winchester, issued by the U. S. Geological Survey of the Department of the Interior, indicates thickness and richness of oil shale beds in many places. Because of the demand for gasoline and for crude oil from which it is made, as well as for the ammonia by-product which is used in fertilizers, rapid progress is being made in producing these materials by investigation, experiments and general development. More than a dozen large companies have been organized in Colorado, Nevada, Montana, Utah and Wyoming and are now experimenting to determine the most efficient and economical way to produce oil from the shale. Aerial tramways are being built to bring the shale from mines opened high on the mountains to retorts built in the valleys near water and other lines of transportation.

### Dyes Being Produced from Shale

Experiments are also proving that numerous useful commodities can be made from the shales, such as dyes, explosives and substitutes for rubber, as well as gasoline, kerosene, paraffin and flotation oil, but the industry is not yet enough advanced to tell which of these products or how many can be manufactured at a profit. It is now considered likely that the by-products will prove most profitable.

The Utah oil shale is black or brownish black, finely grained, generally free from grit. It is tough and flexible. When ignited with a match the oil shale burns

with a sooty yellow flame. In order to obtain its content of oil the shale will have to be mined like coal, crushed and distilled in huge retorts, in which it gives off crude shale oil, ammonia, fuel gas and other possibly valuable products. Though some of the shale has on distillation yielded more than 2 barrels of oil to the ton, very little of the oil is in the shale in the form of oil. There is much partly bituminized vegetable matter in the shale which can be converted into oil by heat.

Freshly broken oil shale gives off a peculiar odor similar to that of crude petroleum.

Most oils obtained from the distillation of shale are reddish brown and at ordinary temperatures range from a thin liquid to a semi-solid vaseline-like product. The specific gravity of shale oil obtained in the field apparatus ranges from 32.98 degrees Baumé to 26.14 degrees Baumé. It is probable, says the report, that the large part of the difference in the oil from different shale is due to variations in the temperature of distillation. Fractionation of shale oil produces: gasoline (distillate to 150 degrees C.), 7 to 12 per cent; kerosene (150 degrees —300 degrees C.), 28.5 to 49 per cent; asphalt, 0.47 to 4.10 per cent; paraffin, 1.63 to 9.21 per cent; sulphur, 0.40 to 1.42 per cent; nitrogen, 0.887 to 2.198 per cent.

The large percentage of nitrogen it is believed will be lessened in commercial practice by injection of steam during distillation.

The refining of shale oil is a complicated process owing to the many distillations necessary to successfully separate the different ingredients which have varying degrees of volatility and specific gravity. Although the products of the American oil-shale industry will probably differ from the Scottish, where the profit is mainly derived from liquid and solid products, it is expected that the variety of American products will be large also.

# The Need for a New Incentive for the Industrial Worker

The Job Alone Does Not Supply It No Matter What It Pays or How Few the Hours It Takes—Maintaining Industrial Morale

By Harry Tipper

THE announcements of the Midvale Steel & Ordnance Company and the Lukens Steel Company regarding their adoption of co-operative administration deserve the thoughtful attention of the manufacturers of automotive apparatus. The steel companies are thoroughly organized and the business as a whole has an enviable reputation of farsightedness in its dealings with workers. Moreover, this is not the first experiment of the kind in the business, as the Colorado Fuel & Iron Company has had a somewhat similar one in process for about three years. The two significant statements in the announcement of the Midvale Steel & Ordnance Company are as follows:

"... recognizing the fact that the prosperity of their companies is inseparably bound up with the general welfare of their employees, propose, with the co-operation and assent of their employees and for their mutual interests, to establish a plan for representation of employees, which shall hereafter govern all relations between the companies and their employees."

"We recognize the right of wage-earners to bargain collectively with their employers and we hereby invite all employees to meet with the officers of their respective companies for the purpose of considering, and, if practicable, adopting a plan of representation by the employees, which shall be thoroughly democratic and entirely free from interference by the companies or any official or agent thereof."

## Guide-Posts for the Manufacturer

This war has indicated, to the student of labor questions and ideas, a number of guide-posts which should be of the greatest value to the manufacturer, whose most important problem is, and will be, the question of how to handle labor so as to procure the most stable and valuable condition. These guide-posts are to be found in the reports of the commissions who have studied labor under war-time conditions in Great Britain, in the history of the strikes over there, in the history of war-time strikes over here and the condition of labor, as shown by the turnover, the production efficiency during the war-time conditions.

The announcement of the Midvale Steel & Ordnance Company shows that the executives of this company have seen at least two of these guide-posts and are to that extent endeavoring to meet the situation in an enlightened and far-sighted way.

It will be noted that the first paragraph of the announcement states specifically that the company proposes, with the co-operation and assent of their employees, to establish a plan for representation of employees, which shall hereafter govern all relations between the companies and their employees.

The epochal character of this statement rests in the

recognition of the right, or at any rate the desirability, of the worker having a share in the responsibility for the conditions of his work and remuneration in the particular organization in which he is working.

This announcement recognizes the fact that neither high wages nor shorter hours are in themselves sufficient incentives to secure the maximum production nor the proper co-operative spirit.

It recognizes the fact that so long as the workmen can only secure representation (in their disputes with employers) through the use of general labor bodies, the organization incentive, upon which the manufacturer's welfare depends, is still wanting.

It suggests a recognition of the fact that none of the material things, wages, hours, good factory conditions, steady employment, can cut down the turnover, speed up the individual production, cut out the absences from the shop, or remove the suspicion which has characterized all the disputes between employer and employees under the present system. All these things have, from time to time, provided a temporary relief, but they have not removed the fundamental troubles, nor lessened the number of strikes, disputes, or difficulties with production.

## High Wages Do Not Provide a True Incentive

This war has provided the workers of all ranks with prosperity greater than any which they have enjoyed during the memory of any of the workers who are so benefited. It has enabled them to make their own terms as to pay, to secure steady employment and to avoid any of those uncertain conditions which usually interfere seriously with the earning capacity of the average worker.

Yet the record has been the same in Europe and here, the high wages have not kept the worker busy all the time, but have seriously cut into his hours of labor, unless the incentive of patriotism has done what the high wages could not do—waked his sense of responsibility. The reports of industries, where the high wages of the workers have resulted in a serious decrease in the number of days worked, if gathered together for the Allied countries for the period of the war, would show the general failure of prosperity to keep the worker to his work, or to stop the strikes, disputes and other indications of continuing discontent. It has been necessary to provide, in the appeal to patriotism, in the education upon the aims and necessities of the war, the incentive which had not been supplied by all the material progress which the worker has made.

## Patriotism the Present Stabilizer

In this country, since April, 1917, the records of disputes, strikes and other causes of loss of production, as well as the important cause of absence from work, have

been met successfully only when the patriotic appeal has shown the worker a real, definite and idealistic reason for doing his utmost and accepting some difficulties.

In fact, this has become so generally recognized that it is continually used to bring the mass of workers into the unity of action that alone will give the full power to the war machine.

Of course, the experiences of this war have indicated a great many other points in connection with the labor question which cannot be touched upon in this article, but must be left for future discussions. The points to be noted now are the necessity for some organization incentive to the worker in that organization and the fact that the job alone does not provide that incentive, no matter what it pays nor how comfortable its conditions are.

The writer was for several years engaged in factory work, and in the course of that training operated every machine in the factory for considerable periods of time, keeping up with the other operators and handling every bit of the routine of the matter. During the same time his spare moments were mostly spent in the company of skilled labor union men, getting their point of view, their ideas and their outlook. Very few of the operations which he had to undertake provided any incentive in themselves, once they were mastered. In fact, they became so irksome from their cramped requirement of mental and physical concentration that the one outstanding thought of importance was—how to get away from the monotony.

### Most Work Lacking in Incentive

From a careful examination of industrial work it is a conservative estimate to say that 75 per cent of the work in industry is repetitive, monotonous and lacking in any requirement which will supply either the incentive to good work or the incentive to keep working.

In war time we have successfully appealed to the instinctive ideal of citizenship to provide that incentive, but in peace times we have had no such ideal to appeal to and the material desire of the worker is paramount—the desire to escape from the monotony of his work and secure as much money as possible for the little work he is obliged to do.

This latter, the material desire, has found its expression in the labor union, and, among the more discontented spirits, in the political ideals of syndicalism and communistic collectivism, all of which attempt to cure the trouble by aggravating it.

The real necessity of the case is a co-operative spirit in the manufacturing organization, which can find its expression in some such plan as that adopted by the Colorado Fuel & Iron Company and those now announced by the other steel companies named.

It is not merely that such a step is morally desirable, but it is necessary for the economic stability and progress of industry as a financial matter. It is obvious to the student of human affairs that we are in danger of industrial turmoil, which may be more disastrous than the turmoil of the present war, unless steps are taken to supply some of the necessities for co-operative working out of these important industrial humanity problems.

### Industrial Morale

It is really a consideration of industrial "morale" and the means which are necessary to create a splendid morale and keep it.

We have discovered the tremendous importance of morale in soldiers, and how it can nullify advantages

in guns, transport, and all other equipment. We have seen the greatest war machine in the world stopped by men who were unprepared a few months previously, and we still marvel at the miracle of it. We have seen the Allies in four years outmaneuver all the science and diligent operations of a fifty-year preparation.

In thinking of this it is well to remember that this is an industrial war.

The whole of Great Britain has been made over industrially in order to fight—and this has been accomplished in less than one-tenth of the time the war was originally prepared. In a few months the United States has created new industries and brought them to such a pitch of perfection that they equal or surpass those which were slowly accumulated over many years of experience.

### The War's Lessons for the Manufacturer

As this is an industrial war, what can industry get from its lessons in the importance of morale, incentive, the ease with which technical advantage can be lost or overcome, and the splendor, character and possibilities of the individual when he is aroused?

They show on the positive side what a real incentive will accomplish, while our continual industrial difficulties show what a lack of incentive will disorganize.

We are providing millions of our workers with an incentive which has given them a glimpse of their own possibilities and importance. We have sent millions of them to work and fight for this incentive on the most dangerous mission that most of them have experienced—with the smallest pay they have ever received.

How are we to change industry so that it shall be up to the level of these men? How will we make it possible for them to reconcile their new sense of justice, democracy, their own power and individual capacity with the industrial organization to which a good many millions of them must return?

Obviously we must be prepared to give the human side of our business a great deal more thought than we have been accustomed to give it. It will not do to continue in the attempt to treat these workers as the German government has treated the German people, as though they were to be instructed without any voice in the matter, as though they were to be ordered, driven, and herded in industry without having anything to say about it. These things are not possible if we desire a stable, profitable industry.

Man-power is a new word in industry, borrowed from the war, but it is a good word and one which must be recognized in industry more thoroughly if we are to increase the efficiency of our industrial organizations, provide ourselves with a stable foundation of production capacity and make it possible to pass through the reconstruction period with a minimum of turmoil.

### Co-operation and Democracy in Management

It is a good sign of the times that the steel business, with its recognized reputation for intelligent business management, has indicated that co-operation and democracy must become live words in industrial management. It is an encouraging sign that these organizations have seen that the good industrial worker needs to be led, not driven, just as the soldier; and that morale can be better secured by an army of co-operation and understanding.

It is said that the high morale of the American Army is due to the co-operative feeling and good understanding that exists between the officers and men and that this has been established by the training and character of its officers.



These experiments, undertaken by large stable industrial organizations, indicate that we may hope for the same kind of an army of industry and consequently the same kind of industrial morale, with its economic invincibility.

This cannot be accomplished, however, by the work of a few isolated companies who have seen sufficiently the necessities of the case to take some action.

Neither is it to be expected that any one man or set of men will evolve, at once, a plan which will satisfy the case.

The subject is too large for that; it involves too many factors in human action which are little understood in industry and rarely studied.

It will necessitate the widest study on the part of all men interested in industrial management. It will require the deliberate removal of all the prejudices,

misconceptions and misunderstandings which have overlaid the subject until the real possibilities are well-nigh buried in the heap. It will mean a new knowledge of labor movements and a new understanding of men as such. It will necessitate a study of the matter, prompted by the desire for co-operative understanding which animates the officer in the army.

Above all, it calls for the widest interchange of thought and the most careful examination of all plans, with full and free discussion of their practical application.

Only the combined wisdom of the industrial leaders, studying the problem with the energy which has distinguished their study of operating problems, supplemented by the same interchange of ideas and results, will enable us to approach it in the way that its importance and imminence deserve.

# A Business Man's Views Regarding Trade Acceptances\*

A System of Business Based on the Principle of Good Credit—The Man Who Will Not Accept a Trade Acceptance Is Not a Good Customer to Sell—The Advantages Analyzed

By C. E. Crofoot

THE trade acceptance is not new to the world. We in the United States are simply behind the times in its adoption. England, France and Germany, as well as other European countries, have long used this system to great advantage, in connection with the use of the banker's acceptance, which latter we have used in this country in connection with our foreign trade for many years. The progress of the trade acceptance toward general adoption in the United States has been an outgrowth of the present war. Foreign bankers and business men visiting our country in the interests of business with the Allies soon after the outbreak of the war stood aghast at our antiquated commercial credit machinery and our unfamiliarity and apparent indifference toward so important an asset as the trade acceptance.

The first impetus given to the trade acceptance dates from the War Convention of American Business with the Chamber of Commerce of the United States, held in Atlantic City one year ago this month. At that great convention only subjects of national importance were discussed, bearing upon the relations of business efforts toward winning the war. Under the subject, "Banking and Finance," the trade acceptance was brought out from its obscure position in America in the past by prominent business men who, head and shoulders above their contemporaries, had tried out the method to their satisfaction and profit. In turn the prominent bankers in attendance indorsed the plan almost to a man in view of its opening up an almost unlimited field for extending banking operations. And so the present trade acceptance boom was launched, the rigging of the ship and its preparation for its publicity voyage being left to the joint

## The Advantages of the Trade Acceptance

*Does away with the open account.  
Provides a larger line of bank accommodations.  
Simplifies bookkeeping.  
Creates a better class of customers.  
Makes for increased profits by a quicker turnover.  
Prevents over buying and promotes careful attention to financing.  
Being two named paper is more readily discounted.  
Places credit upon a higher plane.  
Ties up less capital.  
Develops a keener sense of obligation.  
Insures more prompt attention to payments when used and in general tends toward the elimination from financial transactions of many of the elements of difficulty and annoyances which now embarrass them.*

care of the American Bankers' Association and the National Association of Credit Men.

Under the guidance of these two great American organizations a third came into being, the American Trade Acceptance Council, for the express purpose of furthering this great movement. In addition to the American Bankers' Association and the National Association of Credit Men, the Council is backed by the Chamber of Commerce of the United States and the National Asso-

\*Read before the Convention of the American Gear Manufacturers Association.

ciation of Manufacturers. What more influential support could it have? At a widely attended meeting held in Chicago last May, the council was addressed by Mr. Paul Warburg, Deputy Governor of the Federal Reserve Board, and from that time the movement has become general throughout the country through the wide publicity campaign of the National Trade Acceptance Council.

The purpose of this article is to aid through such publicity as it may extend to our members and thereby enlist the American Gear Manufacturers' Association in this movement, a movement that can only result in great benefit to ourselves as well as toward the cause for which we are all working to-day. While the association so far as I know has not as yet been asked to recommend the adoption of the trade acceptance method by its members, the advantages to be gained thereby are so obvious that we do not need to wait for any man. Let us take time and opportunity by the forelock and jump on the "Trade Acceptance Band Wagon" even without an invitation. I am sure we will be welcome.

#### Founded on the Principles of Good Credit

Let us consider just what the "Trade Acceptance Plan" is.

First, we must not forget that it is founded on the principle of good credit. It is for the man who pays his bills. If a man will not accept a trade acceptance, he is not a good customer to sell. We do not want that kind, and the sooner he is eliminated the better. Credit has been defined as "A promise to pay money or its equivalent at some future time"; also as "The power to get goods in exchange by giving a promise or contract to deliver an equivalent at some future time."

Now, then, the question is: What is the best form for that promise or contract to take? Shall it be the open book account or the promissory note or the trade acceptance? Let us see; most of us are now doing business, I venture to state, upon the open book account system. "Is it satisfactory?" "No, and why, because its principle is wrong." It has no foundation and cannot stand even the most superficial examination for merit. It floats upon thin air, settling with its disastrous effects upon the unwary. It requires constant watching with its attendant expense of time, money and energy, and this at a time when man power is at a premium. We have inherited this system from the old Civil War days, previous to which the bill of exchange, the forerunner of the trade acceptance, was in general use. These went out with that war which caused such a demoralization of credits that business went upon an almost strictly cash basis. In order to get cash, merchants and manufacturers had to give liberal discounts, which gradually became lower with the restoration of normal conditions, and then, as the discount rate got down to a par with the rate at which money could be borrowed at the banks, customers were loath to take advantage of the low discount rate, and the custom of taking 30, 60 and 90 days' time sprang up, and this now antiquated system still sticks to us to-day, notwithstanding its utter inadequacy to meet present demands.

#### The Futility of the Cash Discount

It is true, some of us offer now a cash discount for payment in 10 days, but how much is this really worth to us under the present system? Very little, when you stop to consider what you actually get out of it, that you otherwise would not get if you sold net 30. Those that take the cash discount in strictly 10 days are the customers of good credit who would abide by any terms mutually agreed upon at the time of sale. Others deduct

unearned discounts at anywhere from 15 to 51 days, which defeats the purpose of the plan.

You may laugh at a man expecting to get away with a deduction of 2 per cent 41 days after date of invoice, but in the face of stated terms 30 days net, 2 per cent 10 days we once had a customer, notice I say once, who tried to put one over on us like this: "All shipments on the 27th of the month and after will be considered as of the first of the following month. We take 2 per cent discount on the 15th of the month following shipment, providing goods are received in good order within 7 days from date of shipment."

This amounts to 2 per cent at from 51 days after shipment to any old time. We didn't swallow this, but I have no doubt somebody did and is still, as the firm is now in business and must get goods somewhere. The open account, as its name implies, is open and wide open, until it is paid. Open to what? Onslaughts of every description. Returned goods, cancellations, claims for delays, deductions for unearned discounts, shortages, and we are content to take what is left or can't help ourselves, one of the two. We've acquired the habit and are blind to new ideas and methods.

#### It's Hard to Accept New Ideas

To illustrate:

The story is told of a conversation between a magazine editor and a friend in a Chicago hotel. "Do you use shaving soap when you shave?" asked the friend. "Of course," said the editor; "that's a silly question. Everyone does." "I don't," said his friend. "It isn't necessary. A little water does the work better. It softens the beard quite as well and without lather it's easier to see where you're shaving." "You're just a plain ordinary garden variety of liar," said the editor. "You can't put anything like that over on me."

A year later the editor was making a trip from Chicago to New York. As he entered the sleeper wash-room in the morning he noticed a man standing in front of the mirror shaving. The man was not using soap. He moistened his strong, black beard with a little water and went merrily on.

"I'm interested," said the editor. "Don't you use soap when you shave?"

"Haven't for years," replied the man.

When the editor told the story he said, "For twenty-seven years I used soap when shaving because everybody else used soap, and I had to be hit in the head twice before I could get a common sense idea into my ivory dome."

"I shave every morning," he continued, "and I haven't used shaving soap for a year."

This story was retold some time later to three men at lunch. Two said it was darned nonsense. The third said he knew it to be true. "I use soap when I shave," he said, "because I like it, not because it's necessary. I was in the war both in Cuba and the Philippines," he said. "I couldn't get soap, but I always had as good a shave, although I didn't always enjoy it so much."

So much for the open account.

#### The Promissory Note

The promissory note has its place in business to-day the same as it always has had. The promissory note given by the debtor to the creditor can be made to cover any kind of business transaction or obligation. It is as frequently given for money borrowed for illegitimate use as for the legitimate; for speculation in the market or for the flotation of stock. Unless the maker of the note is favorably known to the creditor it is not looked upon with favor and sometimes not then. How many of us have not been touched up at one time or another by a

"friend in need," business or social, and eventually stung on his, of course, perfectly good note.

The trade acceptance does not propose to eliminate the legitimate or preferential use of the promissory note. It will, it is hoped, displace it in current transactions in merchandise as well as displace the open bank account. The trade acceptance was devised to represent current transactions in merchandise only, and as such I want to explain its advantages before our members to-day.

#### What Is a Trade Acceptance?

It is defined as "a negotiable certificate of indebtedness arising out of a *current* transaction in *merchandise*." Notice the emphasis on the words "current" and "merchandise." These are the distinguishing features of the trade acceptance as compared with a draft or promissory note, and are what gave it preferential standing with the banks. It is *not* to be given to cover a transaction of any other character or for a merchandise account past due! The nature of the transaction, therefore, becomes self evident and the paper by virtue of this is entitled to a special rate of discount.

It is true, discount charge must be borne by the seller, but he is glad to assume this for self liquidating paper promptly received in lieu of former losses by the old fashioned loose and expensive open account methods. Then, again, the trade acceptance is planned to be issued for short periods, 30 to 45 days at the longest, and dating from the date of invoice, so that discount is not heavy.

The trade acceptance transaction is completed after its issuance by the seller by its acceptance by the buyer. He writes his name across the face of the acceptance, together with the date and place of payment, and thus assumes the direct credit liability for the merchandise, title of which has passed to him. The transaction thus completes itself in so far as "proof of claim" is concerned and becomes self liquidating by giving the seller negotiable paper at the outset.

We now see that the trade acceptance takes care of a current merchandise transaction in a far better way than any other method, both from the standpoint of reliability and quick results both to buyer and seller. It has no disadvantages except to the old *skinflint*. As he would never accept one, we will let him worry.

#### How the Trade Acceptances Can Be Adopted

We can adopt the trade acceptance by either of two methods—by previous agreement or by persuasion. We can state our terms under the plan and refuse to sell under any other, or, we sell a concern a bill of goods. We forward invoice together with a trade acceptance drawn upon ourselves at 30 days and ask him to accept it and return to us promptly, provided he does not wish to take advantage of the discount to which he is entitled for payment in 10 days. We follow up with appropriate letters if he does not accept promptly, explaining the purpose of the plan and its patriotic and economic significance. We finally bring him around to the trade acceptance idea within the 30-day period, or, if not, our letters will have had a telling effect toward a settlement in cash long before we would have chased up a delinquent under the old open account system. Some concerns are offering 15 days extra time provided the trade acceptance is accepted, drawing same at 45 instead of 30 days. Undoubtedly other inducements will present themselves as the plan comes into general use.

Our concern is endeavoring to adopt the trade acceptance plan. We made a beginning last spring and have made some progress. Like all other reforms, the sledding is hard at first. The plan needs the help of every member of the A. G. M. A., and in standing to-

gether as one influential association, we can accomplish what we desire. In so doing we shall in no small measure help to put the finances of the entire country on a definite economic basis. If we are to whole-heartedly further the trade acceptance movement, we must stand ready to give as well as to receive.

The ball has been started rolling for us; let us get behind it with a will, and before another year goes by I am sure that we can point with considerable satisfaction to our column of assets, and, instead of dead ledger accounts 60, 90 and 120 days old, show trade acceptances at 30 and 45 days; negotiable assets which if we prefer to discount will represent just so much more cash on hand less the interest we shall all be willing to pay for the accommodation. But this ideal liquid condition cannot be attained overnight or without considerable effort on our part. When one thinks of it, why should we as business men finance our customers? That function belongs to the banks.

Let us consider the condition as of the banks on the one side and the business men on the other. We, the business men, buy and sell and cover our transactions immediately by trade acceptances. These trade acceptances will be handled for us by the banks if we desire, who in turn can re-discount them at the Federal Reserve Bank without question or limit. What condition could be more satisfactory than this liquid condition brought about by its being possible to realize immediately upon accounts as represented by trade acceptance?

#### A Needed Cog In Our Financial Machinery

The trade acceptance satisfactorily supplies the missing link in our financial system to-day. We are behind our allies in its adoption and extended use. In Germany it is interwoven in her almost perfect financial cycle. The question of financing the war gives Germany little concern. Her system was worked out years ago. Food, manpower and raw materials are her desperate wants to-day. Not on account of her lack of planning, but because we have fooled her for once. We finally woke up on preparedness. She figured we never would or could. On the other hand we must begin where she left off on matters of finance or suffer the consequences. We must be alive to the rapidly changing conditions on every hand to day. Never before has there been such an awakening in patriotic spirit on the part of the American people. Let us couple this with a broad vision by the business men into the requirements of the future. Let us not be behind our banking contemporaries. The establishment of the Federal Reserve Bank was the first great step toward the stabilizing of American banking.

The general adoption of the trade acceptance among the business men of America will be another important step forward toward the perfection of our financial machinery, thereby stabilizing business credit.

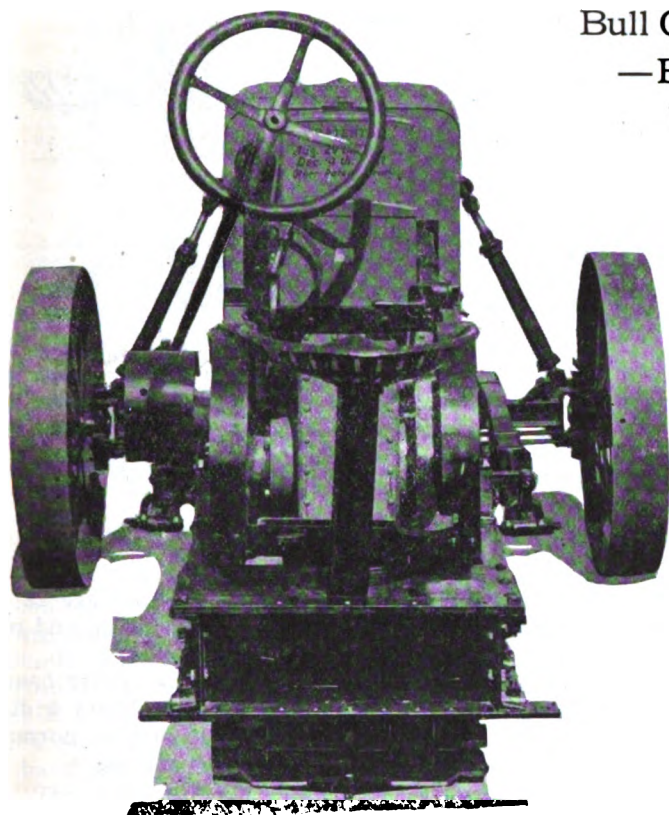
The time has come to make the use of the trade acceptance plan a national business custom. Our own protection compels it. Good business necessitates it. Patriotism demands it.

ACCORDING to *Electrotechnik und Maschinenbau*, special apparatus has recently been contrived to measure rapidly fluctuating temperatures such as an ordinary thermometer is too sluggish to record. At the point of measurement, wires of platino-iridium, 0.02 mm. diameter, are inserted and are connected to a galvanometer. The deflection varies with the resistance of the wires, and it is stated that variations in temperature with a frequency of ten per second may be noted. It is anticipated that the apparatus will be specially useful for studying cyclical variations in temperature in the cylinders of combustion engines.



# The Belt-Rail Creeper Tractor

Bull Gears Mesh with Teeth on Outside of Track  
—Engine and Transmission Form Power  
Unit Supported at Three Points—  
Spring Mounting for Front Ends



*Rear view of Belt-Rail tractor, showing spring stabilizers between axle and radiator frame*

illustrations that the center of gravity of the whole machine is very low, and it therefore has a high degree of stability. As already pointed out, the engine is the Waukesha BU4, which has a bore of  $3\frac{3}{4}$  in. and a stroke of  $5\frac{1}{2}$  in., giving it a piston displacement of 232 cubic inches. According to the rating of the engine manufacturer, this engine develops 40 hp. at 1650 r.p.m. It is of the unit power plant type, and the transmission casing is built integral with it. The whole assembly is mounted on the frame with a three-point support, there being a central swivel support at the forward end of the engine and two points of support at the rear end of the transmission housing.

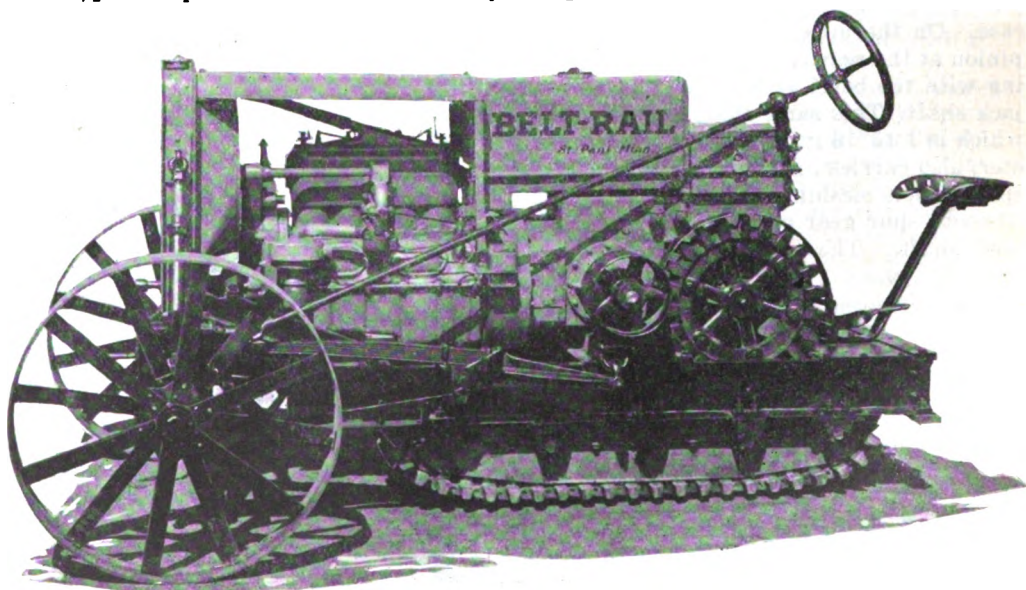
## Runs on Gasoline or Distillate

A Kingston Model L carburetor is fitted, and either gasoline or distillate can be used as fuel. The fuel is carried in an 18-gallon tank, located in a rather high position directly behind the engine, and is fed to the carburetor by gravity. All air drawn in by the carburetor is passed through a Bennett air-cleaner. The speed is controlled by a Waukesha governor, built integral with the engine. Ignition is by a Dixie Model 46 magneto.

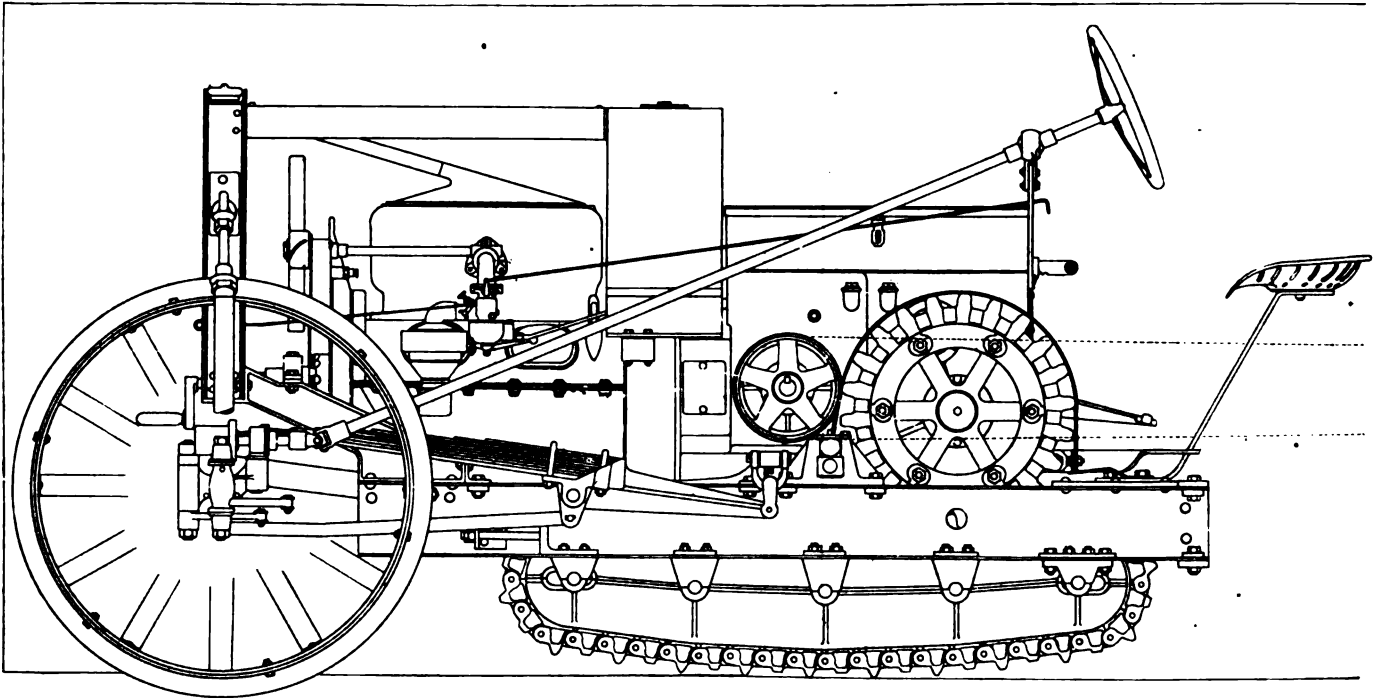
Water is the cooling fluid used, and is circulated by a centrifugal pump through the Sparks Withington radiator, the whole cooling system having a capacity of 10 gallons. The radiator core measures  $18 \times 21\frac{1}{2} \times 3\frac{1}{2}$  in. Back of the radiator is mounted an 18-in. fan, which is driven by a  $1\frac{1}{2}$ -in. flat belt.

**A** CREEPER tractor, differing materially in its creeper action from others of the same type, is manufactured by the Beltrail Tractor Co., St. Paul, Minn. The machine is equipped with the Waukesha Model BU4 engine, and has a rating of 12 hp. on the drawbar and 20 hp. on the belt. At a speed of  $2\frac{1}{4}$  miles per hour the drawbar pull figures out to about 2000 lb., so that the tractor should be capable of pulling three 14-in. bottoms under any conditions. The chief claim made for the Belt-Rail tractor is that the unit of pressure of the track on the ground is very low, and the tractor therefore can be used for working in soggy ground, where horses and wheel-type tractors would quickly become mired. Of the entire weight of the tractor only 28 per cent is on the front wheels and the remaining 72 per cent is on the belt-rail, the latter having such a ground contact area that the unit pressure is only  $3\frac{1}{2}$  lb. per square in.

It will be seen from the



*Power is applied to the creeper of the Belt-Rail tractor through large bull gears, meshing on top of the belt. Note cantilever springs for front axle*



Side view of Belt-Rail creeper tractor. Note air cleaner on carbureter, power pulley and bull gear drive on belt

The clutch, which is fully inclosed, is of the dry disk type, comprising three driving and two driven disks, the driving disks being faced with asbestos on both sides. In addition to the two driven disks, the cast-iron end plates, of which one is bolted to the tapered forward end of the clutch-shaft, and the other is adapted to slide along that shaft, also take some of the torque. Studs riveted into the fly-wheel web serve as the driving members, and the driven disks are treaded over spring bolts, which are riveted into the clutch flange. The fluted shaft of the transmission is supported at its forward end in a ball bearing in the flywheel flange. A ball thrust collar is used for the shifting lever.

The transmission affords two forward speeds, of  $2\frac{1}{4}$  and  $3\frac{1}{2}$  miles respectively, and one reverse speed, equal to the low forward speed. Power for the belt drive is taken off the forward end of the fluted shaft, through a pair of bevel gears. The shaft on which the two sliding pinions slide is the lower of the two in the transmission case. On the upper or secondary shaft there is a bevel pinion at the rear end, meshing with the bevel gear on a jack shaft. This same shaft, which is  $1\frac{15}{16}$  in. in diameter, also carries an 11-tooth spur pinion meshing with a 34-tooth spur gear on a parallel shaft. These two reduction gears, bevel and spur, are inclosed in the same housing as the transmission gears, though in a separate compartment. Hyatt roller bearings are used in the transmission, in conjunction with Bantam thrust bearings.

The final drive is through bull gears, which mesh with teeth on the outside of the belt-rail. There are two of these gears, one on either

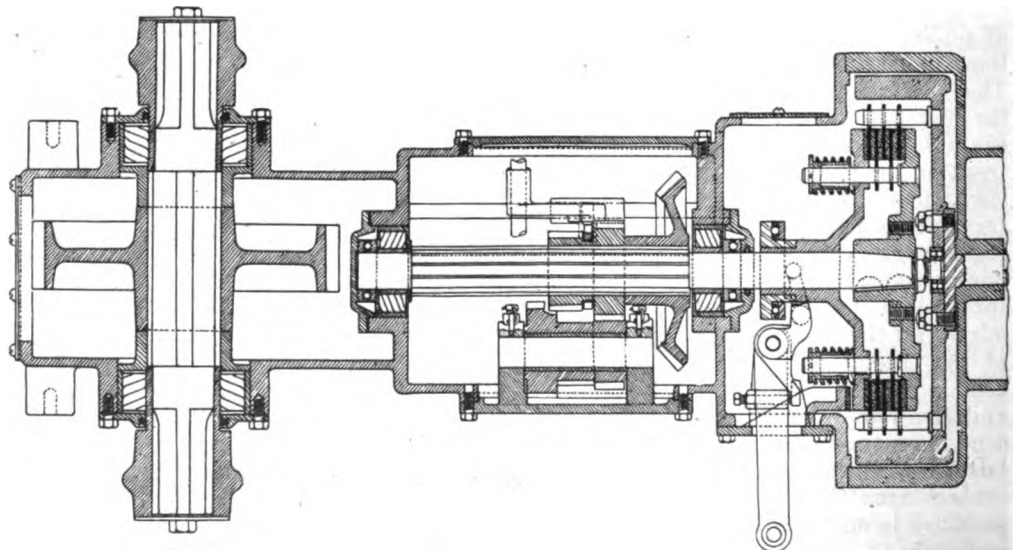
side of the transmission case. The bull gears are  $22\frac{1}{2}$  in. in diameter. The width of the track is 21 in. and its length 48 in.

The belt pulley shaft is mounted in Hyatt roller bearings. The pulley is 10 in. in diameter, and has a width of face of 6 in. The gearing is such that at normal engine speed the belt speed is 2500 ft. per minute.

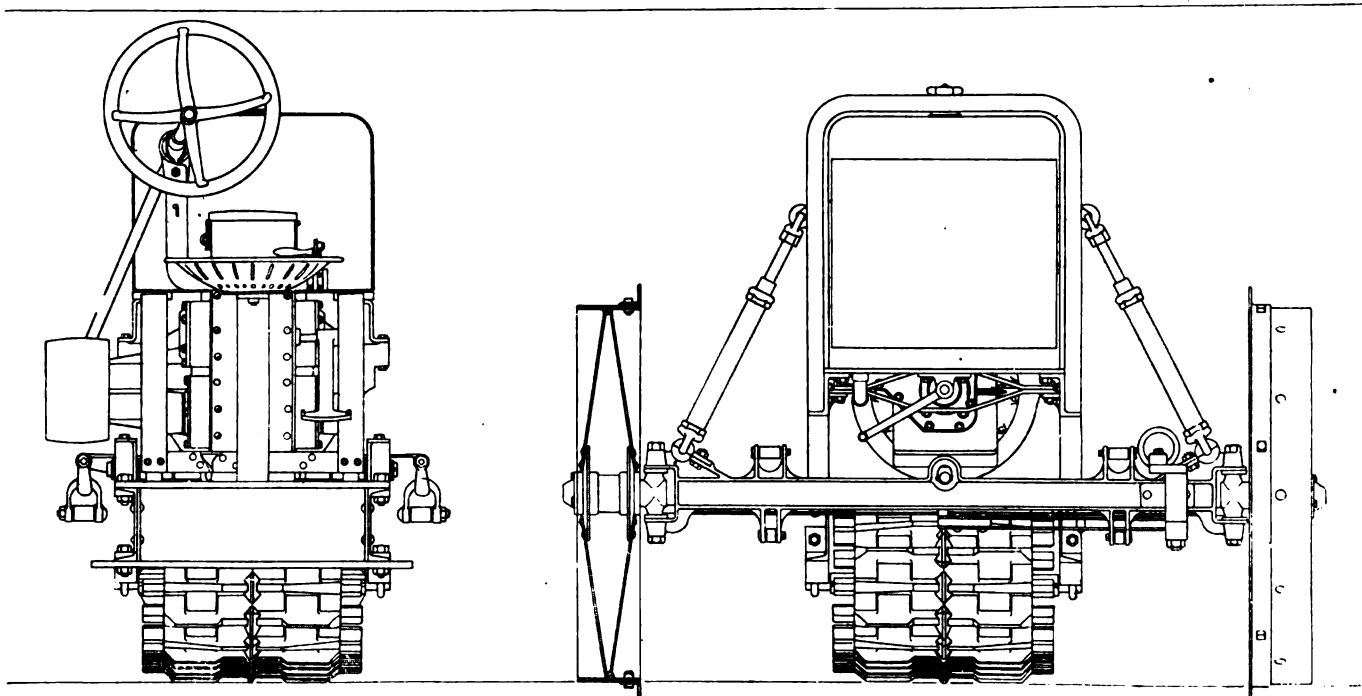
#### Track Rollers Adjustable for Wear

As in other creeper tractors, the weight of the tractor is supported on the track through a series of rollers, five in number. Of these rollers the two outside ones are adjustable lengthwise, so as to permit of taking up any slack in the track due to wear of the joints. The rollers for the track are of the spool type, and their shafts are mounted on Hyatt roller bearings.

The front axle is secured to the frame at the forward end by a sort of pivot and sliding joint; quarter elliptic cantilever springs are used between the frame and the end of the front axle, and there is also a radius rod



Horizontal section through transmission clutch and final drive



Rear and front of the Belt-Rail tractor, showing on the right the attachment of stabilizers to radiator frame

connection. What is known as a stabilizer consists of two coil springs, extending between brackets near the steering heads on the axle, and hooks secured to a frame surrounding the radiator. These permit of the track accommodating itself to sloping ground. The steering wheels are 36 in. in diameter, and are controlled through a screw and nut steering mechanism, operated by means of a hand wheel. The tractor has a turning radius of 9 ft. The frame is built up of 7-in. channel steel. The drawbar may be attached at two different heights, 11 and 18 in.

The weight of the tractor complete, without fuel or water, is 4500 lb.

### Special Threshers for Gas Tractors

ON a former occasion mention was made in these columns of how the advent of the tractor had resulted in changes in the design of such farm implements as plows and binders. Plows for tractors are made more rugged to stand the less yielding draft of the tractor, and in some instances they are made with more sloping mold boards to permit of higher

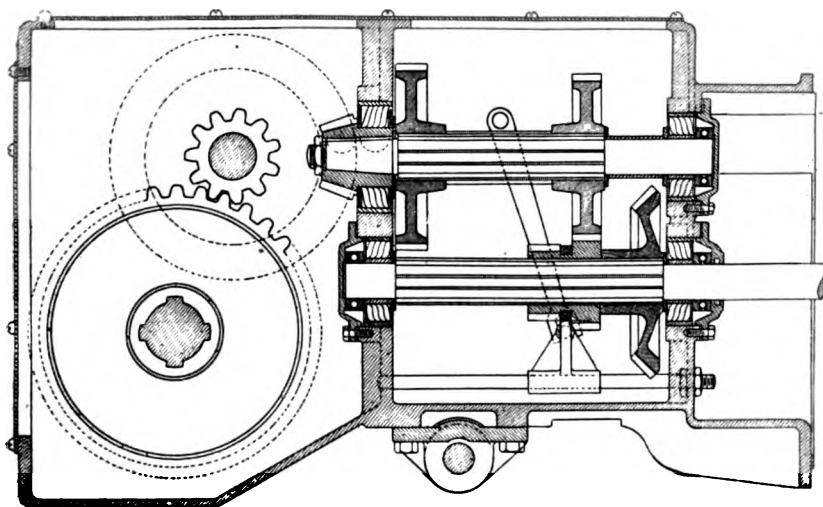
speeds than that attained by the plow horse. Binders have been made to cut a swath of 10 ft. so as to better utilize the power of the tractor without wasting man-power in providing operators for a number of binders hitched in tandem.

During the past year there has been a notable change in the demand for threshing outfits. Until quite recently it was the custom throughout the Middle West, as well as in some other sections of the country, to let out the threshing to contractors who owned steam power threshing outfits. These were large outfits with 36-in. or 42-in. separators requiring from 18 to 20 men to operate them. The contractor, however, furnished only three or four men, perhaps an engineer, a fireman and a water wagon driver, and the rest of the help was secured by neighboring farmers helping each other out.

In pioneer days this no doubt seemed the most economical method, but it has certain disadvantages. The task of boarding 18 or 20 men for two or three days is in any case a most arduous one for the farmer's wife, and is rendered more so by the uncertainty as to the arrival of the thresher, dependent upon weather conditions, breakdowns, etc. Also, when a large number of farmers use the same outfit, some will have to thresh when conditions are not propitious, as when the grain is wet or when it has stood so long in the shock that much is lost by "shelling out" in handling.

As a result of the conditions outlined, there has been a brisk demand during the past year for small threshers adapted to be operated by a three-plow "gas" tractor. It is natural that the farmer who has money invested in a "gas" tractor does not cherish the idea of spending additional money hiring a steam traction engine for his threshing. These small threshers are sometimes referred to as "individual threshers," because they sell largely to farmers for use on their own farms only, but in some cases farmers owning tractors and small threshers will do custom work for some of their neighbors, and in others several farmers in the same neighborhood will buy a thresher together. As only three or four men are required to operate these threshers, the difficulties experienced in accommodating the large thresher crews of former years are obviated.

It is the conviction of a number of leading implement men that the days of the large steam threshing outfit are numbered. The new small thresher is more convenient.



Vertical section through transmission of Belt-Rail tractor



# Some Thoughts on Bombing Plane Engines\*

By a Foreign Expert

FROM the point of view of the pilot, reliability is a prime essential in an aeroplane, and to judge from results, the upright type of engine would appear to be considerably more reliable in the long run than the Vee type. One has only to look at the number of long distance raids undertaken by the enemy and the extraordinarily low percentage of engine failures to realize this. Simplicity is the keynote of efficiency, and incidentally reliability. Surely the following comparison speaks for itself. Take two typical English and one typical German engine of identical horsepower, the 250 hp. Rolls-Royce, the 260 hp. Sunbeam and the 260 hp. Mercedes.

	Rolls-Royce	Sunbeam	Mercedes
Number of magnetos.....	4	4	1
Number of ball races.....	22	17	1
Number of cylinders.....	12	12	6

The principal figures in the foregoing comparison, worthy of note, are the number of ball races. There is at present a serious shortage of a particular grade of steel necessary for the manufacture of ball bearings, which is likely to become acute in the future, so in designing the ideal engine it would appear to be necessary to cut down the excessive number of ball races,

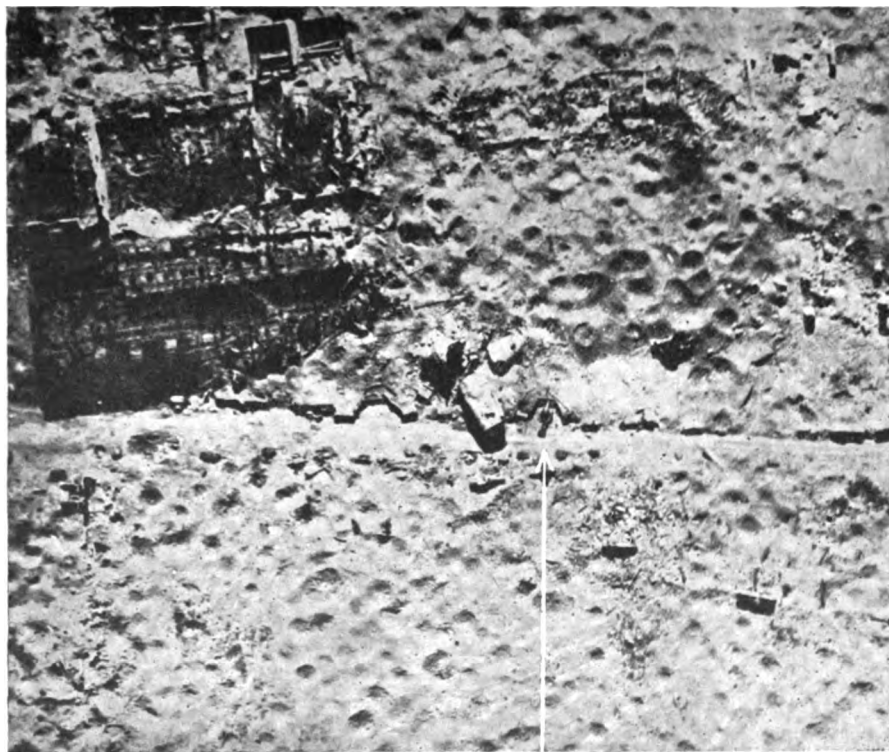
\*While not agreeing with all the views expressed by the author, we print this article because it calls attention to some important truths.—Editor.

as in the Mercedes. The Sunbeam and the Rolls-Royce are high speed, high compression engines, while the Mercedes is a low revolution and low compression engine. Yet which has proved the more reliable under active service conditions? Undoubtedly the Mercedes. What is most needed in an aeroplane is a "margin of power." No automobile engine could be expected either to run reliably or to last any lengthy period of time if it were constantly run on full throttle. The principal reason for its reliability lies in the fact that it is constantly running at different speeds, and seldom on full throttle for long. (Of course, I realize that a car engine has many advantages over the aeroplane engine, as regards solidity and strength of build, but the foregoing is the principal cause of its reliability.)

So far no aeroplane engine has been built or even designed which pretends to yield this much-needed "margin of power," least of all the Vee types. Unless they are running practically "all out" the difficulties of carburetion are such that the engine does not fire evenly on all cylinders. Colloquially stated, no Vee type engine will "tick over" evenly at a slow speed for long, and until an engine is designed which gives this "margin of power" it is not worth while any firm taking up the question of aerial transport from a commercial point of view, because engine failure will remain more or less a lottery. Of course the present type of aeroplanes could be used (with slight modifications), perfectly easy for commercial purposes, but the profits would be totally inadequate even to defray expenditure in overhauls, crashes, etc., or the prices would have to be made so excessive that nobody would take it up.

## Reliability Better Than Speed

Now that we are proposing to undertake the bombing of German towns on a large scale, reliability will be more of an essential than speed, and yet nearly every engine designer persists in designing these high efficiency multi-cylinders, short stroke, high revolution engines, which can only be compared to a racing car. The specialized racing car is tuned up for one race and for one race only, and if that race happens to be a long one, it very often happens that the car is of little use for anything else afterwards because it has been "driven to bits." If you wanted to make a long journey as quickly as possible by road, which would you choose, the specialized track racing car or the high-powered roadster? Undoubtedly the latter,



Ammunition stores and batteries as seen from an Allied airplane over German lines. This photograph reveals clearly a 21-c.m. howitzer gun in the open. With this photograph and the aid of an air observer an artillery commander can quickly demolish the gun

use, though not capable of such high speed as the ; it would prove to be far more reliable under adverse conditions. Similarly, if you wanted to travel a distance over hostile territory and were well equipped, speed would not matter to nearly such a great extent as the staying power of your engine. For an engine to be reliable it must be simple in design, and it has to run constantly at the same speed the revolutions per minute must be low.

#### Success Depends on Pilot's Morale

There is another point which seems to have escaped the notice of a great many of the present-day engineers and that is that the success of an expedition largely depends on the morale of the man who pilots the machine. If this man knows that his engine is going to let him down, that it is reliable, he will have a greater chance of making a success of his raid than if he is constantly waiting and listening for the revolution to slacken down. He knows of no worse feeling on this earth than to be piloting a machine behind an enemy that is known to be unreliable over hostile territory, and to be living in fear of engine failure. Some one imagines that one hears strange sounds in the beating of the exhaust. All the time one is constantly keyed up and listening for things of this nature, with the result that after a time you begin to hear things which don't really exist and eventually, if you use this type of machine long enough, your nerves give away altogether.

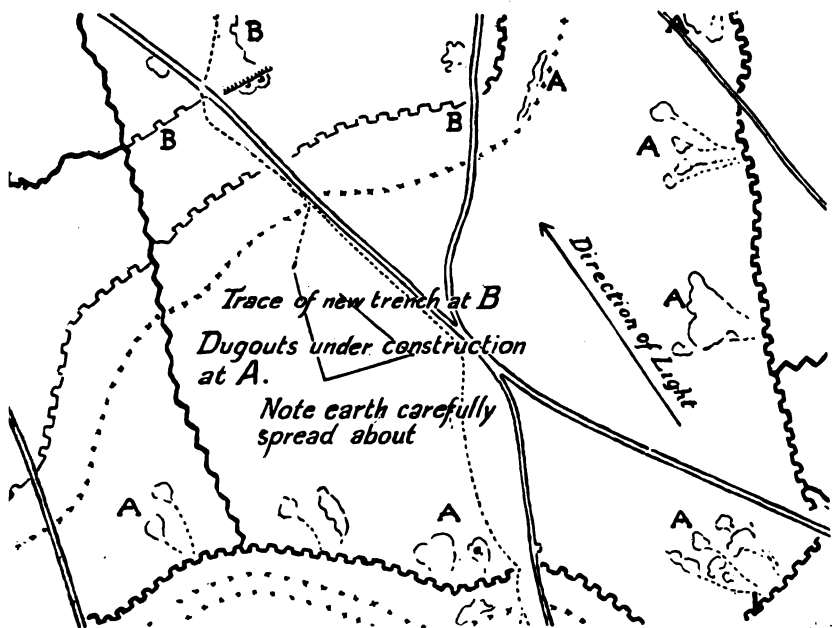
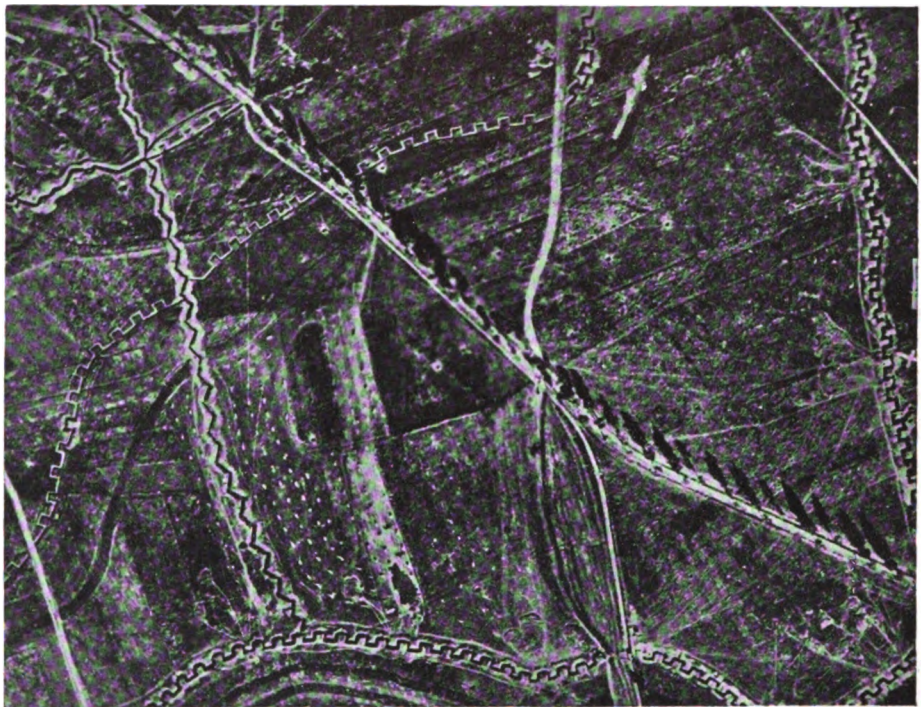
Again, there is another point which is worthy of note, and that is that no Vee type water-cooled engine has ever run for nine consecutive hours in an aeroplane. In engines of this type, unless accurate balance is maintained, the vibration becomes tremendous, and

even when the engine is running sweetly, the vibration which extends to all extremities of the machine is quite considerable.

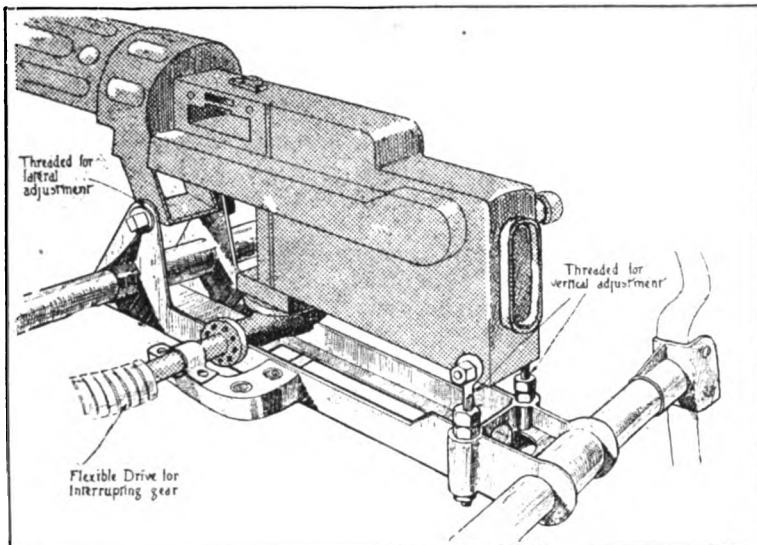
What are the principal advantages of the Vee type engine over the upright engine in car design? Simply that you get one explosion for every quarter revolution of the roadwheel, together with great rapidity of acceleration, neither of which is of the slightest use in an aeroplane.

Some of the points in favor of the upright engine are ease of over-haul, facilities for rapid production, no duplication of fittings, reduction of head resistance, in most cases direct drive. Above all this the Vee engine is only in its infancy and is just beginning to be adopted by car designers, and will have to run the gamut of many alterations and improvements before it is finally, if ever, adopted.

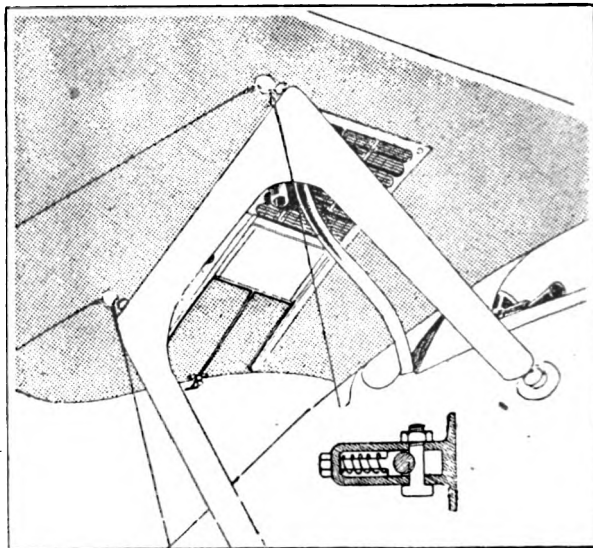
## Making War Maps by Camera



The above view, taken from an Allied airplane over the enemy lines, shows clearly the importance of air photography for the detection of new trenches and dugouts under construction. The method of detecting the important points in photographs is illustrated by the diagram, which is the result of tracing from the photograph the objects worth investigation and study without the confusion of the unnecessary details. For example, near the trenches marked A the enemy has thrown up considerable ground to create confusion to observers. This soil, however, indicates dugouts under construction. The new trenches, marked B, are known by the absence of the heavy shadows which mark the deeper finished trenches.



*The mounting of one of the two synchronized Spandau machine guns which constitute the armament of the Pfalz*



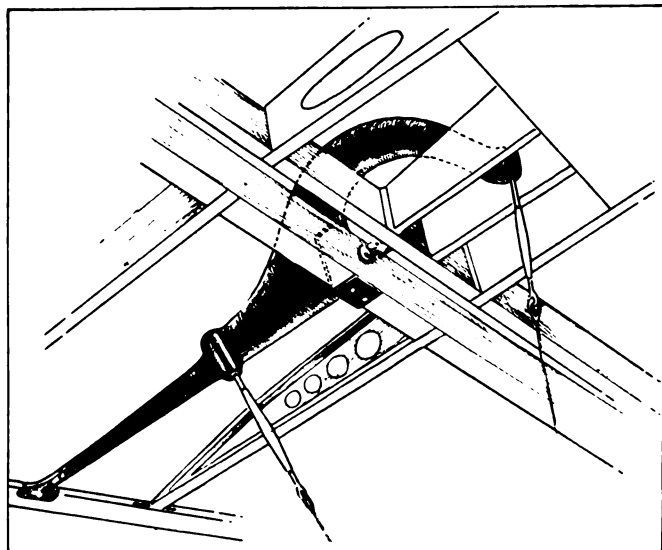
*The radiator is mounted in the top plane, and the cooling is variable by means of a shutter*

# The Pfalz Single-Seater Fighter

## Part V

### Attachment and Construction of Inter-plane Struts and Compression Tubes— Mounting of Armament

THE top plane of the Pfalz is supported from the body by two inverted, flattened U's, as mentioned and illustrated in our last issue. The attachment to the top plane is of a similar character, as shown at the top of the following page. The upper corner of the center-section struts is provided with a sheet steel shoe to which is welded a socket or cup. A bolt passing vertically through the spar terminates in a ball-shaped head, which fits into the cup, and a taper pin passing through ball and socket locks the joint. The inter-plane cables



*A steel tubular crank lever made from two halves welded together along the seams is used for operating the ailerons on the Pfalz*

are attached to little anchor pieces shaped as shown in the sketch, terminating inside the larger cup in a wide head shaped to fit the internal curve of the cup. A certain amount of play is therefore allowed. The right-hand sketch in this illustration shows, from a different point of view, the corresponding fitting on the rear spar.

The internal compression tubes of the wings are secured to the spar by a very simple fitting, shown in the inset sketch. A small steel plate is stamped out to form a shallow projection, the diameter of which corresponds to the internal diameter of the compression tube, which is thus prevented from slipping on the spar. This sheet steel plate is secured to the spars by two horizontal bolts, and its ends are shaped to form the lugs for the attachment of the drift or anti-drift wires, as the case may be. The drift wires of the Pfalz are in reality tie rods of circular section, threaded at their ends to fit directly into the barrel of the turnbuckles. The anti-drift wires are solid wires of about 12 gage size.

#### The Inter-plane Struts

The inter-plane struts of the Pfalz are approximately of Vee form, although they do not quite come to a point at their lower ends. In section they are, needless to say, stream-line, and constructionally they are built up of various laminations, as illustrated herewith in section. The two outer layers are spruce. Then come, one on each side, two layers of three-ply, while the center of the strut is formed by a piece of spruce. The whole is then covered with fabric. The same construction is employed for the center-section struts. The angle formed by the vertical and horizontal arms of these struts is elaborately built up of laminations, the grains of which cross one another at various angles. The strength appears good,



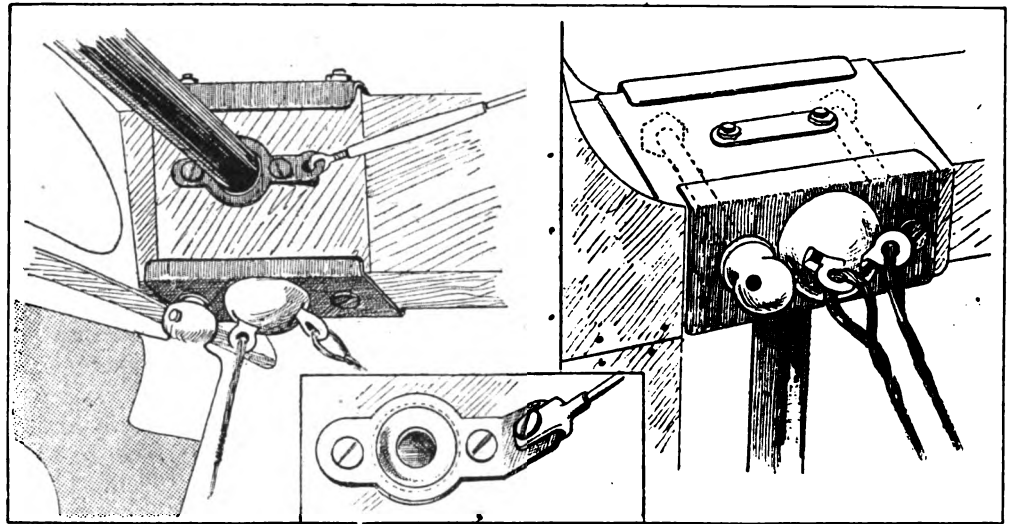
but the struts are certainly not light, compared with the ordinary hollow or even solid spruce strut.

The attachment of the inter-plane struts to the bottom plane is interesting. As the horizontal arm of the struts is shorter than the distance between the spars of the bottom plane the struts cannot be attached directly to the spars. Instead, they are attached, by means of the usual Pfalz ball-and-socket joint, to a compression tube. Owing to the fact that this tube is subject to a lateral load, being loaded both as a strut and as a beam, the usual compression tube attachment already referred to would be inadequate. Instead, the arrangement shown at the bottom of this page is employed. The compression tube is unlike those used elsewhere in the planes, inasmuch as it is not of circular section, but is flattened so as to have flat parallel sides and a top and bottom forming arcs of a circle. At its ends this tube is welded to a base plate of channel section, which partly surrounds the three sides of the wing spar. Before being welded to its end plates the tube is slotted at its ends to accommodate the lugs for the drift and anti-drift wires. These lugs are formed by bending a piece of sheet steel to a channel section, the bottom of the channel being welded to the base plate and the arms welded to the compression tube. The horizontal bolts securing the base plates to the wing spar have their heads filed flat so as to pass between the two drift wire lugs, and are thus at the same time prevented from turning when tightening up the nuts on the other side of the spar. The details of this part of the wing will be clear from the illustration.

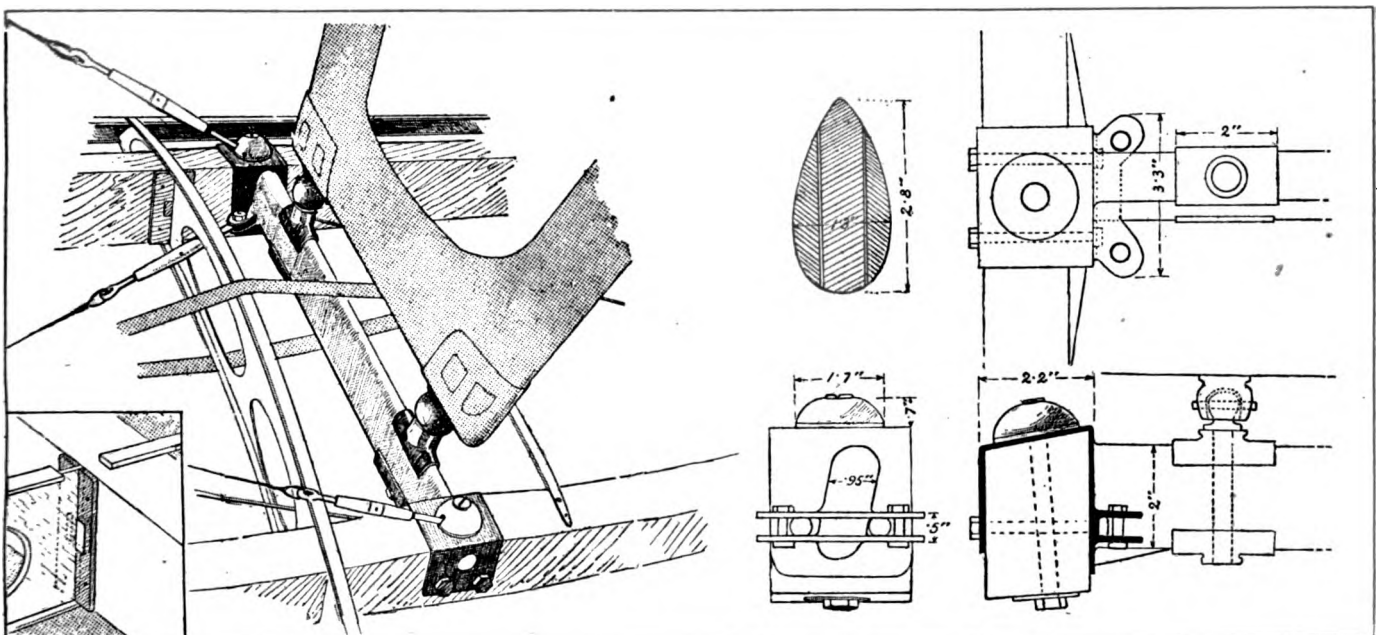
The general arrangement and spacing of the wing ribs of the Pfalz were shown in our last issue. Construc-

tionally the ribs are built up in the usual way of three-ply webs and spruce flanges. False ribs occur between the main ribs, running over the top of the spars, from leading edge to rear spar. These false ribs are made of ash. In connection with the main ribs mention may be made of a rather neat arrangement for attaching the ribs in place on the spars. As usual the rib-flanges are tacked to the top and bottom faces of the spars. In addition the ribs are prevented from sliding along the spars by two vertical pieces of wood, each tacked to the spar. In the middle these vertical pieces are slotted to accommodate a small square block of wood about  $\frac{1}{2}$  in. square—which is glued to the face of the spar. The end of the rib web is recessed to give room for this block, the effect of which is, it will be seen, to relieve to a certain extent the shearing stress on the rib flanges at the corners of the spar. It is only a small detail, but it is worthy of mention, and has been included in the large illustration herewith.

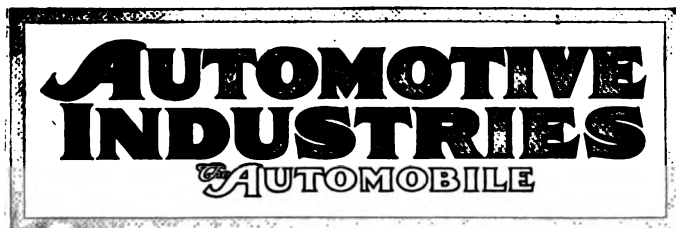
The crank lever of the ailerons is shown in another of  
(Continued on page 604)



*Details of the steel compression tubes and the attachment of the tie-wires on the Pfalz*



*The V-form inter-plane struts are mounted on a steel cross-tubular member, as shown above. The struts themselves are of laminated wood as indicated in the section. The small insert in the corner shows the method of attaching the wing ribs to the spars*



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## The Desirability of Parachutes for Airplanes

EVERY seagoing vessel carries its life boats to which the passengers and crew may repair in case of shipwreck. A life boat is not an absolute protection to the sailor, yet it is the means of saving a large proportion of those who would perish at sea if no such safety devices were carried.

When an airplane is seriously damaged while in flight the occupants are in about the same predicament as the crew of a foundering ship without life boats. The thought has naturally occurred of equipping airplanes with parachutes, which would enable the aviators to jump and descend safely to earth in case the machine took fire, became uncontrollable or was badly damaged by enemy gunfire. Parachute descents from balloons have been made for a great many years and the development of a reliable parachute should in itself not present any insuperable difficulties.

Of course it must be light and compact, so it does not detract too much from the speed, climb and ceiling of the machine. Probably one of the most difficult engineering problems connected with the proposition would be that of a reliable method of attachment to the plane.

### British and German Experiments

Many times in aerial combat aviators are seriously wounded and would not be able to take advantage of a parachute carried "on board," yet it is felt that a device of this sort would save many lives, and after it had once proven its efficacy its presence on the machine would tend to save the nerves of the occupants. The subject of parachutes has received widespread attention in the British press of late, but as yet no steps seem to have been taken to provide them on British war planes. A recent unsuccessful demonstration, which resulted in a fatality, may have the effect of retarding the adoption of the device, though the accident is said to have been due to fault in the attachment and in no way to the parachute itself.

On the other hand, the Germans have begun to equip their fighting planes and recent advices from the British front in Flanders record two escapes of aviators from Fokker biplanes shot down by the British. It would appear from the description given that the device functions automatically, filling with air in consequence of the quick fall of the plane and pulling the aviator out of his seat. If safe landings were effected we will no doubt soon see parachutes made regular equipment of all war planes.

## The Eight-Hour Day as a Basis for Wages

IT is considered probable that practically all of the large steel producing organizations will follow the lead of the United States Steel Corporation in the adoption of the 8-hour working day for employees.

The 8-hour day is the goal for which the working man and labor union have been striving for many years. It has become a sort of fetish which the laborer has worshipped. Whatever conception he had of it and its advantages at the beginning of his fight for it has been modified during the long process of evolution which has been necessary to bring big business, as typified by the Steel Corporation, to a realization of the justice and advisability of granting it now.

What the working man gets, in this case at least, is not an actual working day of 8 hours but a day of that length which is used as the basis of computing his pay. The actual 8-hour day could not be granted now and the laborer understands why. He knows as well as any one that production cannot now be allowed to fall off. He will continue to work 10 or 12 hours a day, as he has during the recent past, and a cold calculation in the accounting department will show that he will be getting for his efforts what is in reality a wage increase of less than 10 per cent.

## They Are Not Buying Liberty Bonds in Belgium

**T**HE manufacturers of Belgium and Northern France are not buying Liberty Bonds.

Some of them are paying tribute to the Hun at a rate which makes our excess profits tax look like a miser's contribution to the village poor-box.

Those who are not paying tribute have already paid the ultimate price of all victims of the Great World Monster—complete annihilation.

The difference between the Belgian manufacturer and the American manufacturer in this respect is merely a difference of distance from Berlin.

We know this now.

We know, too, what the Hun is and what he tried to do.

We know what his methods are and what he thinks of human rights and human life.

We know his ideas of liberty.

We know our duty at this particular time and we will do it.

\$6,000,000,000 worth of Liberty Bonds must be sold—will be sold before the end of another week. The time for explaining why we should buy these bonds has passed. No explanation is now necessary. Everyone knows now not only that it must be done but that it is the one and easiest thing to do.

Everyone knows now that a Liberty Bond, if it paid no interest and never would be redeemed, is still the best investment ever offered in the history of the world, measure its value in any way and by any standard you may choose. Everyone knows this now, Mr. American Manufacturer, you and all of your employees, down to the most unimportant one among them. You need *not* to sell your helpers Liberty Bonds. You need merely give them the opportunity to buy them. And you will do it.

Whether or not yours is a 100 per cent organization depends wholly upon what steps you take to make it so.

And keep this in mind. It is most fortunate that you and your employees do not have to *give*. It is the glorious privilege of both of you to *lend* as our fighters fight.



# □ Latest News of the

## Truck Plans of Car Makers Halted

Government Ruling on Starting Industries Brings Change—Several Affected

DETROIT, Oct. 1—Many passenger car manufacturers in this territory who some time ago announced their intention of entering the truck manufacturing field are obliged to change their programs owing to the Government's ruling relative to starting of new projects.

Among those affected in this territory are Paige, Oakland, Willys-Overland, Olds, Briscoe and Columbia—all passenger car builders. All of them went to more or less expense in preparing their plants for the production of truck models and now must lay aside these activities at least until the war is over. They will all concentrate their efforts on war work.

Nearly all these affected manufacturers, however, will preserve their plans—just stop where they are now—and as soon as the Government gives the word "go" it is their intention to continue from where they left off.

Practically all the truck manufacturers here are on government work—that is, very little of their production is going to commercial fields. The Federal has no trucks going to its dealers.

### Chandler Delivering Tractors

CLEVELAND, Oct. 2—The Chandler Motor Car Co. has reached quantity production on its 10-ton artillery tractors and has delivered 100. It is expected that monthly deliveries will increase rapidly and that 1000 tractors will have been turned over to the Government by Jan. 1.

### Paige Nearly 100 Per Cent on War Work

DETROIT, Oct. 3—The Paige-Detroit Motor Car Co. is rapidly nearing 100 per cent war work and will soon be in production on kitchen trailers, depth bombs and ordinary bombs. This, with the additional order for \$3,500,000 worth of Quad trucks and work on the order for 2000 Signal Corps trucks, will put the company on a 100 per cent war basis in 60 days. Car production is now averaging 25 daily.

### Bomber Makes 143 M.P.H.

WASHINGTON, Oct. 2—A De Havilland 9 plane equipped with a Liberty engine flew from the McCook Field, Dayton, Ohio, to Bolling Field, Washington, D. C., with no stops in 3 hr. 5 min. The

actual flight from Dayton to Washington was 2 hr. 5 min. The distance between the cities is 430 miles with the time of flight 143 m.p.h. The journey was made by Caleb Bragg, civilian pilot, attached to the Engineering Department of the Bureau of Aircraft Production. An engineering officer was the passenger. The pilot traveled by compass at a high altitude and reported no difficulty in holding the course. The plane left for New York this afternoon and will start tomorrow or Friday on a non-stop flight from New York to Dayton.

### Flight Tests of Caproni Plane

WASHINGTON, Oct. 2—Flight tests of an American built Caproni airplane equipped with three Liberty engines are being held by the Bureau of Aircraft Production. A Caproni plane of this type arrived here to-day at Bolling Field from Hazelhurst Field, Mineola, L. I., and will leave to-morrow in a flight for Dayton. This Caproni is one of a few built in United States Government factories for test by American aviators and engineers. The tests are now being made in flights from various fields and will continue to be made until it is decided whether or not to put this particular type of plane in quantity production.

### Daily Liberty Output Averages 278

DETROIT, Oct. 3—Special to AUTOMOTIVE INDUSTRIES—The production of Liberty engines in the several plants that are carrying on this work is rapidly increasing and during the month of September the total average daily production reached 278. It is expected that during the month of October the total output will touch 3000 complete engines.

The Ford Motor Co., is the first plant engaged in this work to exceed a production of 100 complete engines in any one day; on Sept. 30, 120 engines were turned out. This number is increasing daily. Several of the plants, namely, Lincoln, Ford and Nordyke & Marmon, exceeded their August estimates.

### Quantity Liberty Engine Production Reached

WASHINGTON, Oct. 2—The output of Liberty airplane engines is fully up to expectation and has reached quality production. Airplanes are now going ahead rapidly and are being shipped in train load lots daily. These statements were made by W. C. Potter, Acting Director of the Bureau of Aircraft Production, following his return from an inspection of the factories turning out the planes and engines.

## Production Situation Clarified

War Board Has Talk with Makers of Cars and Trucks

NEW YORK, Oct. 3—Chairman Charles C. Hanch of the Automotive Products Section of the War Industries Board attended a meeting of the National Automobile Chamber of Commerce here to-day, and at its close the atmosphere was considerably clarified.

He made a long address before the manufacturers and repeated the statement that every effort should be made to get on a strictly war basis by the end of the year and that the factories may have until Jan. 1 to clean up their inventories. Sentiment among the manufacturers, however, is that they will be permitted to continue this cleaning up after Jan. 1, in case they do not get the job done before and that there is a possibility that the dealers will get some cars during at least the early part of 1919. The production of parts will continue. In cleaning up inventories the ruling of some time ago stands, that production during the last half of this year must not exceed 25 per cent of 1917.

Of the 117 members 74 are now on war work, ranging from 25 to 100 per cent.

Hanch also took up the truck matter. Some time ago it was ruled that makers could produce during the last half of 1918 one-third of the production of the preceding 18 months. Some makers have, however, made this amount during the last 3 months, which would seem to shut them down entirely under the ruling. Hanch stated, however, that such makers would go on at the same ratio as allotted, but that this excess would be deducted from their 1919 allotment.

The traffic committee cited these figures as to carload shipments: August, 1917, 22,000; August, 1918, 13,631; September, 1917, 20,538; September, 1918, 12,000.

The members expressed themselves as in favor of any taxation which is not discriminatory.

One hundred companies were represented by 128 men, one of the largest meetings ever held.

### Olds Will Make Liberty Engines

LANSING, Oct. 1—The Olds Motor Works will soon start production on its initial order of Liberty engines. The first lot of 2000 kitchen trailers is expected to be delivered during this month. The production of passenger cars is slowly being diminished and the plant will be entirely on war work by Jan. 1.

# Automotive Industries □

## 16 De Havilands Daily to France

First Plane Reached France in  
May—Make 130 M.P.H.—  
Praise Liberty Engine

WASHINGTON, Oct. 1.—From 15 to 18 De Haviland 4 airplanes, equipped with Liberty engines, were arriving daily in France in August, according to Major General William L. Kenly, Chief of the Department of Military Aeronautics, who quoted a captain of the Air Service just returned from the headquarters of the American Expeditionary Forces. The captain, stated General Kenly, reported that the first De Haviland 4 planes with Liberty engines arrived at stations in France as early as May 13, 1918, and since that date have been coming in increasing quantities. The captain said that it had been necessary to make some changes in the first planes received, but that each succeeding shipment showed better care, and when he left France the airplanes were very satisfactory. In his report the captain stated:

### Plane Popular With Pilots

The performance of the planes was very good and the plane and motor has become very popular with our pilots. We obtained approximately 130 m.p.h. at ground level with one plane and had without any special preparation obtained an altitude of 10,000 ft. in 10 min. 21 sec., full load, excepting bombs. We were able to loop, dive and otherwise stunt these planes exactly as well as we would any chase plane.

When I left the post the planes were arriving at the rate of 15 to 18 per day. The cars were unloaded by our steam crane, and fuselages unpacked in one day (platform), wings in another day and assembly was progressive, similar to the method used in automobile construction.

After gun test, engine test, and final assembly, the compasses were tested and corrected for permanent magnetism. The machines were then sent to the flying field and were given test flight. After final approval they were then dispatched to stations for assignment to squadron.

Air-test pilots and ferry pilots were all of the opinion that the plane was excellent. The French ministry thought so well of the Liberty motor that the Under Secretary of State for Aviation, Monsieur Dumesnil, informed me that the French would gladly take every motor we could produce which we could not use ourselves. I was also given the same information by Captain de Haviland, the designer of the de Haviland plane.

Lt.-Col. Warwick Wright, Royal Air Force, stated to me that the method of packing the plane was considered by the British to be so good that it could not be improved upon. Out of 750 cases which I inspected I only discovered one in which the contents were badly damaged.

## Implement Makers Get Price Concession

CHICAGO, Oct. 2.—Members of the National Implement and Vehicle Association have been given a concession amounting to approximately \$5 per ton in the price of iron and steel for manufacturing farm implements. The concession is to apply on shipments made on and after July 15, 1918, and on contracts made for material to be used in the ordinary farm implement season ending June 30, 1919. The concession covers steel bars and bands, cold rolled and cold drawn steel, and the following agricultural steel: Parallel shares and regular mouldboards (soft centers); O. H. solids, slag; special O. H., slag; disks, harrows and cultivators; coulters, 15 x 5/32 in.

## Doubles Reduction Drive for White 3 and 5-Ton Trucks

CLEVELAND, Oct. 2.—The White Co., which for some time has used the double reduction gear principle in the drive of its 1½ and 2-ton trucks, has applied this principle to revised versions of its 3 and 5-ton vehicles, in which it has also made a number of other improvements. In these two heavier models there is now employed a unit power plant which is an evolution of the White block engine; a cast radiator of the vertical tube type with removable head and a new system of brakes. Deliveries will be started as soon as factory production overtakes urgent military demands. The type of double reduction gearing employed is that in which the first reduction is obtained through a bevel gear and drive pinion in the center of the axle and the second reduction through drive pinions at the ends of the floating live shafts meshing with ring gears inside the hub case of the rear wheel.

## Lewis Vice-President of Pennsylvania

JEANNETTE, PA., Oct. 2.—Seneca G. Lewis has been elected vice-president as well as general manager of the Pennsylvania Rubber Co. Major C. M. DuPuy, who is at present in France, retains his title of vice-president, sharing this office with Mr. Lewis.

## Chalmers Stock Reduced \$660,000

NEW YORK, Oct. 2.—All the retiring directors of the Chalmers Motor Co. were re-elected at the annual meeting of the company held yesterday in New York. The stockholders approved the plan to reduce the common stock from \$7,060,000, consisting of 532,000 shares without par value, to \$6,400,000, consisting of 400,000 shares of common. The 132,000 shares which are cancelled are held in the treasury. No change was made in the preferred stock.

## Increase Oil Output 2000 Bbl. Daily

By Cementing 50 Wells a Saving  
of 750,000 Bbl. a Year  
Will Be Effectuated

WASHINGTON, Sept. 30.—By cementing oil wells in the North Cushing field of Oklahoma, thereby keeping out the detrimental flow of water, production of oil in the 50 wells has been increased 2000 barrels a day.

The experiment was made by the Bureau of Mines, Department of Interior. In addition to saving 2000 barrels daily for war uses, the experiment added \$4,500 daily to the operators' gross income, and if the increased oil yield continues for one year, which is a reasonable expectation, the experiment will have added 750,000 barrels of oil to the production and \$1,640,000 to the income of the operators.

The cost of cementing the 50 wells was \$10,000, which, when compared with the return, means \$165 for each dollar invested. The Bureau of Mines plans to introduce this new system of cementing the wells in other fields throughout the country in order to meet a possible oil shortage. Commenting on the report, Secretary of the Interior Lane said:

This is the kind of practical conservation that counts heavily just now. It not only is saving from waste one of the most precious natural resources with which this country is blessed, but is also supplying much needed fuel for the Army and Navy. At the same time it is paying the operators handsomely to increase the flow of their wells.

It happens that the crude oil from Oklahoma contains much gasoline. An increase of 2000 barrels of crude oil a day means 500 barrels of gasoline a day or more than 7,500,000 gal. in a year's time. This saving alone, from this restricted field in Oklahoma, is sufficient to drive every automobile in the United States an average of 20 miles, and there are 5,500,000 automobiles in the country.

The best of it is, this is but the beginning of an enormous saving of crude oil by keeping the water out of the wells. It has taken the bureau 2 years to demonstrate the feasibility of using cement in the Oklahoma wells, but now that such a saving can be effected it is being adopted by all progressive oil men.

I understand that the bureau has already started a campaign in the Healdton field, Okla., and that, while it has not yet received a report of the actual results, it is estimated that the saving in this field amounts to more than 300 barrels of crude oil a day. In Illinois the same plan is being introduced, so that the Bureau of Mines is confident that the total savings to the country will be considerable and will go quite a distance in supplying our urgent war needs.

## New Type Kerosene Carbureter

Applied to Any Engine, Gives Same Power as Gasoline Without Smoke or Carbon

NEW YORK, Sept. 28—A kerosene carbureting device which operates on a new principle, and which enables any internal combustion engine designed for gasoline to generate without any change whatever the same power on kerosene as on gasoline, without smoke, carbon deposit or dilution of the crankcase oil has been perfected and is being placed on the market.

The device is the invention of Enoch Rector and is to be manufactured and marketed by the Rector Kerosene Carbureter Co., which is already producing in a limited way and is at present negotiating for the production of the device in large quantities. James F. Allen, of J. F. Allen & Co., 111 Broadway, New York, a firm of bankers, is head of the company. Associated with him are: Vice-president, E. J. Ludington, president of the Chase Bag Co., St. Louis; secretary and treasurer, Stephen N. Bond; George Wilson, manager of the Union Bank of Canada; Archibald R. Watson and other bankers.

The device has been under development for more than a year, and in that time has been extensively tested in the laboratory of Joseph Tracy both for those interested in the company and the United States Government, the latter tests having been made in Tracy's capacity as consulting engineer to the Bureau of Oil Conservation. A long series of road tests have also been made, including the operation of a 5-ton Garford truck for 6 months with the device. The Fifth Avenue Coach Co., which operates the buses on Fifth Avenue, New York, has been experimenting with one of the devices, and during the past 10 days has operated one of its vehicles in regular passenger-carrying work.

According to the tests which were made by Tracy the Rector carbureter gives practically the same mileage on kerosene as can be obtained on gasoline. In laboratory tests the same maximum horsepower is obtainable and the curve shows a considerable increase in horsepower at all speeds below maximum. Analyses of the crankcase oil after both high-speed and low-speed runs show no measurable dilution of the oil. Smoke is completely eliminated, and in the case of the 6 months run of the Garford truck, there was only sufficient carbon deposit to warrant its being wiped off the pistons with a cloth; the valves were in excellent condition.

According to the tests which have been made, the flexibility operating on kerosene is indistinguishable from that obtained with gasoline.

But one size carbureter is required for engines varying in capacity from 15 to 75 horsepower.

In the conduct of the various tests it

is worthy of note that heavy vehicles carrying their rated capacities have always been used. No experiments have been carried on with light vehicles, the thought being that if the device would operate properly and efficiently with a heavy vehicle it would work equally as well with a light vehicle where the demands are not so severe.

Although the use of a heavy vehicle might presuppose almost a continuous capacity load on the engine with little variation of speed and few stops, the reverse has been the case. The device in use on a Fifth Avenue bus, for example—it is fitted to a Knight engine—is subjected to wide demands regarding speed variations with frequent stops of varying length. That the carbureter has equalled expectations for this work is evidenced by the fact that the Fifth Avenue Bus Co. is desirous of equipping all its fleet with Rectors. The fuel consumption measured in dollars and cents is about one-third that with gasoline.

Following are extracts from the report made by Joseph Tracy in his capacity as consulting engineer to the Bureau of Oil Conservation. The tests were made on a 10-ton Garford tractor chassis having a four-cylinder 5.1 x 5.5 engine equipped with Bosch magneto. The vehicle with load weighed 15,275 lb.:

On gasoline the "motor stalled at 9.05 a. m. at 42d Street and 10th Avenue; started immediately. Stopped 9.56 a. m. to telephone and started again at 10.06 a. m. Arrived at Yonkers on first trip 10.25 a. m.; arrived at 42d Street at the end of first trip at 11.30 a. m. Turned and resumed run without stopping. Stopped for traffic at 42d Street and Tenth Avenue one-half minute. Arrived in Yonkers on second trip at 12.34 p. m. Stopped at 12.44 for three minutes for drink. Finished second run at 42d Street at 1.43 p. m. Odometer reading at this point 2723.

"Before beginning third trip, one-half gallon of medium Polarine oil was poured into the motor crankcase. Started third trip from 42d Street at 2.15 p. m., odometer reading 2723 miles. Arrived Yonkers 3.18 p. m.; arrived at 42d Street at 4.20 p. m. Started on last trip at 4.23; arrived Yonkers at 5.23 p. m.; finished 6.27 p. m. at 42d Street, odometer reading 2779 miles.

"Summary of results:

"Weather: fine and clear.

"Temperature: average 73 degrees Fahr.

Barometer, average 30.16 in.

"Condition of road surface during test: dry and in good repair.

"Total distance traveled: 113 miles.

"Elapsed time: 9 hrs. 23 min. 30 sec.

"Actual running time: 8 hr. 35 min.

"Speed, m.p.h.: 13.1.

"Quantity of gasoline in tank at start: 25.375 gal.

"Taken from tank at finish: 3.375 gal.

"Used in test: 22 gal.

"Miles per gallon: 5.1.

"Ton miles per gallon: 39.19."

Immediately following the tests with gasoline, the same route was covered the same number of times with kerosene using the Rector carbureter. Following are the results:

"Weather: fine and clear.

"Temperature: average, 78 degrees Fahr.; barometer: average, 30.04 in.

"Condition of road surface during test: dry and in good repair.

"Total distance traveled: 113 miles.

"Elapsed time: 11 hr. 12 min.

## New Regulations for Exports

Licenses Regarded Used Within Period of Validity—Supersede All Others

WASHINGTON, Sept. 27—New regulations governing the expiration dates of export licenses have been effected by the War Trade Board. On and after Sept. 30, 1918, export licenses will be regarded as used within the period of their validity:

(A) If the through export bill of lading is issued and signed on or before the expiration date of the license and subsequent to Oct. 9, 1917; or

(B) If the ocean bill of lading is dated on or before the expiration date of the license; or

(C) If the dock receipt is dated on or before the expiration date of the license and the ocean bill of lading covering the same shipment is dated not later than 30 days after the expiration date of the license; or

(D) If the railroad notice of arrival issued at the port of exportation is dated on or before the expiration date of the license, and if the ocean bill of lading covering the same shipment is dated not later than 10 days after the expiration date of the license, provided that the provisions of this paragraph (D) shall apply only when the merchandise is exported on vessels loaded at railroad docks, where dock receipts as provided in paragraph (B) cannot be issued by the vessel or its agents; or

(E) If the shipment is on a lighter which arrives on or before the expiration date of the license, alongside the vessel upon which the shipment is to be loaded, and if the shipment is, in fact, loaded on that vessel and ocean bill of lading is signed not later than 30 days after the expiration date of the license.

The railroad agent issuing a through export bill of lading (combination rail and steamship bill covering goods to destination) will forward to the Bureau of Exports, War Trade Board, Washington, D. C., one copy of such bill of lading after there has been noted thereon the port of exit through which the shipment will pass.

These regulations supersede those announced in W. T. B. R. 152, made public June 29, 1918.

"Actual running time: 9 hr. 11 min.

"Speed, m.p.h.: 12.3.

"Quantity of kerosene in tank at start: 25.375 gal.

"Quantity of kerosene taken from tank at finish: 4.25 gal.

"Used in test: 21.125 gal.

"Miles per gallon: 5.3.

"Ton miles per gallon: 39.19."

The present development of the carbureter has only gone as far as kerosene. However, it would seem that other fuels might well be used, such, for example, as distillate, certain grades of fuel oil and crudes not having an asphalt base.



# Liberty Planes Are Being Rushed to Europe

First One Reached Battlefront May 18, and Others Have Followed at Rate of Five to Ten a Day Since

WASHINGTON, Oct. 1.—The first Liberty engine equipped airplane shipped from this country to France arrived on May 18, 1918, not July 1, as was indicated by earlier reports.

If 10,000 Liberty equipped airplanes had been shipped across when the earlier criticisms of the program were made there would have been no facilities for handling them.

In a recent convoy all of the transports, twelve in number, carried Liberty engines and American made airplanes as a part of their cargoes.

The loss of the first five Liberty airplanes flown from the American lines was due to lack of suitable landing ground and the planes landed by mistake within the German lines.

The Liberty engine is proclaimed the best that is made for flying purposes, and airplanes equipped with it have attained a speed of 135 m.p.h.

This statement and other interesting explanations of the airplane situation in France were made by Senator Thompson before the Senate recently, following the Senator's return from a trip through England and France.

## Plane Carries Twenty-one Passengers

He described one of the large Handley-Page bombing planes, type O-400, as capable of carrying 20 passengers besides the pilot and 2000 lb. of bombs in addition to the machine gun equipment, fore and aft as well as in the center. Following is that part of the Senator's address relating to aircraft:

"I also visited various training and flying schools, both in France and England, including the largest flying school in the world at Issoudun, which has about 5000 enlisted men and about 800 officers and a total student membership of about 2000, all of whom are American young men, including a number of Kansas boys. Here they are given about 6 weeks' final training and taught to use all kinds of planes, including the three different types required for all flying squadrons, namely, the fighting or scouting plane, called in the United States service the pursuit plane; the battle, observation, or reconnaissance plane, and the bombing plane. The fliers are divided into three classes and are permitted to choose service with the character of plane they are best able to handle.

"I also inspected the largest aviation assembling plant in the world at Romorantin. Here is where most of the Liberty motors are being installed in the De Haviland 4 and De Haviland 9 planes, commonly referred to as the D.H.4 and the D.H.9. Some criticism on this side of the Atlantic has been made for the delay in the delivery of this character of planes, the erroneous statement being

made on the floor of the Senate as late as last July that there was only one Liberty motor battleplane in Europe. The truth is, delivery of these planes was not expected earlier than July, while, as a matter of fact, the first Liberty motor plane arrived, was set up complete and christened on May 18, 1918, and they have been arriving over there at the rate of five to ten per day ever since.

"Every transport on our way over to France—twelve in number—carried Liberty motors and planes. Complaint was also made because we did not have as many as 10,000 or 20,000 planes over there, when, as a matter of fact, if they had been there they could not have been used, because there was not sufficient hangars or aerodromes to take care of them, or ample flying stations or fields from which to fly and land; and neither was there a sufficient number of fliers or competent men in the aviation service to properly take care of the planes or a sufficient supply of gasoline or lubricating oil.

"The first five Liberty planes had the misfortune to land within the German lines by mistake, so the importance of having suitable grounds on which to land, and to know where to land, can readily be seen.

"It requires about fifty experienced men and three extra planes behind the lines to keep one man flying. While, of course, there was some delay in the development of this wonderful Liberty motor, which is not to be wondered at, but having produced the best motor in existence rather than adopting some inferior motor, it has certainly been worth whatever loss has been caused by the delay and will prove a greater benefit in the long run. The fact is, that the Allies predominate in the air as they do in manpower and in artillery. It is, indeed, gratifying to know, however, that the delay has ended and that planes are now arriving at the distributing points in France about as rapidly as they can be taken care of.

## De Haviland Is Good All-Purpose Plane

"I enjoyed a flight over France in one of the completed and thoroughly equipped Liberty D.H.4. planes. This plane is regarded by experts to be the best all-purpose plane in existence, one that can be used fairly successfully for all three purposes required in a flight, to wit, battling, observation, and bombing. They are each modernly equipped, carrying a pilot who is armed with a Marlin machine gun capable of shooting 600 shots per minute, and the propeller in front of him so synchronized with the gun as to permit the pilot to fire right between the blades without hitting them, and also carrying an observer armed with a Lewis machine gun, which has a greater shooting ability, because it has an independent train and can be pointed in any direction.

"The D.H.4 Liberty plane weighs about 3800 lb., equipped with pilot and observer, and carries 500 lb. of bombs, equally divided, hanging from each wing, and so arranged that the operator may drop the bombs in 50-pound packages, or, if he prefers, can drop the whole 500 lb. at one time. Each plane is also equipped with wireless-telegraph outfit, besides other modern devices for navigation and communication.

"It was also my privilege to visit the Handley-Page plant in England, and on Sept. 1 to enjoy a flight over the city of London in one of the large Handley-Page bombing planes, the type commonly known as O-4000, which can carry 20 passengers besides the pilot, and 2000 lb. of bombs besides machine-gun equipment, fore and aft as well as in the center. The wings of this plane measure 100 ft. spread from tip to tip, and the body is 65 ft. in length, and the plane weighs without equipment 3½ tons and can carry in addition almost its own weight, so that it weighs when fully equipped about 6 tons and costs about \$30,000. It has two 350-hp. motors, both the Rolls-Royce and Liberty motors being used, placed on each side of the nose of the machine instead of directly in front, with platforms built so that the motor can be cranked or repaired in the air. It carries 300 gal. of gasoline and can travel about 800 miles without landing.

## Superairplane to Carry 50 Fighters

"While this may seem like a big story, yet this plant is now turning out another plane twice as large and with more than twice the capacity, carrying 50 passengers, over 2 tons of bombs, and will be able to fly from London to Berlin, bomb that city, and return home without leaving the air. I would not give these facts, except I know they are well known to the enemy by reason of the fact that the very first Handley-Page plane put into commission on trial by the British landed within the German lines by mistake, and Germany immediately began to duplicate it. This, however, was a good thing for Mr. Page, for after a long, hard struggle to get recognition from his own Government for the production of this wonderful machine, as soon as it was adopted by Germany, it was immediately approved by the British, and now they cannot be manufactured fast enough. I had the good fortune to witness several airplane battles at Chateau-Thierry, Verdun, Belgium and along the English front near Amiens.

"I also visited various flying schools in England, principally at Chattis Hill, near Winchester, where I took another airplane flight and flew over to a large flying school at Lecombe Corner, some distance away, and back again. We have 72 different flying schools in England in connection with the English aviators, both American and English fliers being trained and fitted for service, and from which place the fliers are sent to the front in France as they become proficient.

"Special attention is given to the training of all young men for the service they are to perform before they are placed in danger. Every possible precaution is taken to protect them by our Government. There are six rest camps in England where those who disembark on English shores rest up before going to France to enter the training camps there. I learned of at least 14 different kinds of schools in France, as follows: Artillery, airplane and photography, observers, transportation facilities, blacksmithing and repairs, gas schools, machine-gun and automatic rifle, Signal Corps, French mortar, pigeon schools (training the handling of, and caring for, pigeons for messenger service), engineers, camouflage, Army school of the line, and General Staff College."

## Stock of Petroleum Decreases

Oil on Hand During First Half of Year 12 Per Cent Less Than During Last Year

WASHINGTON, Sept. 30—In the first half of 1918, 12,397,660 barrels of crude petroleum were marketed, as compared with 12,114,179 barrels marketed in the same period of 1917. The consumption for the first 6 months of 1918 total 12,669,181 barrels as compared with 11,619,674 for the same period in 1917. The stocks at the end of each of the first 6 months of 1918 show a decrease of approximately 12 per cent as compared with the stocks at the end of each similar month in 1917. Herewith are the tables as prepared by the Department of Interior.

WASHINGTON, Sept. 30—Oil refineries throughout the country have been requested to increase kerosene production to the fullest extent to forestall a possible shortage during the coming winter by M. L. Requa, Director of the Oil Division of the United States Fuel Administration.

Kerosene consumption is increasing,

stated Mr. Requa, and unless immediate steps are taken to increase the supply we will face a shortage this winter, more acute than any experienced with other petroleum products. Following is the letter in full, which was sent to all refineries by Mr. Requa:

I am convinced it is absolutely necessary that the kerosene production of the country be materially increased. Statistically, kerosene is in a more unsatisfactory position than gasoline or fuel oil. We have not heretofore felt the acuteness of this situation because of the summer season through which we have just passed. Now, however, we are approaching the season of maximum kerosene consumption and unless steps are taken immediately to provide increased supply we shall undoubtedly this winter face a shortage much more acute than we have as yet experienced in any of the petroleum products.

The statistics now in the hands of your Sub-Committee show clearly the decrease in the percentage output of kerosene by practically all refineries. The situation as a whole shows decrease in barrels produced and a very large increase in domestic consumption which fortunately has been offset by a decrease in exports due to lack of tonnage for overseas movement. This export movement is now increasing, and the winter will soon be upon us. I request, therefore, that you communicate with each refinery, forwarding them a copy of this letter, and urge upon them the absolute necessity of increasing their kerosene production to the fullest extent possible, at least to a percentage amount equal to that of last year.

## Gasoline from Gas Gains 111%

Output During 1917 Is 114,391,415 Gallons Ahead of Production in Year 1916

WASHINGTON, Sept. 30—The natural-gas gasoline industry in the United States produced 217,884,104 gals. of gasoline by means of compression, absorption, vacuum pumps and the drip system, a gain of 114,391,415 gals. or 111 per cent over the output in 1916. Of this quantity 77.5 per cent was covered by compression and by vacuum pumps, and the remaining 22.5 per cent by absorption and by salvage from the gas mains. The combined production of gasoline obtained by compression and vacuum pumps was 99 per cent greater than that obtained in 1916, and the production secured by absorption and drips was 110 per cent greater.

Market Value Gains 180 Per Cent

Slightly more than 300,000,000 gals. of commercial gasoline was secured from the total output in 1917. The average price paid in 1917 for the raw production at the sources of production was 18.45 cents per gallon and the market value of the

Production, Consumption and Stocks of Petroleum During First Half of 1917 and 1918

APPALACHIAN FIELD							GULF FIELD						
Month	1917			1918			Month	1917			1918		
	Marketed	Apparently Consumed	Stocks End of Month	Marketed	Apparently Consumed	Stocks End of Month		Marketed	Apparently Consumed	Stocks End of Month	Marketed	Apparently Consumed	Stocks End of Month
January.....	1,960,044	1,675,682	4,161,870	1,731,000	1,913,676	3,638,740	January.....	1,943,651	1,770,398	9,554,025	1,651,600	1,110,864	8,925,556
February.....	1,724,571	1,897,055	3,989,386	1,998,300	1,712,810	3,924,230	February.....	1,790,040	1,638,194	9,705,901	1,569,800	912,920	9,522,436
March.....	2,116,689	2,072,860	4,033,215	2,177,900	2,110,330	3,991,800	March.....	1,966,889	1,701,040	9,971,730	1,826,000	2,189,900	9,158,539
April.....	1,978,046	1,908,872	4,102,389	2,177,560	2,203,275	3,966,085	April.....	2,131,112	1,854,831	10,248,011	1,744,600	2,213,960	8,689,170
May.....	2,204,088	1,785,721	4,520,756	2,279,700	2,284,235	3,961,550	May.....	2,108,246	2,101,179	10,255,078	2,032,806	2,354,310	8,367,660
June.....	2,130,741	2,279,484	4,372,013	2,033,200	2,444,835	3,549,895	June.....	2,046,908	2,329,534	9,966,452	2,164,120	2,261,460	8,268,320
	12,114,179	11,619,674		12,397,660	12,669,181			11,980,826	11,395,141		10,926,920	11,043,414	
LIMA-INDIANA FIELD							ROCKY MOUNTAIN FIELD						
Month	1917			1918			Month	1917			1918		
	Marketed	Apparently Consumed	Stocks End of Month	Marketed	Apparently Consumed	Stocks End of Month		Marketed	Apparently Consumed	Stocks End of Month	Marketed	Apparently Consumed	Stocks End of Month
January.....	315,175	179,398	2,276,64	168,300	154,611	1,919,930	January.....	611,898	499,646	903,323	842,700	841,961	516,080
February.....	263,462	201,433	2,338,671	227,900	537,380	1,610,450	February.....	664,332	689,243	878,412	769,500	772,630	512,960
March.....	335,111	184,229	2,489,553	290,700	312,366	1,588,790	March.....	760,885	871,004	768,293	1,048,400	920,230	641,130
April.....	309,745	401,993	2,397,305	294,000	288,860	1,593,930	April.....	799,346	700,342	867,297	955,400	842,970	753,500
May.....	338,029	477,885	2,257,449	314,990	308,080	1,600,840	May.....	760,360	782,444	845,213	1,081,100	954,880	879,780
June.....	329,662	419,953	2,167,158	281,400	427,470	1,454,770	June.....	753,332	767,820	830,725	1,076,960	1,056,060	900,680
	1,891,184	1,864,891		1,577,290	2,028,761			4,350,153	4,310,499		5,774,060	5,388,721	
ILLINOIS FIELD							CALIFORNIA FIELD						
Month	1917			1918			Month	1917			1918		
	Marketed	Apparently Consumed	Stocks End of Month	Marketed	Apparently Consumed	Stocks End of Month		Marketed	Apparently Consumed	Stocks End of Month	Marketed	Apparently Consumed	Stocks End of Month
January.....	1,433,901	1,550,335	6,281,388	1,004,400	1,300,442	3,264,180	January.....	7,763,281	8,953,195	42,647,328	8,443,500	9,154,450	31,842,780
February.....	1,197,218	1,549,933	5,928,673	1,032,600	965,590	3,331,180	February.....	7,035,199	8,234,465	41,448,082	7,693,450	8,185,410	31,350,820
March.....	1,433,513	1,908,255	5,456,931	1,189,800	1,232,390	3,288,600	March.....	7,827,901	8,681,095	40,414,868	8,309,300	8,718,580	30,941,640
April.....	1,308,431	1,627,553	5,137,809	1,145,100	1,367,600	3,066,100	April.....	7,757,775	8,771,735	39,400,908	8,349,500	8,895,790	30,395,250
May.....	1,424,684	1,705,262	4,857,241	1,205,400	1,247,500	3,024,000	May.....	7,764,440	8,933,542	38,231,806	8,529,120	11,624,410	27,399,960
June.....	1,336,263	1,602,950	4,590,554	1,186,940	1,292,270	2,918,670	June.....	7,463,656	8,929,957	36,765,505	8,486,932	8,165,262	27,721,630
	8,134,010	9,941,278		6,764,240	7,405,792			45,611,252	52,683,989		49,811,802	54,643,902	
MID-CONTINENT FIELD							SUMMARY BY MONTHS						
Month	1917			1918			Month	1917			1918		
	Marketed	Apparently Consumed	Stocks End of Month	Marketed	Apparently Consumed	Stocks End of Month		Marketed	Apparently Consumed	Stocks End of Month	Marketed	Apparently Consumed	Stocks End of Month
January.....	12,305,363	13,055,077	103,506,525	13,401,500	12,297,104	100,571,610	January.....	26,333,171	27,684,584	169,331,101	27,244,000	26,774,106	150,678,870
February.....	11,030,427	10,391,573	104,135,379	12,521,200	12,215,190	97,877,620	February.....	23,696,107	24,602,724	168,424,484	25,763,750	28,302,926	148,129,700
March.....	13,537,322	13,156,224	104,516,477	14,696,600	16,070,000	96,504,220	March.....	27,979,149	28,752,566	167,651,067	29,639,700	31,584,790	146,114,610
April.....	12,819,531	12,132,421	105,203,587	14,181,700	14,352,340	96,333,580	April.....	27,104,844	27,396,505	167,357,306	28,848,860	30,165,795	144,797,675
May.....	13,016,035	13,213,067	105,006,555	14,228,820	14,031,830	96,530,570	May.....	27,616,740	28,999,948	165,974,098	29,672,930	32,706,248	141,764,360
June.....	13,375,807	11,896,586	106,486,776	14,355,640	13,665,940	97,230,270	June.....	27,431,228	28,226,143	166,179,183	29,584,192	29,304,317	142,044,235
	76,074,485	73,843,948		83,385,460	85,622,404			160,161,239	165,664,570		170,643,432	178,808,175	

Includes about 2,000,000 barrels of refinery products included in stock totals prior to May. Statistics for the California field in 1918 were furnished by the Standard Oil Co. (California), the Independent Oil Producers Agency, and the Pacific Coast Petroleum War Service Committee. Statistics of crude oil marketed in 1918 include runs of 4,643,000 barrels net from producers field tanks.

entire output was \$40,188,956, a gain of 180 per cent in gross market value as compared with 1916.

It is estimated that 429,000,000,000 cu. ft. of natural gas was used to produce the gasoline, and the average recovery of gasoline per 1000 cu. ft. was about one-half gallon. The tables include the essential statistics of the natural-gas gasoline industry in the United States in 1917.

### Urge Gasoline Cards

WASHINGTON, Sept. 27 — Recommendation for a card system to be used for gasoline distribution "during the gasoline shortage" was made in Congress yesterday by Congressman Focht. The recommendation was the result of a letter from a constituent, a farmer, who pointed out what he considered the injustice of the Sunday gasolineless program. The farmer, he said, working in his field on week days, witnessing the cars driving by, able only to use his on Sundays, considers it an injustice to be prohibited from the use of passenger cars on Sunday while others with more leisure might use theirs during the week.

### Exports of Petroleum Products for Eight Months of 1918

EXPORTS BY GROUP	AUGUST		EIGHT MONTHS ENDED AUGUST	
	1918	1917	1918	1917
Mineral oils, gal.	237,979,571	225,487,195	1,828,722,361	1,695,532,542
Mineral oils, value	\$32,919,914	\$21,307,362	\$227,470,466	\$154,931,531

### EXPORTS BY PRINCIPAL ARTICLES

Crude mineral oil, gal.	9,553,294	12,192,207	132,549,891	108,504,211
Crude mineral oil, value	\$560,642	\$308,280	\$7,466,943	\$4,843,940
Lubricating oil, gal.	27,807,975	23,247,049	175,767,051	179,556,884
Lubricating oil, value	\$8,777,919	\$4,858,128	\$49,632,214	\$34,264,732
Gasoline, naphtha, etc., gal.	56,944,192	30,593,418	378,621,070	272,594,932
Gasoline, naphtha, etc., value	\$13,677,715	\$7,275,604	\$93,525,191	\$58,733,714
Residuum, fuel oil, etc., gal.	106,564,466	113,518,172	819,830,744	677,623,851
Residuum, fuel oil, etc., value	\$5,582,935	\$4,948,284	\$44,395,445	\$24,574,208

### U. S. Produces Most Petroleum

WASHINGTON, Sept. 30—Five hundred million six hundred fifty-one thousand eighty-six barrels of petroleum were produced in 1917, according to a statement by the United States Geological Survey, Department of Interior. Of this amount 66.98 per cent was produced by the United States. This is 5 times greater than the amount produced by Russia, which ranks second.

The production for the 40 years extending from 1857 to 1917 total 6,983,567,246 barrels. During this period the United States led in production with an output of 60.89 per cent of the total amount.

### August Oil Exports 9,553,294 Gal.

WASHINGTON, Sept. 26 — Crude mineral oil exports for August were 9,553,294 gals. valued at \$560,642, as compared with 12,192,207 gals. valued at \$408,280 for August, 1917. Exports of gasoline, naphtha, etc., amounted to 56,944,192 gals. valued at \$13,677,715 for August, 1918, as compared with 30,593,418 gals. valued at \$7,275,604 for August, 1917, showing an increase of 85 per cent. Herewith is the summary of oil exports.

### World's Production of Crude Petroleum in 1917, and Since 1857, by Countries

Country	PRODUCTION, 1917			TOTAL PRODUCTION, 1857-1917		
	Barrels of 42 Gallons	Metric Tons	Per Cent of Total	Barrels of 42 Gallons	Metric Tons	Per Cent of Total
United States	335,315,801	44,708,747	66.98	4,252,644,003	567,019,201	60.89
Russia	669,000,000	9,418,509	13.78	1,832,583,017	242,336,182	26.24
Mexico	55,292,770	8,264,266	11.04	222,082,472	33,166,241	3.18
Dutch East Indies	12,928,956	1,778,495	2.58	175,103,267	23,628,200	2.51
India	68,500,000	1,133,333	1.70	98,583,522	13,144,469	2.41
Galicia	5,965,447	829,629	1.19	148,459,653	20,646,663	2.13
Japan and Formosa	2,898,654	386,487	.58	36,065,454	4,808,727	.52
Rumania	2,681,870	357,000	.54	142,992,465	19,283,174	2.05
Peru	2,533,417	337,789	.51	21,878,285	2,917,104	.31
Trinidad	1,599,455	222,456	.32	5,418,885	753,670	.08
Argentina	1,144,737	168,340	.23	3,047,858	436,033	.04
Egypt	1,008,750	134,500	.20	2,768,686	369,158	.04
Germany	995,764	140,000	.20	15,952,861	2,155,974	2.30
Canada	205,332	27,378	.04	24,112,529	3,215,004	3.50
Italy	50,334	67,000	.11	947,289	133,919	.01
Other countries	6,530,000	70,667	.10	927,000	123,600	.01
	500,651,086	68,000,596	100.00	6,983,567,246	934,137,289	100.00

aQuantity marketed.

bEstimated.

cIncludes British Borneo.

dEstimated in part.

eIncludes 19,167 barrels produced in Cuba.

### Gasoline From Natural Gas Marketed in the United States in 1917

State	Number of Operators	PLANTS		GASOLINE PRODUCED			Estimated Volume of Gas Treated, M Cu. Ft.	Average Yield of Gasoline per M Cu. Ft. Gas, Gallons
		No.	Daily Capacity, Gallons	Quantity, Gallons	Value	Price per Gallon, Cents		
Okl.	167	234	492,436	115,123,424	21,541,905	18.71	84,719,941	1.359
W. Va.	128	188	136,663	32,668,647	6,511,813	19.93	167,771,351	0.195
Cal.	45	49	99,761	28,817,604	4,438,022	15.40	45,351,247	0.635
Pa.	287	251	59,164	13,826,250	2,778,098	20.01	49,487,056	0.279
Tex.	10	11	32,550	6,920,405	1,149,441	16.61	12,677,216	0.546
Ohio	49	61	25,137	5,439,560	1,051,376	19.33	30,062,141	0.181
La.	15	20	20,118	4,979,754	814,747	16.36	2,143,511	2.323
Ill.	33	55	17,392	4,934,009	866,033	17.55	2,685,895	1.837
Ky.	5	5	13,400	3,818,209	763,186	19.99	24,915,946	0.153
Kan.	4	6	4,642	1,174,960	241,219	20.53	9,315,339	0.126
N. Y.								
Col.	7	6	2,122	181,262	33,116	18.27	68,154	2.659
	750	886	902,385	217,884,104	40,188,956	18.45	429,197,797	0.508

### Gasoline Produced by Compression and by Vacuum Pumps

State	PLANTS		GASOLINE PRODUCED		GAS USED	
	Number	Daily Capacity, Gallons	Quantity, Gallons	Value	Price per Gallon, Cents	Average Yield of Gasoline per M Cu. Ft., Gallons
Oklahoma	207	456,632	106,728,213	20,321,067	18.68	26,399,280
California	40	82,092	23,478,521	3,637,827	19.49	27,477,442
West Virginia	159	44,348	12,276,784	2,211,494	18.01	4,845,648
Pennsylvania	234	32,564	9,011,199	1,792,480	19.89	3,572,360
Louisiana	18	17,915	4,459,920	719,758	16.14	1,468,346
Illinois	54	15,392	4,268,158	756,344	17.72	2,020,044
Texas	9	11,050	3,997,337	674,443	16.87	2,685,316
Ohio	54	8,337	2,331,498	423,106	18.15	836,639
New York	5					
Kansas	1	3,322	369,925	70,361	19.02	150,784
Kentucky	3					
Colorado	1					
	785	671,652	168,921,555	30,606,830	18.12	79,456,856

### Gasoline Produced by Absorption<sup>a</sup>

West Virginia	29	91,315	20,391,883	4,800,319	21.09	162,925,703	0.125
Oklahoma	27	35,804	6,395,811	1,220,538	19.09	48,320,661	0.132
California	9	17,669	5,239,689	800,196	14.99	17,873,804	0.299
Pennsylvania	17	26,600	4,815,051	965,668	20.47	45,914,700	0.105
Kentucky	2	13,006	3,725,898	745,210	20.00	24,871,590	0.180
Ohio	7	16,800	3,108,062	628,470	20.31	29,225,502	0.106
Texas	3	21,650	2,976,068	484,898	16.28	10,010,233	0.293
Kansas	5	3,842	1,071,633	220,550	20.58	9,274,289	0.116
Illinois	1	2,600	665,851	109,689	18.47	665,851	1.000
Louisiana	2	2,203	519,834	94,989	18.37	675,165	0.770
New York			7,000	1,400	20.00	2,776	
Colorado							
	102	230,883	49,017,549	9,592,026	19.87	349,780,274	0.140
Grand total	886	902,385	217,884,104	40,188,956	18.45	429,197,797	0.508

aIncludes drip gasoline.

bIncludes gasoline produced in Kentucky from West Virginia gas.

cIncludes some gasoline produced by compression.

dDrips only.



## Mail Applications for Preference

### N.A.C.C. Sending Out Forms for Passenger Car and Truck Makers to File with W.I.B.

NEW YORK, Oct. 1—The National Automobile Chamber of Commerce is this week sending to passenger car and motor truck manufacturers Application Forms for Places on the Preference List. This is known as "P. L. Form No. 1" and, it is explained, should be filled out and sent at once to the Priorities Division of the War Industries Board, Washington. If the form is approved, the manufacturer is placed on the preference list for fuel, labor, materials and transportation in view of shortages.

In filing the form, makers of trucks are instructed to state that it is in accordance with Circular No. 11 of the War Industries Board and Circular No. 177 of the N. A. C. C., relating to priority for materials for trucks under pledges that such vehicles are to be sold for essential purposes. Passenger car makers, in filing the form should state that it is in accordance with their agreement with the War Industries Board as made plain in that Board's letter to the N. A. C. C. relating to preferential treatment for materials for passenger cars to

be produced during the last half of 1918. The forms are reproduced herewith.

### Marine Engine War Service Committee Formed

WASHINGTON, Sept. 28—Members of the Marine internal combustion engine and accessory industry met here yesterday at the direction of the Chamber of Commerce of the United States and elected a War Service Committee to represent the industry as a point of contact with the Government. The names of the committee are not yet made public and will not be until each member elected signifies his acceptance, following which the names will be certified by the Chamber of Commerce and announced.

### Coal Production Drops Slightly

WASHINGTON, Oct. 1—Bituminous coal production for the week ending Sept. 21 was 12,650,000 tons. This is 4 per cent below the production of the week of Sept. 14, but exceeds the production of the corresponding week of 1917 by 19.4 per cent or 2,060,000 tons. The anthracite coal output for the week ending Sept. 21 was 1,847,000 tons, a decrease of 11.5 per cent as compared with the preceding week and a decrease of 2.1 per cent against the corresponding week of 1917. The loss in anthracite production was due to a strike.

## Government Control of Platinum

### Licenses Required for Sales, Production, Use and Grading —Supply Far Short

WASHINGTON, Sept. 27—Regulations have been completed for the licensing of the sale, use, production and trading in platinum, iridium, palladium, sulphuric acid or other mineral products containing these metals. Licenses will also be required for the use of these metals for manufacturing purposes. The regulations limiting the sale, possession and use of these metals have been drawn up by the Bureau of Mines to be enacted by the War Industries Board, in accord with a Congressional act.

It is unlawful under the regulations for any person without a license to purchase, sell or trade in these metals or to possess 1 oz. troy or more of unmanufactured platinum, iridium, palladium or the compounds for more than 90 days. Licenses are required to purchase, sell or trade in these metals, unmanufactured, except that sales can be made without a license to an authorized agent of the United States or to a licensee who has been given permission to make the purchase. Licenses are required also for:

Producing these metals by mining.

P. L. Form No. 1

**APPLICATION  
FOR PLACE ON  
PREFERENCE LIST**

TO THE PRIORITIES BOARD,  
OF WAR INDUSTRIES BOARD,  
Washington, D. C.

The undersigned hereby makes request to be placed on Preference List of industries and plants for the reasons stated below

**DEFINITIONS OF TERMS.**

- The term "the Allies" shall be taken to mean the nations associated with the United States in the war in which it is now engaged.
- The term "Government" includes the United States Government and the Allies.
- The term "direct Government orders" signifies any order or contract placed by the War Department or the Navy Department of the United States, or the U. S. Shipping Board Emergency Fleet Corporation, or by the Allies.
- The term "indirect Government orders" signifies materials, supplies, or equipment necessary in the manufacture of or in component parts of direct Government orders.
- Work of exceptional or national importance shall be taken to mean work which, while not primarily designed for the prosecution of the war, yet is of great public interest and essential to the national welfare, such as equipment and supplies for railroads and other public utilities, equipment and tools for mining of fuel and ores required in war work; agricultural implements, food accessories, repairs to existing industrial machinery, and other work of similar character.

**NOTE.**—If there is insufficient room to answer printed questions, use separate sheets) attached to completed questions, or table pages ten and four may be used.

1	Insert here name and address of applicant.	Name General office address
2	Location of particular plant for which preference is requested. Separate applications for each plant.	City or town Served by what railroad
3	Nature of product or products. If more than one, approximate per cent of each in total production.	
4	Principal uses which are made of your products, approximate per cent for each use.	
5	List here the machines, tools, and equipment necessary for the production of your products. (Limit entries to those which are essential to the production of your products.)	

Answer to Questions 6, 7, and 8 should represent only the percentage of output which is being applied to unfilled orders. Each percentage in connection with the answer to No. 9 should make sense.

Classification of work on hand.	Per cent.	Description, War Order number, etc.	Estimated time required for completion.
6	What per cent of applicant's total output is now devoted to direct Government orders?		
7	What per cent of applicant's total output is now devoted to indirect Government orders?		
8	What per cent of work is "of exceptional or national importance" as above defined?	State why work is of exceptional or national importance	
9	All other work (percentage).		
Total.		100%	
10	Close approximate monthly requirements of fuel for all purposes.	(a) Coal (tons). (b) Coke (tons). (c) Fuel oil (gallons). (d) Gas (cu. ft.).	11 Number of employees: (a) Men (b) Women 12 Paid on hand
13	Further information considered to be of importance in the consideration of this application.		

The undersigned, being first duly sworn, on oath says that the statements contained in the foregoing application are full, true, and correct.

Subscribed and sworn to before me this \_\_\_\_\_ day  
of \_\_\_\_\_, 1918.

Notary Public

in and for \_\_\_\_\_

By \_\_\_\_\_  
(Name of officer legally empowered to act for applicant.)

Forms which manufacturers of passenger cars and commercial vehicles must fill out and file with the War Industries Board to have themselves placed on the Preference List for fuel, materials and transportation

Producing sulphuric acid or other chemical products where platinum, iridium or palladium is used in the production.

Importing or exporting these metals.

Producing platinum, iridium or palladium either as a primary product or as a by-product by smelting or refining.

Manufacturing electrical appliances or parts containing these metals.

Manufacturing scientific instruments containing them.

Manufacturing or producing any article or product not mentioned above, including chemical, dental, surgical or jewelry supplies containing these metals, where such business requires more than 1 oz. troy per month of platinum, iridium or palladium.

Platinum compounds are used for contact points in ignition systems for airplanes, trucks and all kinds of automotive apparatus as well as in telegraph and telephone instruments.

#### Present Demand and Supply

Representatives of the War Industries Board have set forth the sudden and great increases that the government authorities had found it necessary to make in connection with platinum, etc., requirements. In fact, the government's estimate of requirements was only 40,000 ounces in March and 69,000 in June. Their statement of stocks on hand, while large, is not reassuring should the war continue for years, and the Russian platinum mining be long suspended by internal revolution.

For the year 1913 the world's production of crude platinum has been given at about 313,000 ounces troy, while for 1917 only 83,000 ounces; thus at present there is obtained from all the mines only 26½ per cent of the pre-war output. In 1913 Russia was credited with 95 per cent of the total and in 1917 only 60 per cent.

#### Platinum Discovered in 1735

Iridium is associated with platinum and the supply of this metal is for the most part obtained from the platinum deposits of Russia. Platinum was discovered on Colombia, South America, in 1735. In 1810 it commanded only from 30 to 40 cents an ounce. It was found in Russia in 1819. In 1828 it had a value of about \$7 an ounce. The fluctuation in values of platinum and iridium from 1901 to 1914 is most noticeable, the price per troy ounce of platinum varying from \$14 to \$36. Since 1914 platinum and all allied metals have varied in price as follows: For 1914, platinum \$45, iridium \$65, and palladium \$44; 1915, platinum \$55, iridium \$83, and palladium \$67; 1917 platinum \$103, iridium \$150, and palladium \$110; 1918, platinum \$105, iridium \$175, and palladium \$185, the Government fixed prices.

Next to Russia, Colombia produces the largest amount of platinum and presents the most promise of larger future outputs under stimulus of higher prices. Platinum in this country is found in many places but in small quantity, being less than 1 per cent of the world's production, but with the present high price its discovery and production in this country may be somewhat increased.

## 14 Solid Tire Sizes Now Standard

### War Board Reduces List from Over 100—Mostly Affects 1 to 2-Ton Trucks

WASHINGTON, Sept. 30—Sizes of solid tires will be reduced from a range of more than 100 types and sizes to 14 types and sizes within the next 2 years. An immediate reduction to 40 sizes has been ordered and this will be lowered to 36 on Nov. 1. Following that date there will be a gradual elimination of other types and sizes at specific periods until the minimum number is attained. The use of caustic soda in tire manufacture is to be discontinued at once.

The effect of the reduction within the next two years of solid tire sizes from more than one hundred to fourteen will not by any means be serious. Approximately one-third the total number of truck manufacturers will be affected, but only in so far as their smaller models are concerned.

Analysis of the sizes to be eliminated and those to be continued reveals that 114 separate models of trucks produced by various manufacturers will be affected. Of these models 28 are 1-ton, 36 are 1½-ton and 27 are 2-ton, which is a total of 91, leaving only 23 other models of capacities varying from ¾ to 6 tons which are affected. Practically all manufacturers producing vehicles larger than 2 tons already have adopted tire sizes which fit in with the standardized sizes to be adopted.

These plans are the result of a series of conferences between representatives of the industry and the War Industries Board, held to standardize the sizes and types of solid tires, to reduce the amount of labor, material and capital used. Following is the standardized program:

**Class A**, which is the range of standardized sizes and types which will be continued, includes hard base pressed-on and all removable types of tires of the following sizes:

32x3	36x4	40x5
32x3½	36x5	40x6
32x4	36x6	40x10
	36x7	40x12
	36x7	40x12
	36x8	40x14
	36x10	

**Class B**, which is the range which will be discontinued no later than Nov. 1, 1920, includes hard base pressed-on and all removable types of tires of the following sizes:

30x3½	34x3	36x3½	40x7
	34x3½		
	34x4		
	34x5		38x5

**Class C**, which is the range to be discontinued in manufacture no later than Nov. 1, 1919, includes hard base pressed-on and all removable types of tires:

32x3½	34x6	36x8	38x4
			38x5
			38x6
			38x6

**Class D**, the range which will be discontinued on Nov. 1, 1918, includes hard

base pressed-on and all removable types of tires:

34x3½	42x5	38x4½
	42x6	

**Class E**, which will be discontinued at once, includes all types and sizes of solid tires not specified in the above classes.

#### Continue Tire Production at 50 Per Cent

NEW YORK, Oct. 1—Production of pneumatic tires during October, November and December is to be continued at the same rate as during August and September, namely 50 per cent of normal production. During this period tire manufacturers will be allotted only one-third of their normal quantity of rubber. This means that they must use up all surplus stocks. Those who are close to the situation state that such surplus stocks are ample to permit this fifty per cent production of tires. The War Industries Board, which has made these rulings, hereafter will consider the rubber industry as a controlled industry. Restriction of pneumatic tire production applies only to casings and tubes smaller than 6 in. section. There will be no restriction of 6 in. or larger tires. No restriction will at present be placed on the production of solid tires.

#### G. M. C. Buys Jim Dandy Cultivator

CHICAGO, Sept. 30—The General Motors Corp. has purchased the Jim Dandy Motor Cultivator, hitherto made by the S. K. & S. Co., El Paso, Ill., and manufacturing facilities will be moved to Janesville, Wis. For the coming season it is probable the production will be from the factory of the Janesville Machine Co., but will be made a part of the production of the G. M. C. tractor factory at Janesville, as soon as the latter is completed. The Jim Dandy motor cultivator is of distinct type since it is belt driven. In one row model it can be driven with reins and is easier managed and handled than is a team of horses. The 2-row model is constructed so that the cultivator beams may be dropped and a draw bar substituted for the hauling of any of the lighter utensils on the farm.

#### No Children on War Work

WASHINGTON, Sept. 30—Children under 14 years of age cannot be employed on war work. Children between 14 and 16 years of age cannot be employed more than 8 hours a day nor before 6 a. m. or after 7 p. m., and no more than 6 days per week on war work. These regulations were announced to-day by the War Labor Policies Board. The board states further that the prohibition of employment of children below certain ages does not imply that their employment above these ages is favored. It merely states these regulations because of the great demands that children be included in the industrial war effort for war. It points out that 14 or 16 years of age workers are certain to be workers in their lat-

## Marines Have U. S. Made Outfit

### First Aviation Unit to Go Overseas with American Built Equipment

WASHINGTON, Sept. 28—The first aviation unit organized in this country and sent abroad using American-made material was the First Marine Aero-nautic company, equipped for water flying only, which is stationed abroad at a naval base. This information is made public in an announcement of the Marine Corps Aviation.

In addition to maintaining a flying field at Miami, Florida, where actual flying training is given, the aviation Section of the Marine Corps gives candidates instruction in ground work at the Massachusetts Institute of Technology, Boston, and has two schools for instruction in aviation mechanics.

The flying course at Miami covers 75 days, and includes preliminary, acrobatic and formation flying combined with instruction in bombing, gunnery and reconnaissance. There are now 289 students at the Massachusetts Institute of Technology. When marines are assigned to this school they are enrolled as Gunnery Sergeants for the duration of the course and receive the pay allotted to this rank.

#### Chance For Promotion

Those who show themselves as promising material are made officers after completing their training as flyers. The ground course lasts 10 weeks and 80 men are graduated each month. One hundred men kept in reserve at all times insures against a break in supply of men to the school. If a man fails to be graduated he has the option of being transferred to training for regular duty in the Marine Corps or being discharged.

Of the two schools for mechanics, the larger is maintained at the Naval School for Mechanics, Marine Corps Section, Great Lakes Training Station, Chicago, Ill. Here Marines are trained as mechanics, riggers and armorers. At present there are 120 enlisted men taking the course at Great Lakes, and 60 men are sent each month from the Marine Corps. The total number of men allotted to the Marine Corps at one time is 360.

The second school for aviation mechanics is located at the Naval School, Marine Corps Section, San Diego, California. The training is the same as given at the Great Lakes School. Ninety-three enlisted Marines are taking the course at the present time. The capacity is 120.

#### Hanch Increases Production for Two

WASHINGTON, Oct. 1—Some idea of the relief some truck manufacturers may expect from the action of the War Industries Board restricting production during the last half of this year to one-third of

the number of vehicles produced during the last 18 months is given by decisions of Charles C. Hanch, chief of the Automotive Products Section, early this week. It is understood that two manufacturers already have had their apportionments increased, both by practically 50 per cent. Hanch is given latitude by the War Industries Board to increase or decrease apportionments. It is understood that he will decide individual cases and that a number of truck manufacturers at present have appeals pending.

#### The Pfalz Single-Seater Fighter

(Continued from page 593)

the illustrations. As in all German machines, ailerons are fitted to the top plane only, and their crank levers are horizontal, working in slots in the plane. The aileron hinges on a false spar. The crank levers are built up of two halves of sheet steel, pressed to form in section one-half of an ellipse. The two halves are then welded together along the edges. The control cables are secured to the crank lever by the same ball-and-socket attachment as that employed for the rudder and elevator controls already described. The cables pass from the lever, around pulleys in the bottom wing, and through tubes to the controls. These tubes appear to be made of some sort of paper or cardboard, although whether made by wrapping the paper spirally or rolled up straight to form a tube we have not been able to ascertain.

Reference has already been made to the fact that the radiator of the Pfalz is mounted in the top plane. The cooling may be varied by an adjustable shutter which has a handle projecting back so as to be within the reach of the pilot. The rod carrying the handle has a series of notches cut in it so as to form suitable stops for the shutter in any desired position. The details of the locking device are included in the sketch of this part.

The armament of the Pfalz consists of two synchronized machine guns of the Spandau type. Two transverse tubes form the supports for the gun mounting, which appears very light, being made of light gage steel suitably reinforced by webs in places. The rear attachment of the gun provides for vertical adjustment, while the front attachment enables a slight lateral alignment of the gun after the mounting has been bolted into place on the cross tubes. A peculiarity of the gun placing on this particular Pfalz is that the guns are entirely inclosed under the top covering of the body, with only the muzzle projecting. On a later specimen of the Pfalz fighter the more usual placing of the guns above the body has been employed, whether because inclosing the guns was found unsatisfactory or not we are not in a position to say. Probably the inclosed guns were found to have a tendency to overheat.

In the Pfalz under review no attempt appears to have been made to camouflage the machine, which is painted with aluminum paint all over its body and wings. The rudder tail plane and elevator are painted a dark yellow.

## Egypt Fair Market After War

### Few Cars Entering Now—Introduction of Trucks and Tractors Needs Education

CAIRO, EGYPT, June 30—Very few automobiles are now being imported into Egypt for private use owing to war conditions and the difficulty of shipping facilities from American ports. This applies to cars for use by civilians. The British army uses a very large number of cars of all types, all of which are purchased through the war office in London.

There should be a fair demand for automobiles in Egypt after the close of the war. The possible buyers are found in the European population resident here and also among the wealthier Egyptian natives. Automobiles in Egypt largely are used in the three centers—Cairo, Alexandria and Port Said. There are a few in the smaller Egyptian cities, but the roads throughout Egypt are not yet sufficient in number or of such character as to encourage automobiling generally throughout the country. Roads are improving each year.

Egypt should be a good market for gasoline farm tractors, and after the war those American firms having energetic Egyptian representation will undoubtedly meet with success and sell a fair number of these tractors.

Motor trucks are not largely used in Egypt, although a few of the larger stores in Cairo have motor delivery wagons. The heavy truck or camion is practically unknown except for army uses.

The reasons for the few trucks in use is partly found in the fact that Egypt has not sold many horses because of the war demand, although a large number of camions and donkeys have been purchased by the British army for the Palestine campaign.

This has not affected the question of local transportation to the point where business houses will look to motor trucks or even to farm tractors to make up for the loss in animal power because of the war. Both agriculture and transportation have been carried on in a crude way in Egypt and it is going to call for an educational campaign before these conditions will change.

#### Ohio Labor Shortage Acute

TOLEDO, Sept. 20—According to reports from twenty-one local United States employment offices throughout Ohio the state's labor shortage continues to be acute. The records show that approximately 10,000 jobs were filled during the week ended Sept. 14. There were 17,074 requests for help. Applicants totaled 14,352. Out of the 4182 requests for female help 2488 took positions. There were 227 applications for farm work and 132 took jobs. Requests for farm work numbered 229.



## Production Uncertainty Bothers Truck Makers

NEW YORK, Oct. 3—It is expected that as a result of the meeting of the Motor Truck Committee of the National Automobile Chamber of Commerce which is to be held this afternoon, the situation with regard to production will be materially clarified. Manufacturers are at odds and end following the recent ruling of the War Industries Board curtailing production during the last half of the year to one-third of the output during the past 18 months and this is one question which is to be threshed out.

At the time the Highways Transport Committee was getting into its stride, no hint of curtailment had appeared and it was with the probability of full production that this committee's plans were developed. Now, however, that a curtailment appears imminent, it may be that considerable revision of such plans will be necessary. It is understood, in fact, that certain plans now under consideration are entirely held up and will not be acted upon until some assurance regarding future production is forthcoming.

That there may be some relief is apparent from the action of Charles C. Hanch, chairman of the Automotive Products Division of the War Industries Board, who already has been instrumental in having the allotments of two manufacturers increased by practically 50 per cent.

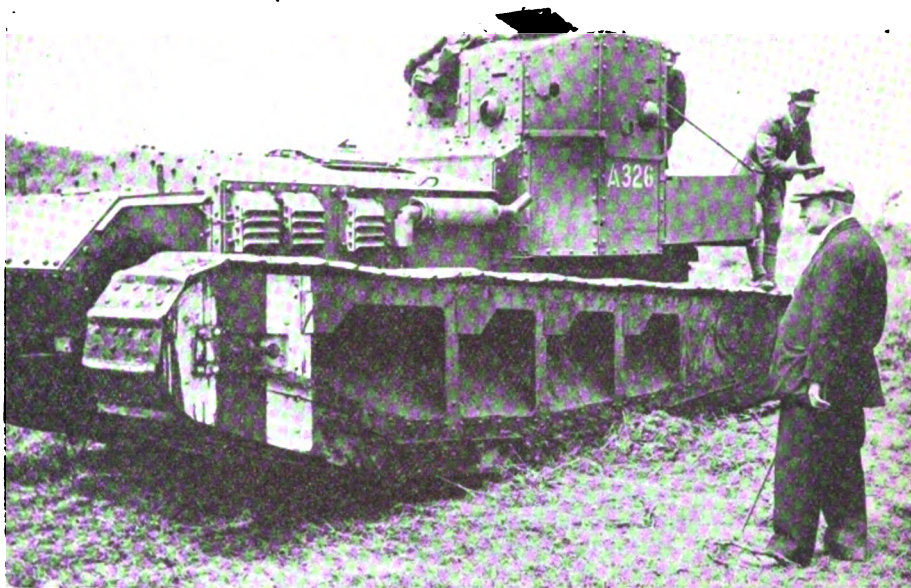
The directors of the N. A. C. C. held their regular monthly meeting yesterday. This is to be followed to-day by the regular meeting of members, after which will come the meeting of the truck committee. At the director's meeting, the consensus of opinion was that members of the association will not oppose any taxation which in the opinion of government is necessary.

### Detroit Subscribes 25 Per Cent Quota

DETROIT, Oct. 2—Over 25 per cent of Detroit's \$74,000,000 quota was subscribed by the fourth day of the campaign. The total now stands over \$19,000,000. The fourth day brought nearly \$5,000,000. Among the subscribers were the following:

Packard	\$1,000,000
Hudson	700,000
Fisher Body Co.	500,000
Cadillac Motor Car Co.	450,000
Maxwell-Chalmers	300,000
Studebaker Corp.	250,000
Detroit Copper & Brass	250,000
Timken-Detroit Axle Co.	225,000
Continental Motors Corp.	200,000
Hudson (employees)	178,000
Detroit Iron & Steel Co.	100,000
Nich. Smelting & Refining	100,000
Paige	100,000
Detroit Lubricator	119,600
Michigan Steel Castings	111,000
Morgan & Wright	100,000
Michigan Lubricator (employees)	52,000
Michigan Malleable Iron (employees)	50,000
Northway Motor	50,000
Buhl Stamping	50,000
Jeffery-DeWitt Co.	40,000
Michigan Lubricator	27,000
Anderson Electric Car Co.	25,000
Buhl Malleable Co.	25,000
Sherwood Brass (employees)	25,400
Total	\$5,078,000

Toledo corporations and individual members subscribed a total of \$3,635,000 the first day of the loan or nearly one-fifth of the entire quota of the city and county.



Another view of one of the British Whippet tanks which are doing such effective work on the Western front. These are being operated in conjunction with the cavalry and have been quite successful in the Allied drive at Picardy. The civilian in the picture is the Prime Minister of Newfoundland

Willys-Overland	\$1,500,000
Auto-Lite Electric Co.	300,000
Champion Spark Plug Co.	\$150,000

Flint's factory men have already oversubscribed their quota of \$1,111,725, having pledged \$1,254,270 or an oversubscription of \$150,000 of the total subscription to date. The Buick shops which head the list show nearly half of the subscriptions with a total of over \$664,000.

Chevrolet Motor Co.	\$238,300
Champion Ignition Co.	109,100
Port Motor Co.	52,000
Flint Varnish & Color Works	25,000
Imperial Wheel Co.	10,200
Marvel Carburetor Co.	16,900
Walker Weiss Axle Co.	17,300
Weston Mott Co.	146,000
Grand Rapids Brass Co.	25,000
Haskelite Co.	20,000
Hayes Tonia Co.	50,000
Keeler Brass Co.	75,000
National Brass Co.	10,000

### Regulations Governing Tractor Production

WASHINGTON, Oct. 3—Under government control curtailing the use of steel and iron in the manufacture of farm tractors and farm equipment which was announced in AUTOMOTIVE INDUSTRIES last week, regulations issued to-day provide that tractor manufacturers who produced and sold 50 or more tractors Oct. 1, 1917 to Sept. 30, 1918, may not exceed 75 per cent of their consumption of iron and steel during that period in the year October, 1918, to Sept. 30, 1919. Tractor makers who produced and had in field operation 10 tractors and not more than 50 tractors during the last year, will not be allowed to produce over 50 tractors during the coming 12 months. Tractor manufacturers who produced less than 10 tractors in the last 12 months cannot produce more than 10 tractors during the year Oct. 1, 1918 to Sept. 30, 1918. Manufacturers of other farm equipment or machinery similar to farm tractors will also have to follow these regulations.

Signed pledges will be demanded from manufacturers by the War Industries

Board to use materials on hand or that come into their possession, solely for the manufacture of tractors, farm equipment and parts, to reduce the tonnage of iron and steel as provided by the regulations, to produce only the most essential farm equipment and parts and to distribute the products only for essential users which comply with the curtailment regulations of the War Industries Board providing for economies and substitution.

The tractor and farm equipment industries consumed 2,000,000 tons of iron and steel in the last year and it is expected that 500,000 tons will be saved for the direct war program by the curtailment.

Judge Parker, Priorities Commissioner, in a statement issued with the regulation acknowledged "that the farm tractor and farm implement industry is not only an essential but an actual indirect war industry." He pointed out the urgent need for steel and iron for direct war needs at this time, however, and makes this the reason for the curtailment.

### Wilson Made Curtiss Vice-President

BUFFALO, Oct. 2—At the monthly meeting of the board of directors of the Curtiss Aeroplane & Motor Corp. Charles Wilson was elected a director and vice-president in charge of production. Mr. Wilson is president and general manager of the Wilson Foundry & Machine Co., Pontiac.

### Ford's Eagle I In Test Runs

DETROIT, Oct. 1—Henry Ford's first sub-chaser—Eagle I—which was launched July 11, has been fitted up and is now making runs up and down the Detroit River in tests. Since the date of the launching of this boat six other Eagles have been put into the water. There are always twenty-one Eagles in the course of construction.

## Many Detroit Plants Enlarge

### Great Increase in War Work Necessitates Expansion—Building Permits Increase

DETROIT, Sept. 30—Due to the steady increase in the volume of war work in Detroit and surrounding territory many automobile and allied concerns find it necessary to erect new buildings and additions to increase their facilities for supplying the growing war requirements. An unusually large number of building permits for factory buildings and additions have been issued during the past few weeks.

The Packard Motor Car Co. is planning a one-story oil reclaiming station to be erected at the plant on East Grand Boulevard and the Michigan Central Railroad.

Dodge Brothers are contemplating a \$300,000 addition to the new building which was recently erected on Lynch Road to accommodate war work.

The Hudson Motor Car Co. has plans on foot for an additional plant building, 60 x 450, to cost in the neighborhood of \$60,000. It is reported that the building will be used for shell manufacture.

The Paige-Detroit Motor Car Co. will erect a one-story generator house building at the plant located on McKinstry Avenue.

The Swedish Crucible Steel Co. is building a one-story addition to its factory at Butler Avenue and the Grand Trunk Railroad.

The Parish Mfg. Co., manufacturer of automobile frames, will erect a two-story addition to its factory on Mt. Elliott Avenue, between Harper and Milwaukee Avenues.

The Detroit Copper & Brass Rolling Mills, which is practically on 100 per cent war work, has under construction the erection of a \$400,000 addition to its

factory at 1223-9 West Jefferson Avenue.

The Detroit Auto Piston Co. will erect a one and a half story factory addition, 60 by 104.

J. E. Bolles Iron Works is planning a one-story building to be erected at the plant located at Milwaukee Avenue and Grand Trunk Railroad.

The Continental Motors Corp. is making plans for a large power house to be erected at the Muskegon plant.

### Ball Bearings on Preferred List

WASHINGTON, Sept. 30—The manufacture of ball bearings and steel balls has been recognized as an essential industry by the War Industries Board. Any member of the industry whose plant is now or in the future shall be exclusively devoted to manufacturing products being or to be absorbed directly or entirely by the Government or in other uses of essential importance, may have his plant given a Class B-3 rating for steel and iron requirements. This rating is given upon the condition that the usual pledge of co-operation be signed and that the rules of the Priorities Division be followed. Manufacturers whose entire output does not go for Government use may file applications for places on the preference list and will be given preference according to the extent of their direct or indirect Government business.

### Caproni Climbs 13,500 Ft. in 46 Min.

NEW YORK, Oct. 1—In recent tests the Caproni bombing plane, fitted with three Liberty engines and carrying a load of 4650 lb., averaged 105 m.p.h. With this load it was able to climb to 6500 ft. in 16 min. It reached 10,000 ft. in 27 min. and 13,500 ft. in 46 min. The gasoline consumption approximated 30 gal. per engine per hour.

### Open Bids for 25,000 B Trucks

WASHINGTON, Oct. 1—Bids for 25,000 Class B 3-ton war trucks have been received by the Motors Division of the U. S. Army, and opened to-day.

## Latin America a Good Market

### Enormous Opportunities Offered Manufacturers of Automotive Products

NEW YORK, Sept. 30—A glance at the export statistics given in tabular form on this page is sufficient to indicate the enormous extent to which our trade in automotive products with Latin America increased during 1917 when compared with the figures for the previous year.

As compared with 1916, our 1917 passenger car exports increased 52 per cent in number and 76 per cent in value.

Our commercial car exports increased no less than 232 per cent in number and 210 per cent in value.

The value of parts exported increased 232 per cent, tires increased 107 per cent and the only decrease shown is that of gasoline, which is a fraction less than 5 per cent below 1916.

### 106 Per Cent Increase in Year

Considering the subject from another angle:

During the fiscal year ending June 30, 1916, the total value of cars, trucks, parts and tires exported to Latin-America by the United States was \$9,587,275. In 1917 the total had risen to \$19,796,917—an increase of over 106 per cent.

Total figures for the year ending June, 1918, are not yet available, but the exports of cars, trucks and parts to Latin-America from the Port of New York alone during the first seven months of the present year are valued at \$7,545,572, a record which is doubly remarkable when the serious shortage of shipping is taken into consideration. As a matter of fact, this seven months' record of shipments from New York is almost as great as the twelve months' totals on these items for 1916.

Exports of Passenger Cars, Commercial Cars, Parts, Tires and Gasoline from the United States to Latin American Countries for the Fiscal Years Ending June 30, 1916-1917

	PASSENGER CARS				COMMERCIAL CARS				PARTS, VALUE		TIRES, VALUE		GASOLINE, GAL.	
	1916 No.	1916 Value	1917 No.	1917 Value	1916 No.	1916 Value	1917 No.	1917 Value	1916	1917	1916	1917	1916	1917
Argentina.....	4,399	\$2,065,439	3,924	\$2,336,001	45	\$33,063	141	\$146,255	\$222,637	\$1,458,111	\$488,329	\$1,301,344	6,621,419	4,091,067
Bolivia.....	26	16,208	141	100,151	.....	.....	20	48,590	3,453	11,684	4,954	9,187	11,340	18,443
Brasil.....	272	157,968	873	523,383	11	19,635	14	8,300	59,935	134,326	295,479	696,876	6,034,603	6,062,944
Chile.....	826	530,211	2,587	1,821,842	17	46,566	69	160,696	72,939	248,043	58,809	264,603	365,778	389,420
Colombia.....	91	58,525	173	118,937	4	1,236	2	4,998	18,967	27,777	28,617	39,298	278,825	280,805
Costa Rica.....	60	28,325	37	23,125	.....	.....	.....	.....	10,162	8,398	6,088	11,918	143,390	154,007
Cuba.....	3,698	2,091,295	3,529	2,545,071	117	171,647	397	722,519	411,731	906,710	547,410	1,019,915	629,340	2,178,213
Dom. Republic.....	131	60,127	191	96,173	4	5,173	22	23,640	12,389	35,301	18,223	37,441	259,896	412,427
Ecuador.....	62	44,396	137	106,478	2	3,378	1	2,050	8,014	12,648	9,225	13,645	.....	.....
Guatemala.....	24	23,552	35	36,174	2	4,916	4	4,323	2,367	9,852	8,852	26,473	79,040	81,848
Haiti.....	10	3,788	29	13,780	.....	.....	.....	.....	3,285	5,286	988	2,287	5,757	15,107
Honduras.....	34	22,652	42	24,564	6	14,540	4	4,094	15,649	12,639	7,932	19,657	301,221	251,287
Mexico.....	383	309,200	2,807	1,642,011	51	100,500	218	198,151	42,258	125,823	236,811	257,413	955,755	614,793
Nicaragua.....	.....	6,275	.....	3,084	.....	.....	.....	.....	.....	.....	157	294	353,234	423,976
Panama.....	228	170,964	356	216,711	32	55,171	75	97,970	34,180	56,657	73,854	74,047	1,136,231	1,285,442
Paraguay.....	6	2,256	40	20,192	.....	1,394	.....	4,172	.....	.....	.....	.....	.....	.....
Peru.....	59	40,388	400	295,558	5	5,830	25	48,776	5,458	27,332	9,663	27,934	.....	.....
Salvador.....	68	54,598	75	62,314	.....	.....	.....	3,717	.....	11,314	11,673	22,530	76,893	99,103
Uruguay.....	285	150,540	1,165	612,838	2	5,818	4	10,437	27,086	125,913	76,608	100,427	556,599	293,400
Venezuela.....	518	314,156	542	327,507	6	13,029	14	28,502	40,783	87,768	71,849	128,966	557,057	915,067
<b>Total.....</b>	<b>11,180</b>	<b>\$6,150,836</b>	<b>17,083</b>	<b>\$10,925,894</b>	<b>304</b>	<b>\$486,896</b>	<b>1010</b>	<b>\$1,513,473</b>	<b>\$995,010</b>	<b>\$3,305,582</b>	<b>\$1,955,521</b>	<b>\$4,051,255</b>	<b>18,366,348</b>	<b>17,567,349</b>

**Ranken Heads Purchasing Agents**

DETROIT, Sept. 28—The 1919 convention of the National Association of Purchasing Agents will be held in Philadelphia. Officers elected for the ensuing year are: President, D. D. Ranken, E. I. Du Pont De Nemours Powder Co., Wilmington; first vice-president, F. J. Solon, Owens Battle Machine Co., Toledo; second vice-president, J. A. Whaling, Solvay Process Co., Solvay, N. Y.; third vice-president, V. W. Bergenthal, Wagner Electric Mfg. Co., St. Louis; secretary, L. F. Boffey, New York; treasurer, John C. Dinsmore, University of Chicago. A membership drive is contemplated and a suggestion was offered that the organization apply for membership to the American Society for Testing Materials. Thirty-five members of the Michigan Institutional Buyers' Association have affiliated themselves with the Purchasing Agents.

John C. Toomey has been appointed district manager of L. A. Young Industries, Inc., Detroit.

L. A. Smith, assistant to T. J. Toner, director of sales and advertising of the Maxwell Motor Co., Inc., Detroit, has been placed in charge of Maxwell and Chalmers sales in the eastern territory, with headquarters in New York.

Charles B. Wilson, former general manager of the Wilson Foundry & Machine Co., Pontiac, has been appointed a director, with the rank of vice-president, of the Curtiss Aeroplane & Motors Corp., Buffalo. For the last 3 months he has been assistant in charge of production at the Curtiss plant.

E. L. Kreamer, formerly of the sales and advertising department of the Oakland Motor Co., Pontiac, has enlisted in the Motor Transport Division, and is now stationed at Washington, D. C.

E. D. Williams, formerly employment supervisor of the motor plant of the Oakland Motor Car Co., has associated himself with the Cleveland Tractor Co.

B. B. Holt, purchasing agent of the Harroun Motors Corp., Wayne, Mich., has tendered his resignation, effective Oct. 1, to become sales manager for the manufacturers' division of the Bradfield company. This division of the Bradfield company is at present furnishing material on war contracts in Michigan, Indiana and Ohio.

Jay E. Chilson has been appointed representative for Chicago for the L. H. Gilmer Co., Philadelphia.

H. F. Harris has been appointed general sales manager of the Republic Motor Truck Co., Alma, Mich.

Z. D. Barnes, non-ferrous metallurgist with the Westinghouse Air Brake Co. for the past few years, has joined the operat-

## Men of the Industry

*Changes in Personnel and  
Position*

ing department of the Aluminum Castings Co., and will make his headquarters in Cleveland.

**Paige Nearing 100 Per Cent War Basis**

DETROIT, Sept. 28—The Paige-Detroit company is fast approaching the 100 per cent war basis. In a few weeks all the resources of the company will be devoted exclusively to Government service. When the company has used its present supply of materials it will make no more passenger cars.

**Government Rents Ford Buildings**

WASHINGTON, Sept. 30—Seven buildings used by the Ford Motor Co. for distributing, assembling and service stations have been taken over by the Government. The buildings are located in St. Louis, Atlanta, Long Island City, Cambridge, Louisville, San Francisco and Philadelphia. The St. Louis building, which has 215,000 sq. ft. of floor space, will rent to the Government at 31½ cents per square foot, and will be used by the Depot Quartermaster. The Atlanta building, totaling 161,000 sq. ft., at a rental of 26 cents per square foot, will be used by the Reclamation Department of the Quartermaster Corps. The Long Island City building, 477,000 sq. ft., rental 31 cents per square foot, will be used by the Gas Defense Service. The Depot Quartermaster is using the Cambridge building, which has 160,000 sq. ft., at 32 cents per square foot. The Louisville plant of 83,000 sq. ft. is being used as a Medical Supply Depot at 24 cents per square foot. The Division of Military Aeronautics will take over the San Francisco building of 38,000 sq. ft. at 24 cents per square foot. The Ordnance Department and the Depot Quartermaster divide the Philadelphia Ford building for the monthly rental of \$1,420 per floor.

**Dort Prices Advance**

DETROIT, Oct. 1—The Dort Motor Car has increased the prices of its models as follows:

	New Price	Old Price
Touring and roadster...	\$985	\$925
Coupe and sedan.....	1415	1325
Sedanet .....	1150	1060

**May Stop Gasless Sundays**

WASHINGTON, Sept. 28—Gasolineless Sundays will continue indefinitely, but the ban may be lifted at any time, according to statements made yesterday by Dr. H. A. Garfield, United States Fuel Administrator.

**West Heads Wheel Makers**

CLEVELAND, Sept. 30—The next meeting of the Automotive Wheel Manufacturers' Association will be held here Oct. 10. At the last meeting of the association the following officers were elected: President, R. H. West, West Steel Casting Co.; vice-president, R. B. Flower, Standard Steel Casting Co.; treasurer, W. E. Burns, Michigan Malleable Iron Co.; secretary, George L. Lavery, West Steel Casting Co. Executive committee—H. A. Coffin, Detroit Pressed Steel Co.; R. D. Webster, Wire Wheel Corp. of America; George Walthers, Dayton Steel Foundry Co.

C. P. Kimball, president of C. P. Kimball & Co., Chicago, body and coach builders, has become president of the Great Lakes Tire Service, which handles the United States tires and tubes and specializes in tire service.

Lester E. Willson, formerly vice-president in charge of sales of the Briscoe Motor Corp., Jackson, has been appointed general sales manager of the Dauch Mfg. Co., Sandusky, Ohio. J. W. Wellington, formerly production manager of the New Castle, Ind., plant of the Maxwell Motor Co., has been made general manager of the Dauch company.

Charles H. Gresslee, formerly sales manager of the Selden Truck Sales Co., Cincinnati, has been appointed district sales manager of the All-American Truck Co., Chicago.

**Workers' Exemption Claims Filed**

DETROIT, Sept. 30—Through the filing of industrial exemption claims for its needed skilled men the Continental Motors Corp. has been successful in retaining 200 of its force, having been placed in a deferred class. The company has lost 1200 men, who have gone into military service. More than 6500 men are employed by the company, of whom 3000 are with the Muskegon plant. A careful record of the status of every man is kept by the company, which facilitates the filing of exemption claims when occasion arises.

**Railroads Want Highways Co-operation**

WASHINGTON, Sept. 30—The United States Railroad Administration has requested all firms or associations planning activities to assist the railroads to also consult with the regional directors of the Highways Transport Committee in their districts with a view to correlating the transportation work of the highways and railroads as much as possible. The Railroad Administration has directed all of its regional traffic assistants to co-operate as closely as possible in this work with the regional directors of the Highways Transport Committee. The highways regional directors have been instructed by the Highways Transport Committee to submit all plans for future organization or extension of operations to the committee for its examination and approval.



## Liberal Pension Plan of a Tool Manufacturing Company

AKRON, OHIO, Sept. 30—The Whitman & Barnes Mfg. Co. announces to its employees the establishment of a pensioning plan, which is most liberal in its provisions.

The plan goes into effect as of Sept. 1, and under it those eligible to apply for pensions are:

All employees who have been in the company's service continuously for 30 years or more; male employees who have reached the age of 60 years and female employees who have reached the age of 55 years, and who have been in the company's service continuously for 25 years; male employees 65 years of age and female employees 60 years of age who have been in the company's service continuously for 20 years; male employees 70 years of age and female employees 65 years of age who have been continuously in the company's service for 15 years.

The company bears all the expenses in connection with the administration of the pension system; no contributions from employees will be asked, and no assessments will be levied upon them.

Pensions will be paid monthly as follows: For each year of continuous service, 1 per cent of the average regular monthly pay during the 10 years preceding retirement. Bonuses and awards are not to be included in computing the average monthly pay. No pensions will be granted in amount more than \$100 per month, nor less than \$20 per month.

The company undertakes to continue the payment of the pensions for the life of the employee, and furthermore, should the employee be married and be survived by a widow, or widower as the case may be, the company will continue to pay the pension to the survivor so long as he or she remains unmarried and possesses no other income or means of support.

In case the employee receives compensation from the company or from any state, national or public fund, for disability incurred in the company's service, the pension granted will not be for a larger amount than will, when added to such other income, be equal to the amount of the pension computed upon the regular basis that such an employee would receive who did not receive other compensation.

Pensions may be refused or canceled in cases of criminal or gross misconduct, or assignment of pension, or in cases which the management deems advisable for cause.

The pensioner is given the privilege of engaging in any other line of work not prejudicial to the interest of the company.

In the cases of those who re-enter the service of the company after having been out of it for a while, the length of service considered in the matter of pension awards is figured from the time at which re-employment began. This provision of course does not hold in the case of such temporary absences as are incurred through illness or accident or temporary lay-off, because of a reduction in the working force.

Where the period during which an employee is out of the service of the company is less than one year, the employee is not considered as having been re-employed, but the time during which he was away from the company is deducted from his "length of

service" record in making pension calculations.

The entrance of employees into the Government service is covered by special provisions.

### Jurisdiction Over Flying Fields Altered

WASHINGTON, Sept. 28—The Air Service testing fields located at Dayton, Detroit, Buffalo and Elizabeth, N. J., have been transferred from the jurisdiction of the Bureau of Aircraft Production to the Division of Military Aeronautics.

The method of testing finished airplanes will undergo a complete change. Instead of flying each machine produced at least 1 hour before crating, as has been the practice, the fifteenth, twentieth or thirtieth plane, as may be decided, will be selected from the shop run, shipped directly to a testing squadron and given a trial, "flown to destruction." The other planes will be immediately crated and sent on the way.

As quickly as weaknesses develop in any of the machines tested, the fault found will be communicated both to the factory and overseas, and remedied before the planes take the air. It is expected that this plan combined with the present high efficiency of factory inspection of parts and assembly, will increase the speed with which airplanes reach the American Expeditionary Forces and at the same time insure the highest quality of service.

### Expansion of Royal Air Force

WASHINGTON, Oct. 1—The Royal Air Force of Great Britain, which numbered a total of 350 officers in June, 1915, contained 18,000 early this year. These figures have been announced by the British Aviation Mission in this country to emphasize the expansion of the air service since 1914.

In July, 1917, British pilots dropped 65 tons of bombs on German towns while in May, 1918, this increased to 686 tons and at the present time as much as 600 tons are dropped in a week. In July, 1916, 62 Hun planes were brought down and 36 British planes were missing, while in March, 1918, 574 German planes were brought down against 162 British planes missing. In July, 1916, 5000 aerial photographs were taken, while in March, 1918, 69,000 aerial photographs were brought in by the air service.

### Will Discuss Waterway Transportation

WASHINGTON, Oct. 1—New fields for important motor truck uses will be developed if the present plans for extending inland waterway transportation are developed. An important conference will be held here on Oct. 11 when delegates representing owners of boats on inland canals, members of chambers of commerce in cities located on or near the canals and others interested in waterway transportation will meet with the United States Railroad Administration and discuss the better distribution and more economic use of tonnage. Director-General McAdoo has been endeavoring for sometime to increase the usage of waterways and to bring about closer co-operation between them and the railroads.

## Women Workers Must Be Taught to Eat Properly

ST. LOUIS, Sept. 28—Perhaps the most interesting topics developed at the seventh annual convention of the National Safety Congress in session here last week were those in reference to the employment of women in new industries.

The matter of making women satisfied in their new fields came up in the wood-working section, and was echoed throughout the entire meeting.

F. D. Campau, secretary of the Furniture Manufacturers' Association of Grand Rapids, told of the means used there to interest women and keep them on the job. He said in explaining new conditions: "The greatest single stumbling block we found was that the women workers did not eat enough. Most of them were unused to work and came from homes where they could 'get a bite' at any time of the day. They came without sufficient breakfast and they refused to carry a large package of lunch and a lunch bucket was regarded as out of the question. The result was a headache in mid-afternoon.

"In overcoming this our factories tried serving milk and sandwiches for between-meals lunch. The sandwich caused trouble. The Jewish women refused the ham and were inclined to think we had offered them an insult. We changed to chicken and on Friday the Catholic women would not touch our offering. We compromised on a specially made, large, thick ginger cookie which is served with the milk. The headaches have disappeared and so has most of the discontent with factory work.

### Complete Dressing Rooms Needed

"Next came the problem of preparing suitable dressing rooms where even the most intimate garments could be exchanged. We have not found any women who are willing to go to and from home in working clothes. The lockers must have rooms for the skirts to hang full length, a place must be provided for large hats and there must be sufficient full length mirrors. Small mirrors are required in abundance.

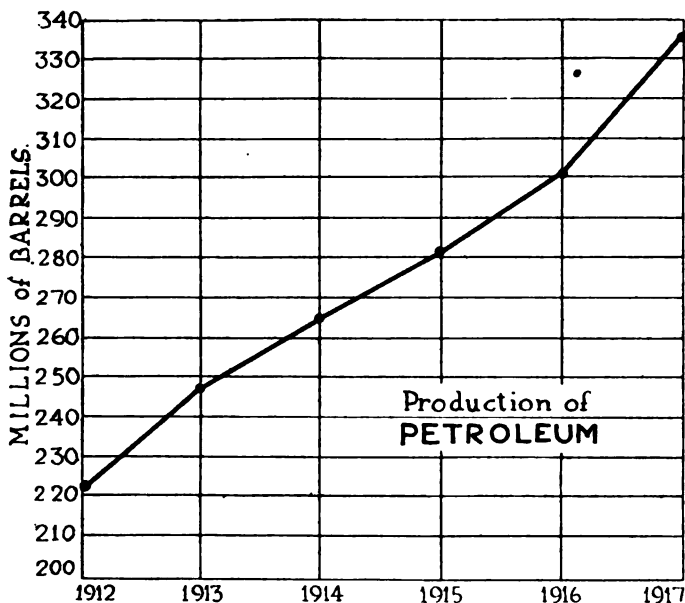
"We have found that women can be interested in safety work more easily than men and more effectively. If a good social worker is not available, pick out some woman from the workers and instruct her in all of these things so that she may be a leader.

"We have found that care of injured or ill working women in a good hospital is a good investment. Often the women, as well as men, sent to a hospital get their first lesson in cleanliness, of living where there are sheets, proper night clothing, balanced diet and the lessons they learn there make them better employees. Especially is the effort to have the very best surgical treatment a lesson, for they quickly demand better from the family doctor for their family in case of need, and this better treatment which follows goes far to relieve their worries at home."

# AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acide:</b>	<b>Burlap:</b>
Muriatic, lb. .... .02-.03	8 oz., yd. .... 17½-17½
Phosphoric (85%)... .35-.39	10½ oz., yd. .... 21½-22
Sulphuric (60), lb.. .008	<b>Copper:</b>
<b>Aluminum:</b>	Elec., lb. .... .26
Ingot, lb. .... .33	Lake, lb. .... .26
Sheets (18 gage or more), lb. .... .40	<b>Fabric, Tire (17½ oz.):</b>
<b>Antimony, lb. .... .13%-13%</b>	Sea Is., combed, lb.1.65-1.70
	Egypt, combed, lb.1.25-1.35
	Egypt, carded, lb.1.20-1.30



The production of petroleum in the United States shows a steady increase during the past six years. There is every prospect of the increase being maintained in the future

Peelers, combed, lb.1.05-1.20	<b>Rubber:</b>
Peelers, carded, lb. .95-1.05	Ceylon:
Fibre (¾ in. sheet base), lb. .... .50	First latex pale crepe, lb. .... .61 -.63
<b>Graphite:</b>	Brown, crepe, thin, clear, lb. .... .60
Ceylon, lb. .... .07½-.25	Smoked, ribbed sheets, lb. .... .59 -.61½
Madagascar, lb. .... .10 -.15	<b>Para:</b>
Mexican, lb. .... .03½	Up River, fine, lb. .68
Lead, lb. .... .08 -.09	Up River, coarse, lb. .... .40
<b>Leather:</b>	Island, fine, lb. .... .59
Hides, lb. .... .18 -.35½	Shellac (orange), lb. .74 -.76
Nickel, lb. .... .40	Spelter .... .09½-.09¾
<b>Oil:</b>	<b>Steel:</b>
Gasoline:	Angle beams and channels, lb. .... .03
Auto., gal. .... .24½	Automobile sheet (see sp. table).
68 to 70 gal. .... .30½	Cold rolled, lb. .... .06½
<b>Lard:</b>	Hot rolled, lb. .... .03½
Prime City, gal. .250	Tin .... .80
Ex. No. 1 gal. .... 1.70	Tungsten, lb. .... 2.45-2.50
Linseed, gal. .... 1.88-1.90	Waste (cotton), lb. .... .12%-17
Menhaden (Brown) gal. .... 1.80-1.31	
Petroleum (crude), Kansas, bbl. .... 2.25	
Pennsylvania, bbl. 4.00	

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
Black Sheet Extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Don't Require Import Licenses

WASHINGTON, Sept. 28—Under new regulations many commodities can be imported into the United States from the United Kingdom, France or Italy or their European or Mediterranean African possessions without first securing an individual import license. The following commodities are those connected with the automotive industries specifically excluded from the terms of the new general license and will require the individual license:

Asbestos; castor oil, castor beans; chrome, chrome ore and chemicals extracted therefrom; cobalt, cobalt ore, and chemicals extracted therefrom; copper ore and copper concentrates; corundum; emery and emery ore; ferro-alloys; ferro-manganese; graphite or plumbago, and graphite crucibles; iridium; iron ore, lead, leather; all finished and all leather row stock; manganese, manganese ore; mica; molybdenum, molybdenum ore and chemicals extracted therefrom; palladium; platinum and manufactures of, pyrites; rubber, crude, scrap and reclaimed; balata, gutta, gutta serena, gutta percha, gutta serena, manufactures of rubber; tin in bars, blocks, pigs or grain or granulated, tin ore and tin concentrates or any chemical extracted

therefrom; titanium, titanium ore and chemicals extracted therefrom; tungsten, tungsten ore and chemicals extracted therefrom; vanadium, vanadium ore, and chemicals extracted therefrom.

## Requests Suspension of Racing

WASHINGTON, Sept. 30—Voluntary suspension, for the period of the war, of automobile, motorcycle and motor boat racing and speed contests has been asked by the United States Fuel Administration. The American Automobile Association, co-operating with the request, has assured the Fuel Administration that it will strictly observe it. Chairman Richard Kennerdell, of the Association Contest Board, stated that he has suspended operations and will issue no more sanctions for race meets or speed contests. Sanctions have been previously given for races to be held at Trenton, N. J.; Danbury, Conn.; Tucson and Phoenix, Ariz., and in Los Angeles, Cal., within the next 2 months, but it is expected by the Fuel Administration that the promoters of these contests will call off the events in order to meet the Administration's request.

## Sulphuric and Nitric Acid Prices Fixed

WASHINGTON, Sept. 27—The following maximum prices have been agreed upon for sulphuric and nitric acid as a result of conferences between the manufacturers of these and the Price Fixing Committee of the War Industries Board. The prices take effect Sept. 30, 1918, and expire Dec. 30, 1918:

Sulphuric Acid 60° Baumé, \$16 per ton of 2000 lbs.  
Sulphuric Acid 66° Baumé, \$25 per ton of 2000 lbs.  
Sulphuric Acid 20 per cent Oleum, \$28 per ton of 200 lbs. f.o.b. at manufacturers' works in sellers' tank cars.  
All strengths less than 66° Baumé shall be calculated from the price of 60° Baumé.  
All strengths above 66° Baumé (93.2 per cent H<sub>2</sub>SO<sub>4</sub>) shall be calculated from the price for 66° Baumé.  
In carboys, in carload lots, one-half cent per pound extra.  
In carboys, in less than carload lots, three-fourths cent per pound extra.  
In drums, any quantity, one-fourth cent per pound extra.  
Nitric Acid 42° Baumé 8½ cents per pound. f.o.b. manufacturers' works in carboys.  
In carboys in less than carload lots one-fourth cent per pound extra.  
There shall be no additional mixing charge for mixed acids, same being figured on the acidity content.

**Lansing Co. Receives Trailer Order**

LANSING, Sept. 30—The Lansing Co. has secured an additional Government contract for electric industrial truck trailers of the Reynolds type, thereby putting the company on a 90 per cent war basis. Seventy per cent is sent directly to the United States Government and 15 per cent is indirect. The remaining 10 per cent of the company's production will be devoted to equipment for industrial and commercial institutions. Under the new contract the company is to supply 400 trailers a week to the Government until the demands are supplied. The company now maintains three portable mills to supply lumber and timber for government use. One is located in a camp 15 miles west of Lansing, another near Holland, and the third near Ann Arbor. The company is now compelled to work over-time and has been devoting four nights a week to war work.

**Schacht Doubles Floorspace**

CINCINNATI, Sept. 28—The Schacht Motor Car Co. will occupy the large new extension to its plant in this city, by which it doubles its factory floorspace and considerably more than doubles its output by Nov. 1, after which 80 per cent of its production will be under contracts it now has with the Government.

**Liberty Carburetor Organizes**

The Liberty Carburetor Co., Detroit, has been organized by Jere McCarthy, president of the McCarthy Motor Sales Co., Ford distributor. The company will manufacture a special carburetor for Ford cars known as the Liberty.

**Airplane Plant for Chicago**

CHICAGO, Sept. 28—The Illinois Mfg. Association is negotiating for the erection of an airplane plant here. The estimated cost is \$50,000,000.

**More Room for France**

CLEVELAND, Sept. 28—The France Mfg. Co. has just moved into a new factory building on Berea Road.

**Naval Architects to Meet Nov. 14**

PHILADELPHIA, Sept. 28—The twenty-sixth general meeting of the Society of Naval Architects and Marine Engineers is to be held in Witherspoon Hall, Philadelphia, Thursday and Friday, Nov. 14 and 15. There will be a banquet at 7 p. m. Friday.

**Wisconsin Plates to Cost \$0.15½ a Pair**

MILWAUKEE, Sept. 30—The State of Wisconsin has contracted with the Schwab Stamp & Seal Co., Milwaukee, for 200,000 pairs of motor license plates for 1919 at 15½ cents per pair, the same price charged by this concern for the 1918 supply. Last year the requirement was 180,000.

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

**Western to Make Own Trailers**

KANSAS CITY, Sept. 28—The Western Trailer Co., of which C. J. Welch is president, will take up the manufacture of a line of trailers. The company heretofore has been Western distributor of Fruehauf trailers, but hereafter will make its own. It is planned to produce a body for every line, including flare-board, stake and enclosed, canopy top, etc. The company is erecting a four-story building 60 x 150 ft., and will be in production within 90 days.

**Ford Considering Mexican Market**

DEARBORN, MICH., Sept. 30—Henry Ford & Son have closed arrangements with J. L. Mayfield, of Mexico City, Mexico, to supply him with 1000 Fordson tractors during the ensuing year for distribution throughout Mexico. He has been appointed Mexican representative, but will be privileged to send tractors to states bordering Mexico if the opportunity presents itself. This means that all the machines sent to him will not be distributed entirely within Mexico.

The current rumors that the tractor company has completed plans for the erection of a plant in Mexico are unfounded. The proposition is being looked into, however, and it is Ford's intention eventually to have a factory in that country.

The tractor plant is running at high speed, and is striving hard to attain a production of 200 tractors daily. The highest daily output was reached Sept. 27, when 191 machines were produced.

**Detroit Weatherproof Advances Price**

PONTIAC, MICH., Sept. 30—The Detroit Weatherproof Body Co. will advance its prices from \$97.50 to \$110 on Oct. 1.

**Dividends Declared**

The Hendee Mfg. Co., Springfield, Mass., has declared a quarterly dividend of 1½ per cent on its preferred stock, payable Oct. 1. Books close Sept. 20.

The Standard Woven Fabric Co., Framingham, Mass., has declared a quarterly dividend of 1½ per cent on its first preferred stock, payable Oct. 1. Books close Sept. 20.

The Hupp Motor Car Corp., Detroit, has declared the regular quarterly dividend of 1½ per cent on the 7 per cent cumulative preferred stock, payable Oct. 1 to stockholders of record Sept. 20.

**Oakland Starts on First Government Order**

PONTIAC, MICH., Sept. 30—Work has started this week at the Oakland Motor Car Co. on the company's first Government order. A large contract for two-wheeled kitchen trailers for the Aviation Section had been received several weeks ago. The capacity of the trailer is 1 ton, and when fully equipped is a complete field kitchen for 310 men. Stoves and ovens are mounted directly on the trailer, which is equipped with adjustable legs to balance it in horizontal position. None of the equipment is removed from the trailer when in use.

**Trailers from Grand Rapids**

GRAND RAPIDS, Sept. 30—The J. M. Case Trailer Co. is a new company in the motor truck industry which manufactures a complete line of all-steel semi and four-wheeled trailers of 3, 4, 6 and 10-ton capacity. The company also builds three sizes of pole trailers, 3½, 4 and 6-ton, and trailer chassis equipped with gravity steel dump bodies. The president of the new company is J. M. Case.

**Auto Body Gets War Order**

LANSING, Sept. 28—The Auto Body Co. has received a war order for truck bodies, the value of which is said to be approximately \$500,000. This is understood to be one of a number of body orders given or to be given by the Government to some of the body manufacturers who heretofore have done little or no war work.

**Chicago Dealer Develops Farm Light**

CHICAGO, Sept. 28—To supply complete automotive equipment to dealers for farm power, the Marmon-Chicago Co., Marmon and Hupmobile distributor, will market on a national scale a new product of its own, the Universal farm light and power plant, designed to supply complete electric light and power for the modern farm. Charles E. Gambill, for 17 years with the Marmon company, and president of the Marmon-Chicago Co., states that the Universal plants will be distributed entirely through motor car trade channels. The system is one which can be utilized not only for electric lighting but also is designed for use with other small power farm machinery, such as cream separators, milking machines, feed grinders, etc., and, in addition to the gasoline-electric outfit, the company will distribute nationally equipment of this sort, designed for the Universal plants. In addition the Marmon-Chicago Co. has taken on the distribution over limited territory of the Parrett tractor.

**Motor Truck Club Changes Name**

NEW YORK, Sept. 28—By way of eliminating misunderstanding regarding its aims and objects, the Motor Truck Club of America has changed its name to Motor Truck Association of America.



**Quartermaster Corps Contracts**

WASHINGTON, Sept. 30—The following list of contracts have been placed by the Quartermaster Department of the Army:

George W. Diener Mfg. Co., Chicago, gasoline cans, \$1000.  
Vacuum Oil Co., New York, Gargoyle cylinder oil, \$33,160.  
Standard Oil Co. of Indiana, Chicago, fuel oil, \$42,880.  
Prudential Oil Corp., New York, motor gasoline, \$54,000.

**Aircraft Bureau Contracts**

WASHINGTON, Sept. 30—The following list of contracts have been placed by the Bureau of Aircraft Production:

Hayes Mfg. Co., Detroit, cylinder jackets.  
Liberty Iron Works, Sacramento, spares for planes.  
Fisher Body Corp., Detroit, spares for planes.  
Iron City Products Co., Pittsburgh, engine spares.  
Chicago Metal Products Co., Chicago, piston pins.  
Splitdorf Electrical Co., Newark, spark plugs.  
Zenith Carburetor Co., Detroit, spares for carburetor.  
Wright-Martin Aircraft Corp., New Brunswick, engine spares.  
Bristol Co., Waterbury, Conn., venturi tubes.  
W. H. Mullins Mfg. Co., Salem, Ohio, cylinder water jackets.  
Watts, Stebbins & Co., New York, balloon cloth.  
Stewart Hartshorn Co., New York, tie rods.  
Wright-Martin Aircraft Corp., New Brunswick, engine spares.  
Willis-Overland Co., Toledo, engines.  
Western Electric Co., New York, fittings for antenna systems.  
A. Fisher Body Corp., Detroit, propellers.  
Wright-Martin Aircraft Corp., New Brunswick, engine spares.  
Duplicator Mfg. Co., Washington, commercial duplicators with supplies.  
Pittsburgh Steel Products Co., Pittsburgh, steel tubing.  
Bordentown Steel & Tube Co., Bordentown, N. J., steel tubing.  
Batesville Lumber & Veneer Co., Lawrenceburg, Ind., lumber.  
Louisville Point Lumber Co., Louisville, lumber.  
Koesse, Shoe & Schleyer Co., Cincinnati, lumber.  
James Cunningham & Sons Co., Rochester, balloon windlasses.  
Foxboro Co. (Inc.), Foxboro, Mass., air speed indicators.  
Splitdorf Electrical Co., Newark, engine spares.  
Kuena Radiator Co., Toledo, radiator spares.  
Candler Radiator Co., Detroit, radiator spares.  
Splitdorf Electrical Co., Newark, spark plugs.  
Curtiss Aeroplane & Motor Corp., Buffalo, spares for planes.  
Marlin-Rockwell Corp., New York, N. Y., boxing radiators.  
Pyrene Mfg. Co., Washington, fire extinguishers.  
Tennessee Valley Iron & Railroad Co., Colliwood, Tenn., locomotive and crane.

**Engineer Depot Contracts**

WASHINGTON, Sept. 30—The following list of contracts have been awarded by the General Engineer Depot, War Department:

Hercules Gas Engine Co., Evansville, gasoline and kerosene engines.  
Goodyear Tire & Rubber Co., Washington, rubber hose.  
Texas Co., South Washington, Vt., Texaco motor oil.  
Link-Belt Co., Chicago, locomotive cranes.

**Ordnance Department Contracts**

WASHINGTON, Sept. 30—The following list of contracts have been placed by the Ordnance Department of the United States Army:

Holt Mfg. Co., Peoria, Ill., tractor equipment.  
Nash Motors Co., Kenosha, truck equipment and truck chassis.

**Contracts**

R. M. Newbold, Washington, test and development of truck lighting, maintenance, and repairs on motor vehicles.  
Detroit Copper & Brass Rolling Mills Co., Detroit, brass rod.  
Warren Tool & Forge Co., Warren, Ohio, crowbars.  
Grant Motor Car Co., Cleveland, gun drawings.  
Fox Motor Co., Philadelphia, and Presto Machine Works (Inc.), Brooklyn, inspection gauges.  
Eiseman Magneto Co., Brooklyn, magneto breaker.  
Nash Motors Co., Kenosha, truck repair parts.  
Johns-Manville Co., H. W., New York, speedometers.  
American Brass Co., Waterbury, Conn., hinge pins.

**Ordnance Department Contracts**

WASHINGTON, Sept. 27—The Army Ordnance Department has placed the following purchase orders:

Four-Wheel Drive Auto Co., Clintonville, truck repair parts.  
Studebaker Corp., South Bend, forging and machining shells.  
Quartermaster Corps, New York, cup grease and gasoline.  
A. O. Smith Corp., Milwaukee, smoke and drop bombs.  
Ohio Trailer Co., Cleveland, trailers and equipment.  
Nash Motors Co., Kenosha, various truck equipment.  
Highland Body Mfg. Co., Cincinnati, truck bodies.  
American Axe & Tool Co., Glassport, Pa., bench axes.  
North & Judd Mfg. Co., New Britain, Conn., snap hooks and rings.  
Berg Auto-Trunk & Specialty Co., New York, fuse setter cases.  
Hindley Gear Co., Philadelphia, trench motor assembly.  
Detroit Copper & Brass Rolling Mills, Detroit, cartridge-case disks.  
White Motor Co., Cleveland, truck spare parts.  
Holt Mfg. Co., Peoria, tractor hand books.  
Ford Motor Co., Detroit, helmets.  
Motor Car Equipment Co., New York, portable electric motor.  
Hale & Kilburn Corp., Philadelphia, miscellaneous equipment for repair trucks.  
C. M. Hall Lamp Co., Kenosha, rubber and brass tubing.  
Plant Bros. & Co., Manchester, N. H., repair truck covers.  
Bljor Motor Lighting Co., Hoboken, adapters.  
Fisher Auto Top Co., Norwalk, Ohio, powder bags.  
Inter-State Motor Co., Muncie, tractors.  
Four-Wheel Drive Auto Co., Clintonville, towing hooks, water manifolds.  
Champion Ignition Co., Flint, spark plugs.  
The Lang Body Co., Cleveland, crating cars.  
Commerce Motor Car Co., Detroit, brown prints.  
Dodge Bros., Detroit, spare parts for truck chassis.  
Bastian-Blessing Co., Chicago, miscellaneous chests for supply trucks.  
Dunlap & Co., Edinburg, Ind.; Chas. T. Wilt Co., Chicago, truck chests.  
American Car & Foundry Co., Berwick, trailer bodies and spare parts.

**Planes Coming From Cincinnati**

CINCINNATI, Sept. 28—The Overmeyer Airplane Mfg. Co. has bought three acres of land at the West End and will at once begin the construction of a plant for the manufacture of airplanes. It will begin with three large contracts from the Government for war service and will be kept busy on Government and war work during the period of the war, but the plans of the projectors are to manufacture airplanes for commercial and private use following the close of the war. E. C. Drury, of Philadelphia, is interested in the company.

**Ordnance Purchase Order**

WASHINGTON, Sept. 18—Following is a list of contracts and purchase orders placed by the Ordnance Department of the United States Army:

Four Wheel Drive Auto Co., Clintonville, Wis., truck chassis spare parts.  
General Electric Co., Schenectady, N. Y., mobile repair shop equipment.  
Quartermaster Corps, Washington, D. C., automobile and motorcycles.  
White Co., Cleveland, Ohio, tarpaulins.  
Ward & Co., Washington, D. C., repair track tools and equipment.  
Goodyear Tire & Rubber Co., Akron, Ohio, tire repair material.  
Berg Auto Truck & Specialty Co., New York City, carrying cases.  
Quartermaster Corps, New York, N. Y., axle grease.  
The Four Wheel Drive Auto Co., Clintonville, Wis., truck repair parts.  
Quartermaster Corps, New York, N. Y., engine oil.  
Dodge Bros., Detroit, Mich., instruction books.  
Swineheart Tire & Rubber Co., Akron, Ohio.  
Berg Auto Truck & Specialty Co., New York, N. Y., dispatch cases.  
Federal Rubber Co., Cudahy, Wis., rubber cups.  
Cadillac Motor Car Co., Detroit, Mich., unit tractor power plant.  
The Williams Foundry & Machine Co., Akron, Ohio, clamps.  
Firestone Tire & Rubber Co., Washington, D. C., Indian Tire & Rubber Co., New Brunswick, N. J., solid tires.  
Federal Rubber Co., Cudahy, Wis., hand grenade plugs.  
Norman W. Henley Publishing Co., New York, N. Y., automobile repair books.  
Allen Motor Co., Fostoria, Ohio, recoil groups.  
Commerce Motor Car Corp., Detroit, Mich., alterations on trucks.  
Lansing Co., Lansing, Mich., trailer trucks.  
The Wheeler-Schebler Carburetor Co., Indianapolis, Ind., carburetors.  
The Baker H. & L. Co., Cleveland, Ohio, standard tractors and trucks.  
The Eiseman Magneto Co., Brooklyn, N. Y., magneto repair parts.  
Commerce Motor Car Co., Detroit, Mich., tire pumps.  
Empire Rubber & Tire Co., Trenton, N. J.  
Columbus McKinnon Chain Co., Columbus, Ohio, American Chain Co., Bridgeport, Conn., truck chains.  
Firestone Tire & Rubber Co., Akron, Ohio, cord tires and inner tubes.  
Goodyear Tire & Rubber Co., Akron, Ohio, United States Tire Co., New York City, tires and inner tubes.  
Locomobile Co. of America, Bridgeport, Conn., motor testing apparatus.  
Maxwell Motor Co., Dayton, Ohio, test of ordnance vehicles at S. A. E. convention, Dayton, Ohio.  
The Eiseman Magneto Co., Brooklyn, N. Y., magnetos.  
The Nash Motors Co., Kenosha, Wis., metal tool boxes.  
Fisk Rubber Co., Chicopee Falls, Mass.; Braender Rubber & Tire Co., Rutherford, N. J., tires.  
United States Tire Co., New York City; Hood Rubber Co., Watertown, Mass.; Goodyear Tire & Rubber Co., Akron, Ohio; The B. F. Goodrich Rubber Co., Akron, Ohio, solid tires.  
The Nash Motors Co., Kenosha, Wis., miscellaneous truck equipment.

**Navy Supplies Contracts**

WASHINGTON, Sept. 28—The Bureau of Supplies and Accounts of the Navy Department has placed these contracts:

Randolph & Baker, Sussex, New Brunswick, airplane spruce.  
S. H. White, Ottawa, Ontario, airplane spruce.  
Watson & Todd, Ottawa, Ontario, airplane spruce.  
A. C. Dutton Lumber Co., Springfield, airplane spruce.

**Marine Corps Contracts**

WASHINGTON, Sept. 28—The Marine Corps has placed contracts as follows:

Marathon Tire & Rubber Co., Cuyahoga Falls, tire casings and inner tubes.  
Standard Oil Co., of New Jersey, Baltimore, oil and gasoline.  
Nash Motors Co., Kenosha, spare parts for trucks.

**Cleveland Busy on War Work**

CLEVELAND, Sept. 28—Nearly all the industrial activity in Cleveland is war work. Practically every kind of war necessity is made in this city. The production of passenger cars is at low ebb and all the companies are working up their inventories preparatory to getting on 100 per cent war basis by Jan. 1. Cleveland's production is more diversified than any city of the United States.

The wood-working and castings industries are not very busy, but it is expected that the latter will be filled to capacity within a short time. The Government demands for wood-working lines being only a small percentage of the capacity of the industry, many of the plants will be obliged to convert their facilities to other activities or suspend operations entirely, as very little commercial demand along this line exists.

The White company is speeding up its production of the large Government order for Class A trucks, part of which was parceled out to the Pierce-Arrow, Peerless and Packard companies, each receiving an order for 3000. The Peerless company is tooling up to get into production.

The Grant Motor Car Corp. is experiencing some difficulty in obtaining material. The average daily output of passenger cars is fifteen and truck production is 150 a month. The company is cleaning up its inventory with the expectation of being on 100 per cent war basis by the first of the year. The erection of a large building in Findlay, Ohio, is being considered, although nothing definite has been determined.

The Jordon Motor Car Co. is balancing its inventory and expects to be on war work entirely by the end of this year. The F. B. Stearns Co. is busily engaged in turning out Rolls-Royce airplane engines, of which it produces six a day. Only two passenger cars are built daily. Approximately 75 per cent of the production of the Willard Storage Battery Co. is for the Government. The production of passenger cars at the Winton plant is slowly diminishing, the output now being five a day. War work takes the biggest portion of the facilities of the plant. The Chandler Motor Car Co. has been in production on its war tractors for a number of weeks with the resultant reduction of passenger cars.

The tests at Dayton of the new bombing plane made by the Glenn L. Martin Co. are proving that this new type of

plane is the best yet produced. The results thus far are very gratifying, but the company is not ready to make any public announcement until the tests have been completed. The 68-acre flying field adjoining the plant is rapidly being put into shape and six large hangars will soon be erected. Each hangar will accommodate two or three machines.

**Disclose Chevrolet-G-M Plan**

NEW YORK, Sept. 28—In the official circular being sent to the stockholders of the Chevrolet Motor Co., calling attention to the special meeting to be held in this city on Oct. 11, for the purpose of voting on a plan calling for distribution of its assets to the Chevrolet stockholders, it is pointed out that an arrangement has been made with the General Motors Corp. whereby fractional shares will be purchased by that corporation at the rate of \$112 a share for General Motors Corp. common stock. The arrangement calling for the sale of the assets of Chevrolet to General Motors was approved in writing by the holders of 571,437 shares out of a total of 641,098 shares outstanding.

**Call "Non-Essential" Laborers "Slackers"**

WASHINGTON, Sept. 28—Transfer of men from employment in "non-essential" industries by characterizing them as "slackers" is planned by the United States Employment Service. Community Labor Boards throughout the country have been notified by N. A. Smythe, Director of the Service, to prepare and have published lists of industries in which women can be substituted for men. It is expected that by this means the men who are working in non-essential industries will be shamed into transferring their activities. It is anticipated that this will result in a transfer of 500,000 men to war work.

**Pay Certain Regal Creditors in Full**

DETROIT, Sept. 28—All creditors against the Regal Motor Co., now in receivership, whose claims are secured by first mortgage gold notes of the company, will be paid in full, it is announced by the Securities Trust Co., receiver. It is estimated that unsecured creditors will receive from 20 per cent to 25 per cent of their claims. The public sale, together with the machinery taken over by the Government, amounted to \$541,347.25.

**Bicycle Makers to Conserve**

WASHINGTON, Sept. 28—Bicycle manufacturers will conserve about 2500 tons of steel by observing a conservation program effective Oct. 1, and outlined as a result of conferences between the manufacturers and the War Industries Board. In addition to saving this steel, which is one-third of the quantity consumed by the industry in the last 12 months, there will be additional savings of other materials, production will be simplified and capital tied up in stocks will be released. The results are to be secured through a substantial reduction in the numbers of types and models of bicycles, saddles, handlebars, rims, tires, sprockets, pedals, etc. The manufacturers will discontinue, wherever possible, the use of metal, rubber and leather. Partly fabricated materials can be continued for production provided that no bicycles are made later than Dec. 31, 1918, other than those provided in the new program. Rim manufacture will be confined to one clinch type, 28 x 1 9/16, one single tube type 28 x 1 7/16. Tires will be confined to one clincher type in two sizes, either 28 x 1 1/2 or 28 x 1 1/4, one single tube type 28 x 1 1/2 or 28 x 1 1/4. Manufacturers may use the different markings, treads, etc., which are provided by the rubber tire manufacturers in accordance with their conservation schedule.

**Ford Tractors Sent in Carloads**

DEARBORN, MICH., Sept. 28—Henry Ford & Son are now carrying out a uniform policy with all their distributors of sending them only carload lots of 300 tractors each. This permits a whole train load to go to one destination and eliminates railroad congestion somewhat. The tractors are unloaded at one point and distributed from there throughout the state. Four train loads, each bearing 300 tractors, were dispatched to each of the following states: Iowa, Kentucky, Indiana and New York. Train loads will be sent to other states as fast as production permits. The daily production of the plant averages 155 tractors now.

**Seven Deaths from Flying**

WASHINGTON, Sept. 28—Seven deaths resulted at flying fields in this country for the week ending Sept. 21, 1918, representing one fatality for every 2129 hours flown, or 171,320 miles of air travel.

# Calendar

**ENGINEERING**

Nov. 14-15 New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

**ASSOCIATIONS**

Oct. 7-12—Milwaukee. American Foundrymen's Assn. and 5

allied organizations. Milwaukee Auditorium.

**SHOWS**

Sept. 30-Oct. 4—Trenton, N. J. Tractor demonstration (Trenton Fair). Harry B. Salter, Supt.  
Oct. 1-5—Washington, Ga. (Wilkes Co.). Tractor demonstrations, State Fair.

Oct. 12-19—Atlanta. Tractor demonstrations Eastern State Fair and Automotive Exhibition.

Oct. 14-27—Dallas, Tex., Seventh Annual Texas Automobile Show. Texas State Fair.

Oct. 16-18—Ottawa, Ont., International Plowing Match. Tractor and Farm Machin-

ery Demonstration. Experimental Farm.

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration. State Fair.

Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.

**RACING**

Oct. 5—Cincinnati. Cincinnati Speedway.



# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

Vol. XXXIX  
Number 15

PUBLISHED WEEKLY AT 239 WEST 39th STREET  
NEW YORK, OCTOBER 10, 1918

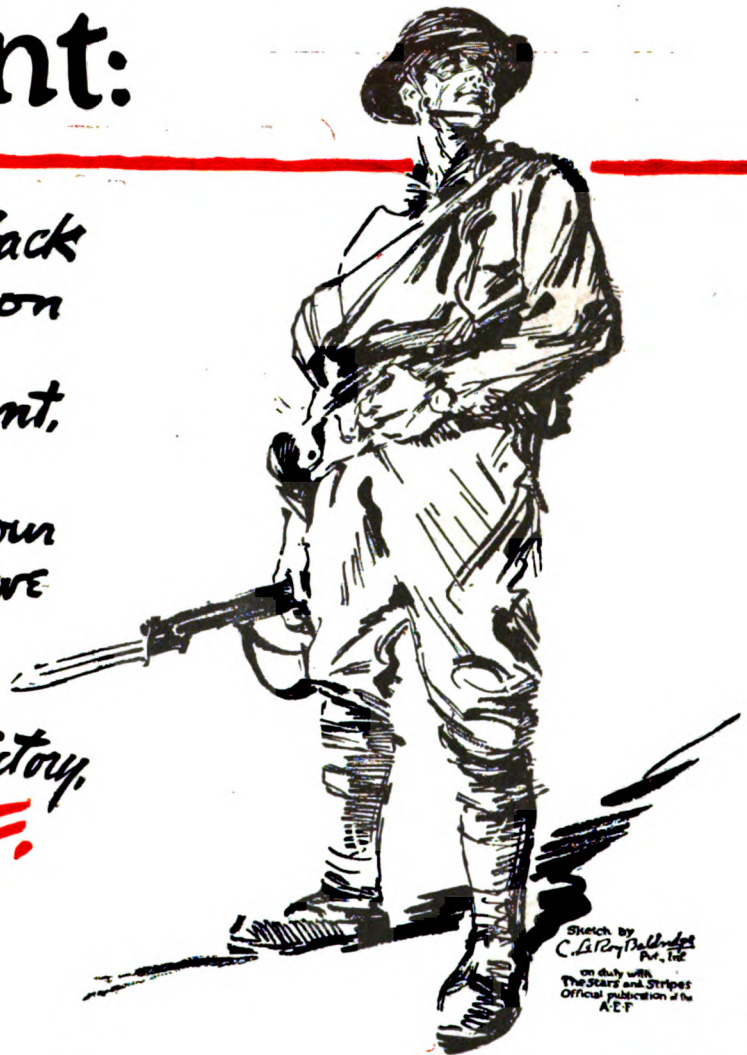
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Three dollars a year

# The A.E.F. to the President:

"If the folks back home fall short on the billions you need, Mr. President, call on us for the balance. We like our pay - but if we have to we can go without it,

Yours for Victory,  
**A.E.F.**

France, Sept. 7, 1918



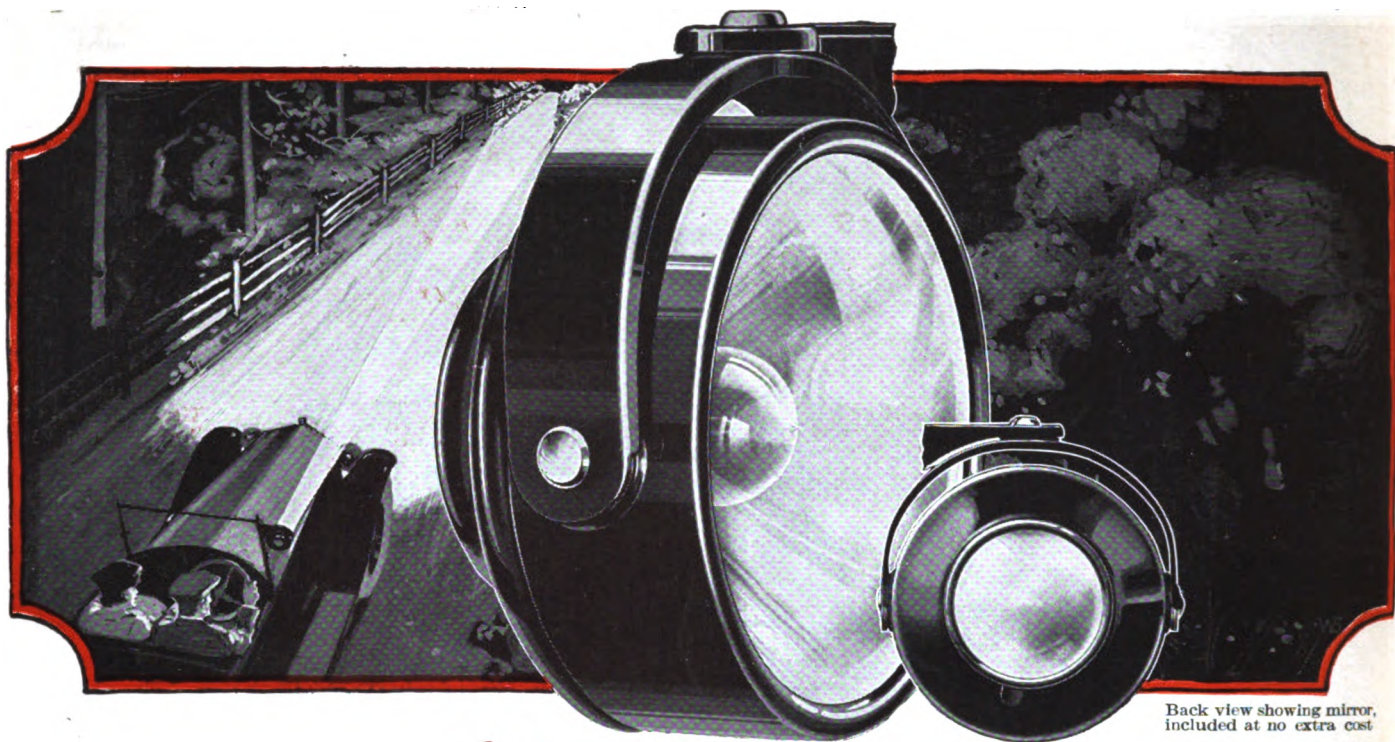
# Fourth Liberty Loan

THIS SPACE CONTRIBUTED TO  
THE WINNING OF THE WAR BY



U. S. BALL BEARING MFG. CO.  
CHICAGO ILL.





Back view showing mirror,  
included at no extra cost

**\$5.00**  
Complete  
with bracket  
and  
electric cord

# Stewart V-RAY SEARCHLIGHT

*A Real Searchlight—Not a "Spotlight"*

When you have occasion to use a searchlight, you want a *real* searchlight—not a "spotlight" with its small restricted "spot" of light.

You want a strong, powerful, all-revealing searchlight beam.

That is what you have in the Stewart V-Ray Searchlight. Its penetrating shaft of light shoots 'way down the road, revealing even the most distant objects.

The exterior design is particularly noteworthy. See how it stands apart—a thing of beauty. Observe how symmetrical it is. Note the design of the body; also the back.

It is beautifully finished with many coats of jet black enamel, baked on. And there is just a touch of nickel here and there to make the "tailor-made" appearance complete.

The Stewart V-Ray Searchlight harmonizes with the design of the modern automobile. Adds to its appearance. Looks like a built-in part of the car—not like a misplaced, re-vamped headlight.

It is scientifically designed. Made with a perfect parabolic reflector, which is silver-plated—not polished tin. Has a full six inch curved lens, instead of plain window glass.

A 3¼ inch reducing mirror, included at no extra cost, is located in the center of the back. It is not necessary to twist the light at an unsightly angle to use mirror. The switch is located conveniently so the hand finds it instantly in the dark.

The back is so formed that the hand grasps the light naturally, without cramping—and turns the light in any direction—up, down, right, left, front, or back—with ease. The case is absolutely dust and moisture-proof. A focusing device permits the use of any size bulb.

The bracket—an exclusive Stewart feature—not only permits turning the light in any direction, but also fits any windshield.

Both its handsome appearance and complete utility recommends it. It has high quality and finish all the way through. Its low price—\$5.00—is not an indication of quality, but a tribute to the Stewart Organization, which makes quality accessories at popular prices possible through large quantity production.

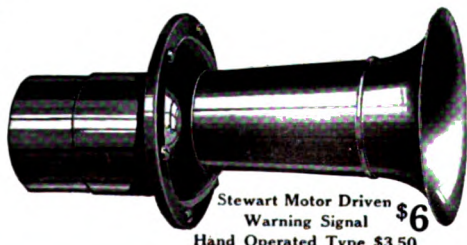
And so it is with all Stewart Automobile Accessories. Each, because of sheer merit and high quality, deserves a place in the equipment of every automobile.

Stewart Accessories are sold by leading accessory dealers, jobbers and garages everywhere.

**Stewart-Warner Speedometer Corporation**  
CHICAGO, U. S. A.



Stewart  
Speedometer  
**\$25**



Stewart Motor Driven  
Warning Signal  
Hand Operated Type \$3.50

Stewart  
Vacuum System  
**\$10**



Stewart Lens  
Per Pair  
**\$2**

# **AUTOMOTIVE INDUSTRIES**

## *The* **AUTOMOBILE**

VOL. XXXIX

NEW YORK, THURSDAY, OCTOBER 10, 1918—CHICAGO

No. 15

## **Aircraft Program of 1917 Proves Successful**

**Complete Engine Program Then Decided Upon Has Not Been  
Altered—Bureau of Aircraft Production Since It Took  
Hold Has Not Altered Program or Started  
a New Line of Production**

By David Beecroft

**N**EW YORK CITY, Oct. 8—Having told last week how the Aircraft Board was purposely created without executive power, and how its mission was purely advisory, leaving all executive power in the hands of existing organizations in the army and navy, the time is opportune to analyze the program drafted during the summer and fall of 1917 for aircraft apparatus and note how wise were many of the decisions made at that time in view of the latest developments at home and at the front. Each month brings fresh conviction as to the judgment of our program of aircraft design, and while there have been many orders and counter-orders, not one organization was responsible for these and very frequently the cause for them did not rest with the army or navy or Aircraft Board, but with aircraft authorities in other countries.

The wisdom of developing a type of engine such as the Liberty and building it with six, eight and twelve cylinders has been justified and the complete program of this engine has not yet been entirely carried out. The fact that on Sept. 5, 1918, one year from placing of the first contract for the Liberty engine, 6000 had been manufactured in America and

delivered is the best proof of the selection of such an engine, especially designed for production. In August approximately 2250 of these engines were manufactured, and the production in September must have approximated 3000. We are rapidly approaching the time when we will have a daily production of 275 Liberty engines, or a monthly production in excess of 5000.

Some months ago when production of Liberty engines was being slowed up it was urged that a great error had been made in not starting the manufacture in the summer of 1917 of several types of European aviation engines of good standing at that time. While the manufacture of such was not decided upon it was given very careful consideration by the Aircraft Board in 1917. It was found that to manufacture some of the best types of European engines the price would approximate \$11,000 per engine. The best figure one big American manufacturer would quote on one of these engines was \$10,000. The Liberty engine of greater horsepower has been produced on an original contract price of \$6,000 which was later reduced to \$5,000, and it is more than possible these engines will be produced at a purchase price

of \$4,000. It is solely the design and suitability of it to American manufacturing practices and American factory equipment and organization that have made this low price possible. It could not possibly have been done on a foreign engine.

There has been a good deal of experience in America during the past year in manufacturing a foreign type aviation engine. An order was placed for the manufacture of the twelve-cylinder European type engine in June, 1917, the order being for 1000 of these, and in the middle of May, 1918, or 11 months after the placing of the order, only six of these engines had been delivered.

### European Design and American Production

The argument that European types of engines should be built without changing the design has been largely exploded in this case, as over 700 changes had to be made in this engine to meet manufacturing conditions in American factories. It is true this is not as many changes as were made on the Liberty engine, but considering that the European type was a standard tried-out product, the figures are indisputable evidence of the difficulty of manufacturing a European type in an American factory without modifying the design.

Those who had to do with the general framing of the aircraft program in 1917 are to be congratulated on many of the decisions made relating to the program. Practically everything they decided upon is being carried out, and scarcely a new thing has been started since the creation of the Bureau of Aircraft Production in May, 1918, when John D. Ryan was placed in charge of this. The program for manufacturing the Liberty engine was laid out complete. The contract for the 300 hp. Hispano-Suiza engine was approved. The manufacture of the LeRhône engine was started. The selection of the DH-4 and DH-9 planes was settled in the fall of 1917. Arranging for the development of the Caproni and Handley-Page bombing planes was under way last fall and in the early winter and experts to give the necessary assistance in developing these types were brought to this country. The Handley-Page staff arrived the last week of December, and the Caproni experts arrived in January. Arrangements were made for bringing LaPere, the well-known French designer, to this country to develop new designs and he arrived last December.

### Criticism of Senate Committee Must Be Withdrawn

With this record of achievement to the credit of those who took charge of our airplane program a year ago, and with practically nothing new started since the Ryan administration took hold, many of the statements of the recent Senate Committee Report must be discounted and many of the blames placed on the Aircraft Board must be withdrawn. In spite of not having executive power, but only being an advisory organization, the old board seems to have had a broad grasp of the situation.

It is opportune here to just refer to the general conception of aviation as held in the summer of 1917. At this time our Allies insisted on America meeting first of all the great requirements for mate-

rials. If America could give England and France materials out of which airplanes could be made that would be a big step in checkmating Germany. Our Allies had to have materials in order to carry out their airplane program. Consequently our first duty was that of supplying materials.

After this our Allies insisted on America supplying finished parts if they were able to do this after furnishing raw materials. Raw materials must come first, and finished parts afterward.

The third requirement was that we must supply trained men by way of aviators, mechanics, ground men and others to assist in airplane work.

With these three primary essentials supplied, our Allies took the view that if in addition America could manufacture planes, she should decide on the manufacture of those planes that could be produced in greatest quantities and which would be interchangeable so far as uses are concerned, that is, planes suitable for directing artillery fire, reconnaissance, photography, and other uses. It was undoubtedly this request on the part of our Allies which led to the selection of such a type as the DH-4 or the DH-9, which are well suited for a variety of uses, and lend themselves to production.

### Program of Great Significance

In view of this desire on the part of our Allies, the program as laid down on aviation a year ago becomes of greater significance.

This partly explains the delays which have taken place with regard to our program on building bombing planes, such as the Caproni or Handley-Page.

It was not until July, 1917, that the Handley-Page bombing plane started on its developing stages in England. At that time few were produced and England was just developing an interest in a bombing plane program. The first conception of possibility of destruction by a bombing plane dates from July, 1917, when the British Handley-Page made the trip from London to Constantinople and destroyed a Turkish war ship. This really decided the British to go ahead with the manufacture of such planes, but it was necessary to make a great many changes in design.

### America Urged Not to Produce Bombing Planes

At that time America was practically urged not to go into bombing plane production because the submarine menace was particularly acute and it was a grave question as to whether America would have shipping facilities to transport bombing planes if they were manufactured. In view of this there is little wonder that America should have considerably delayed its bombing plane program.

Later, in 1917, when the possibilities of building bombing planes were seriously considered there were unfortunate incidents that delayed matters. At this time Handley-Page had no working drawings suitable for beginning production in America. Three different sets of Handley-Page drawings were sent to America, the last arriving in December, 1917. It was planned to go into production and dies were made according to the first two sets of drawings.



all of which had to be destroyed when the third set arrived in this country. Some further dissension was created about this time due to a personal representative coming to the United States and endeavoring to sell the Handley-Page on a personal basis in spite of the fact that the U. S. A. had previously arranged to deal direct with the British Government on such matters.

In justice to the old board organization, which was largely drawn from the automobile industry, and to the manufacturers who endeavor to carry out

the orders placed by the army and navy, it must be stated that the change in board leadership has not resulted in any new policy with regard to our aircraft program. The Bureau of Aircraft Production has not started into production a single new type of engine or plane that the old board had not started. The Bureau of Aircraft Production has, as nearly as can be judged, consumed 3 or 4 months going over about the same ground that the old organization went over in 1917 and has apparently arrived at about the same conclusions.

## Accuracy Training Most Rigorous Test

**T**HE most rigorous flying instructions given to pilots, according to the War Department, is "accuracy training." This comprises turning the figure eight at angles of 60 degrees on short courses flying as low as 300 ft.

On an average field for this instruction there are three figure eight courses laid out, with eight markers, one in the center of each turn, one where the turn starts, one where it finishes and one at the outermost point. These are fixed points, never changed because of varying winds, though turns must be made in the direction which will come nearest to bringing them into the wind. All courses are so laid out that, should a forced landing be necessary owing to motor or other trouble, it will be possible to reach either the main field or some other open field suitable for safe landing.

A new man is first taken up by an instructor, who points out the courses, flies one of them, then has the student fly it. If any difficulty is developed in coming quickly into a 50-degree bank and holding it without either climbing, nosing down, slipping or skidding, or if turns are not made accurately over the points and wind drift properly overcome by "crabbing," the student has his trouble pointed out and is worked over until he can fly satisfactorily with an instructor.

Most of his work on eights is then done alone, in flights lasting 15 or 20 minutes, under the careful observation of the instructors and of all students not in the air. He is kept on eights until he can fly them almost perfectly alone. If any difficulty develops which he does not right after criticism, he is taken up again by an instructor. On eights, and field work as well, he must level off 150 to 200 ft, before a turn.

For climbing out of the field a square 1200 ft. on a side, marked by corner pylons and whitewashed side lines, is used.

The pilot must make banks at the corners as steep and sharp as he can with confidence—at least 45 degrees, preferably 60 degrees—and must hold his course accurately to the white ground line. The only exception is made on the first turn. When the wind is not head-on against the take-off, it may be difficult to make the first turn over the pylon 1200 ft. from starting and take-off with safety, and pilots are ordered never to attempt it unless sure of ample flying speed.

After four times around the field, a plane climbs to 1000 ft., makes sure that no others are taking off, flying the course, or landing, and does a one-turn spiral, aiming to stop on a white spot in the center of the field. Ample speed for safety, however, particularly on the last part of the spiral and straightening out for the landing at least 100 ft. above the ground, are insisted upon as of greater importance than merely stopping in the exact center of the field.

Three or four planes are usually sent off in series, timed so that no two will be over the same part of the course at one time. They must spiral down on the same order as they started, and each plane must start its spiral immediately after, but not until, the plane ahead has landed. There is a knack in the beginning of this spiral, and it takes time to acquire it. The engine must be cut off simultaneously with the banking of the plane, and the pointing of its nose down and the whole movement must be executed while the plane is directly over the white spot in the center of the field.

Emphasis is laid on the bearing of the accuracy stage work on a student's later work, either on the front or as instructor. A good flier must be able to make turns accurately and without losing altitude. After becoming proficient in 60-degree banks it is not a difficult matter for him to practice later at higher altitudes.



*Members of the American Gear Manufacturers Association in Convention at Syracuse.*

# Magnetism in Magneto-Generators

## An Analysis of Flux Changes Through the Armature Coil and of the Voltage Curve of an Ignition Magneto Based on Oscillograph Records

By Harry F. Geist, E.E.

THE one most important element in the make-up of a magneto-generator is its magnetic field, for it is upon the strength of this field, its distribution through the magnetic circuits of the machine and the manner in which this magnetism is shifted by the motion of the armature that the generating ability of the magneto depends.

The magneto as designed for ignition purposes performs three electromagnetic functions, namely, the generation of electric energy, the storage of energy and the dissipation of the energy in the form of a spark. In the case of the high-tension magneto, production of the spark involves a transformation of the energy to a very high potential.

How the machine will generate the electric energy that subsequently goes into the spark depends upon the amount of the magnetic flux that is interlinked with the windings of the machine, and upon how this interlinkage is changed by the changing relative position of the armature faces with the pole piece faces; while the manner in which the coil stores and utilizes this energy is largely dependent upon the circuit characteristics of the windings.

This article will be restricted to a study of the magnetic flux present in the magneto and of the manner in which it is affected by the armature rotation. The writer has employed an oscillograph as a means of making such studies.

Attention is called to Figs. 1, 2 and 3, illustrating in a diagrammatic way a conventional wound-armature type magneto. The armature is shown in three distinctively different positions with respect to the reversal of the flux through the coil, this reversal taking place twice for each revolution. These positions are, respectively, 75 deg., 90 deg. and 105 deg. from the horizontal armature position. The arrow denotes the direction of rotation assumed. The diagrams show the magnets with an assumed polarity, the pole pieces conforming to the machine bore, and the armature with its winding, one turn of which is shown in section, and indicates the direction in which current would flow if the circuit were closed.

For this discussion, the winding is considered open circuited, so that the distribution of flux and the flux changes will respond naturally to the true changes in the magnetic path as the armature revolves and will not be disturbed by the reactive forces that would accompany closed circuit currents.

The diagrams also show the flux distribution through the armature as fed from the pole pieces in amounts designated by  $\phi$  expressed in maxwells, the standard unit of magnetic flux. This distribution shows the flux that flows through the coil core proper and the

flux that is by-passed from the coil by the armature faces in their proper proportions for each position, as calculated from data to be presented later. Inasmuch as the armature is assumed to be continually revolving, there will be a continual changing of the flux distribution as indicated by the lines marked  $d\phi/dt$ , which express the actual rate of flux shift and its direction, the unit of rate being one maxwell per second. These rates of shift were produced by an armature rotation speed of 600 r.p.m.

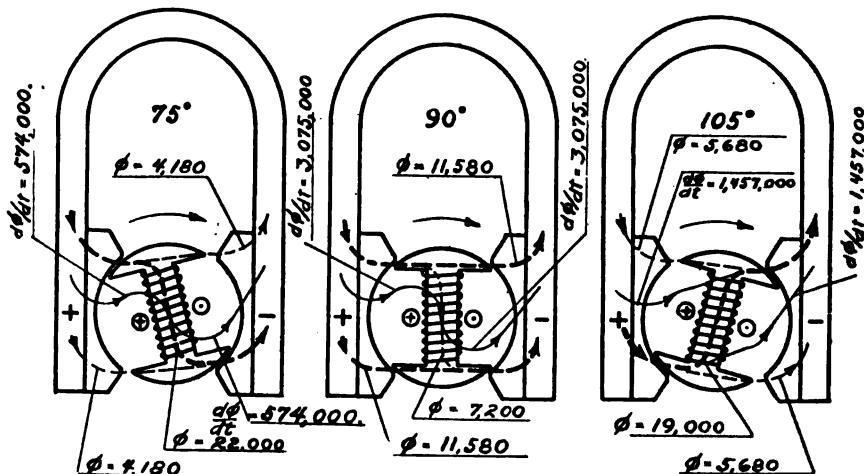
A study of the figures shows that in Fig. 1 most of the flux passes down through the coil, as indicated by the heavy dotted lines, and that it is being shifted out of its interlinkage with the coil to the path presented by the armature faces by-passing the coil.

Fig. 2 shows the armature in the position where its faces bridge the opposite pole piece tips, and in which position under ideal conditions all the flux would be excluded from the coil, but owing to the eddy currents and hysteresis of the iron that carries the flux, the flux is slightly delayed in being shifted from the coil core.

Referring now to Fig. 3, it is seen that the flux is here practically all flowing through the coil core again, but that it now flows up through the core in the opposite direction from that in which it flowed in Fig. 1, and, also, that the flux continues to be shifted into the coil.

In order that the electromotive force generated during the armature change will be of the same polarity for the positions of the armature shown, the shifting of the flux must always be in the same direction with respect to the coil. In the diagrams this condition is shown to be fulfilled in that the changing flux, as represented by the lines  $d\phi/dt$ , is passing downward on the left-hand side of the coil and upward on the right-hand side of the coil for all three diagrams.

Thus one varying impulse of e.m.f. is generated as



Figs. 1, 2 and 3—Diagrammatic illustrations of a conventional wound-armature type magneto, with the armature in three different positions with respect to the reversal of the flux through the coil

the armature makes one complete half turn, starting from its horizontal position, and duplicates its performance with an impulse of opposite polarity as it completes the revolution.

It is very important to notice at this time that during the first quarter of a revolution practically all of the flux is shifted out of interlinkage with the coil, and that for the succeeding quarter of a revolution this same flux is thrown back into interlinkage with the coil, the passing out and back into interlinkage following each other so closely that one continuous effect is produced. It is also important to notice that the flux, in being shifted, has two paths to follow during shift. These two facts, including the double use of the magnetic field and the double path for flux shift, combined with the shortness of the magnetic path necessary, are no doubt responsible for the fact that this type of magneto is easily the most efficient type of generator for magneto design.

In order to analyze the magnetic phenomena of a magneto in both a quantitative and qualitative manner, it is only necessary to study the manner in which the e.m.f. is generated as the armature revolves to produce the flux shift. The theory of this generation is as follows:

### Theory of E. M. F. Generation

It is well known that when magnetic flux is shifted from interlinkage with a coil of wire, or vice versa, an electromotive-force is induced in the coil. The simplest condition is that of the open circuit e.m.f., as with an open circuit the reactive forces due to electrical currents do not have to be taken into consideration.

This e.m.f. will be determined by the law according to which an e.m.f. of one volt will be generated at the terminals of a coil if a magnetic field is caused to be shifted in its interlinkage with the coil at the rate of 100,000,000 turn-maxwells per second.

If  $e$  designates this e.m.f.,  $N$  is the number of turns in the coil;  $\phi$ , the flux in maxwells, and  $t$  the time in seconds, then this law can be expressed in the form of the following equation:

$$e = \frac{Nd\phi}{10^8 dt} \quad (1)$$

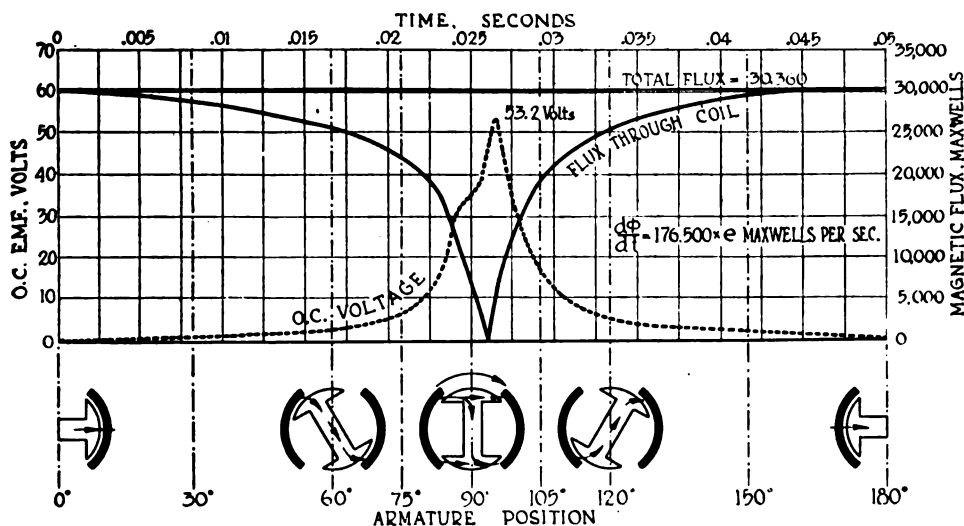


Fig. 5—The o.c. voltage wave is a reproduction of the oscillogram shown in Fig. 4

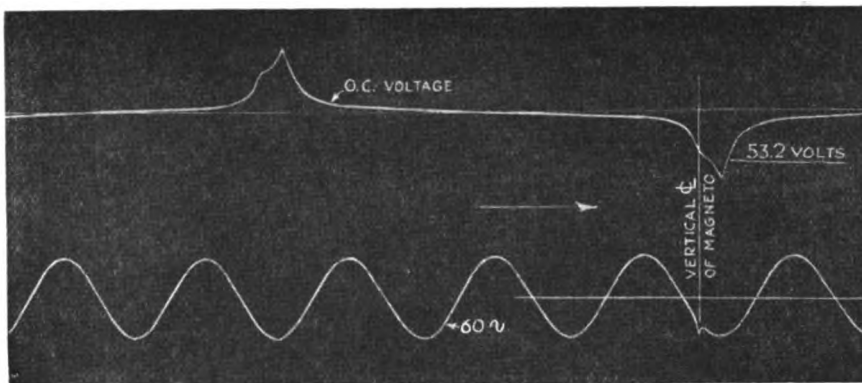


Fig. 4—Oscillogram of the open circuit e.m.f. wave of a low-tension magneto of the conventional wound-armature type

In this equation  $d\phi/dt$  expresses the rate of flux change. Equation (1) can be transformed to read

$$\frac{d\phi}{dt} = \frac{10^8 e}{N} \quad (2)$$

giving the rate of flux change at any instant, or to read

$$d\phi = \frac{10^8 e dt}{N} \quad (3)$$

thus forming an expression for the amount of flux shifted during an infinitely small interval of time  $dt$ . By a summation of a series of consecutive intervals  $dt$ , taken over a complete cycle of flux change, the total amount of flux involved in the change can be ascertained.

It is therefore evident that any method that makes it possible to measure the e.m.f. induced in the magneto coil as it varies with the motion of the armature makes possible an analysis of the magnetic field of the machine, by the use of equations (1), (2) and (3).

The oscillograph offers a very simple and direct method of graphically measuring the voltage wave of the magneto, giving as it does a photographic record of the voltage variations for any period of time desired.

### Analytic Measurements

In Fig. 4 is illustrated an oscillogram of the open circuit e.m.f. wave of a low-tension magneto of the conventional wound-armature type. This machine is one of standard make and good design, and has the following physical dimensions that have a bearing upon its electromagnetic performance.

Its armature has an outside diameter of  $1\frac{3}{4}$  in. and is wound with 566 turns of No. 22 wire. The active bore depth of the machine is  $2\frac{3}{4}$  in., with a clearance of 0.004 in. between the rotor and the stator, and the overlap area of the armature tips upon the field pole tips for the vertical position of the armature is 0.327 sq. in. The weight of the magnets is 3.6 pounds.

In obtaining the oscillogram shown in Fig. 4, the armature was revolved at a speed of about 600 r.p.m.

Referring to the oscillogram, the arrow indicates the sequence of events along the record; the



upper curve represents the open circuit e.m.f. wave of the magneto for about one complete revolution of the armature and shows how the e.m.f. rises to a peak corresponding to a value of 53.2 volts during a small part of the revolution and then drops off as rapidly; and the lower curve shows a 60-cycle voltage wave that is practically sinusoidal, serving as a time calibration of the oscillogram, in that the distance between two similar points on the wave represents a period of 0.01666 second.

On this 60-cycle wave may be seen a little irregularity that locates the vertical line marked "Vertical Center Line of Magneto," and indicates the vertical armature position with respect to the open circuit e.m.f. wave generated in its coil. This small irregularity was produced by including a battery and coil circuit, of the kind commonly used for battery make-and-break ignition, in the 60-cycle circuit, so arranged as to be automatically short circuited and then opened at the instant the armature reaches its vertical position, so that the inductive kick voltage produced by the choke coil is superimposed upon the 60-cycle wave.

It is evident that by this combination of the e.m.f. wave of the magneto taken simultaneously with a 60-cycle timing wave that indicates the position of the armature, the value of  $e$  for any armature position can be easily obtained from Fig. 4 and that by the use of the data available in the oscillogram, in connection with equations (1), (2) and (3), a very complete analysis of the magnetic phenomena of the machine is possible.

Attention may be called to the fact that the maximum or peak value of e.m.f. does not occur at the instant the armature reaches its vertical position. Under ideal conditions it would generate its maximum voltage at this instant, but the shifting of the magnetism in the iron at a speed of 600 r.p.m. sets up eddy currents and hysteresis that cause the peak of the wave to be delayed slightly, as previously pointed out. These losses in the iron, of course, are greatest at higher speeds of rotation, so that the delay of the maximum is also greater.

### Calculations

A check-up for one complete revolution of the armature shows the time required to be about 0.10 second, but the results desired can be obtained from one-half the cycle of the machine, which corresponds to 0.05 second.

If the time ordinate of the e.m.f. wave of the machine is divided into 100 equal parts, each part representing an interval of 0.0005 second, and the value  $e$  is tabulated for each part, it is possible to tabulate simultaneously with these values of  $e$ , by the use of equation (2), the rate of flux change  $d\phi/dt$ , and since each of these divisions represents an armature position that can be determined, it is evident that the rate of flux change for any armature position is determinable.

Further, by the use of equation (3) it is possible to calculate the flux in maxwells shifted during each interval, so that by adding the amounts of flux shifted for all intervals the total amount of flux shifted with respect to the coil is obtained. Such a summation derived from the oscillogram, Fig. 4, gives the total amount of flux as 60,720 maxwells.

It must be remembered that the flux is first shifted out of interlinkage with the coil and then back into interlinkage with the coil, so that the actual amount of flux present in the machine is only half of 60,720 maxwells, or 30,360 maxwells.

An approximation of the above result may be obtained by considering the entire half revolution of the armature as one interval of time  $dt$ , so that  $d\phi$  will then give the total amount of flux shifted for the half revolution. For this approximation it is necessary to take the

numerical average value of  $e$  for the half revolution. The average value of  $e$  for the oscillogram shown may be obtained by the use of a planimeter or by taking the average of a hundred equally spaced values. This value was found to be 6.72 volts, which, substituted in equation (3), gives

$$d\phi = \frac{10^8 \times 6.72}{566} \times 0.05 = 59,360 \text{ maxwells}$$

shifted with respect to the coil for a half revolution, and checks very well with the 60,720 maxwells obtained by the step by step summation process.

To illustrate the method of calculating the flux shift, as well as the maximum rate of flux change in this machine, the maximum or peak voltage value is substituted in equation (2):

$$\frac{d\phi}{dt} = \frac{10^8 \times 53.2}{566} = 9,399,300 \text{ maxwells per second.}$$

In Fig. 5 the o.c. voltage wave is a reproduction of the oscillogram of Fig. 4 and the curve marked "Flux Through Coil" is obtained by subtracting the flux shifted for each of the 100 intervals of time from the maximum flux through the magneto, until none is left, and then adding the flux shifted until all the maximum is again obtained. The distance between the zero flux line and the maximum flux line is thereby divided into two parts, of which the lower represents the amount of flux flowing through the coil, and the upper, the amount flowing through by-pass paths, so that the diagram makes possible a complete analysis of open circuit flux distribution for any armature position. The rate of flux shift  $d\phi/dt$  will always be exactly in proportion to the open circuit voltage and can be obtained by multiplying the value of  $e$  by the constant 176,500, as seen from equation (2).

The values of flux distribution and shift given in Figs. 1, 2 and 3 were obtained from diagram, Fig. 5.

Another item of interest in this connection is the form factor of the voltage wave generated:

$$\text{Form factor} = \frac{\text{Effective value}}{\text{Average value}} \quad (4)$$

The effective value is the value indicated by an ordinary voltmeter and is also the value received by taking the square root of the average of a large number of values of  $e$  taken at equal intervals over the wave and squared. This square root of the mean squares or effective value taken by means of an ordinary voltmeter for an armature speed of 600 r.p.m. was 13.0 volts, while calculations based on Fig. 4 give the value as 12.82, which is a very good check. Therefore,

$$\text{Form factor} = \frac{12.82}{6.72} = 1.91.$$

From this form factor it is possible to calculate the average voltage received from a magneto over quite a range of conditions without the use of an oscillograph, because the form factor is dependent almost entirely upon the physical dimensions of the armature and the field pole pieces and their co-relation.

**BAUXALITE** is a non-ferrous metal having a specific gravity slightly greater than that of commercial cast aluminum. Its specific gravity is 3.2. According to reports of tests on hand it has a tensile strength of from 30,000 to 35,000, and compression, transverse, and torsion strength of 125,000, 87,000 and 60,000 lb. respectively.

It is said to be easily machined at high speed without the use of a lubricant. It is claimed for it that while it may be plated in any metal color required, it can be polished to a silver finish by the usual simple methods and will not corrode.

# Tractor Activities in Northern Ohio

Industry Early Developing Into a Specializing or Assembling One—Parts Makers Increasing—What the Various Companies Are Doing

By P. M. Heldt

**I**NDIANAPOLIS, IND., Oct. 4.—Northern Ohio has been a center of the agricultural implement industry, particularly the traction engine and thresher industry, and since the "gas" tractor is closely related to the steam traction engine, and is, in fact, rapidly replacing it, it is no wonder that we find the tractor industry well represented in this district.

There are essentially two classes of firms engaged in the tractor business in Ohio, one with implement antecedents, the other composed mainly of men who were formerly or are still connected with the automobile business. The former are for the most part located in the smaller towns, while the new organizations, composed of automobile men, seem to prefer the large manufacturing cities.

The tractor industry is developing early into a specializing or assembling industry, and besides tractor manufacturers we find in the district mentioned a good many firms that supply complete parts to tractor makers.

The writer has just made a trip through the northern part of the state, starting at Cleveland and working in the general direction of Indianapolis, calling on all firms in the business located in this territory.

## Cleveland Expanding Rapidly

In Cleveland we have in the Cleveland Tractor Co. one of the largest firms in the industry. The Cleveland creeper type tractor, although it has been on the market only a little over one year, is already so well known that it requires no description. The firm occupies a new and modern plant at Lamb and Euclid Avenues, rather remote from the center of the city. In fact, it is beyond the urban street railway service and the firm operates a motor bus between the terminal of the street car line and its plant, which runs all day and carries people to and from the plant free of charge.

During the past summer the company moved into an addition to its plant, a single-story structure measuring 182 x 444 ft. The original plant is now used almost exclusively for office purposes, the various factory departments, such as machine shop, heat treating and assembling departments, having been moved into the new building. At present the company employs a force of 884.

Its output during the month of August was between 600 and 700 tractors, and it is hoped shortly to get the production up to 1000 tractors per month. In this connection it must be remembered that the engine, which forms a very considerable part of the whole tractor, is manufactured in the Weidely plant in Indianapolis.

The Cleveland tractor is a two-plow outfit and, being of the creeper type, is specially adapted for use in districts where the ground has to be worked while in a soggy condition or where the soil is sandy. I asked Mr. Drysdale, the advertising manager, whether there was any tendency toward a seasonal business in tractors, and he replied that they had not been able to observe this so far; there probably would be if only one section of the country was considered, but where a national business was done, one part of the country made up for another.

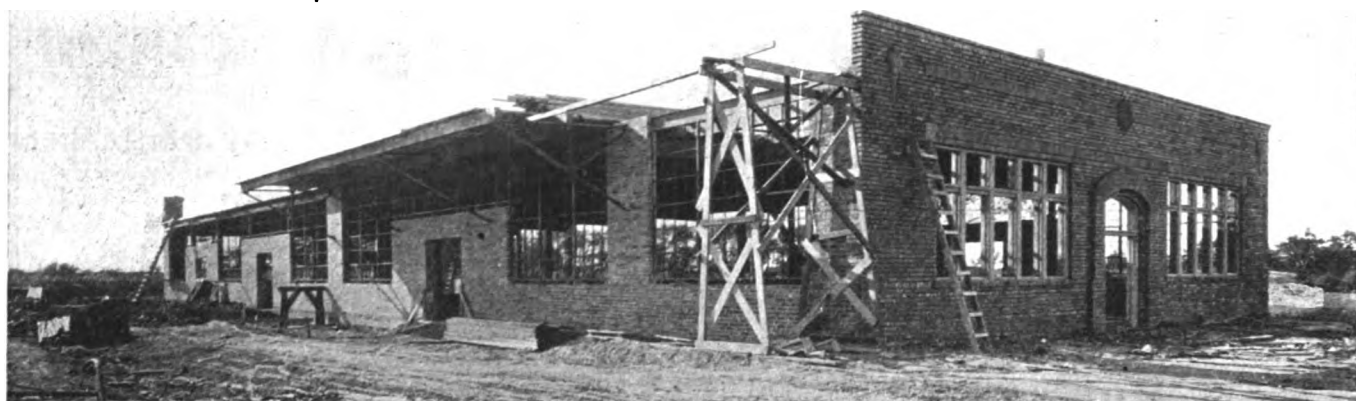
A number of improvements have recently been made in the mechanical construction of the tractor. Thus, the pins of the track are now surrounded by hardened-steel rollers, which engage with the teeth of the driving sprocket, whereby the life of the sprockets is greatly increased. Timken roller bearings are now used throughout the tractor, and a sort of roof shaped guard of sheet metal is placed on the track frame, on which the dirt carried up by the track falls and is carried off. The Cleveland company employs the movable assembling method in what is probably its simplest form, there being a track on the floor, consisting of two channels with the open side up. On this track there are wheeled trucks, on which are placed the frames of the tractors, to which the other parts are added as the trucks move along.

## Craig Tractor a Newcomer

A new concern in the tractor business in Cleveland is the Craig Tractor Co., which has just been incorporated under Delaware laws, with a capital stock composed of 3000 shares of 7 per cent cumulative preferred stock of a par value of \$100 a share and 3000 shares of common stock without par value. While the charter has been issued, at the time of the writer's call, the application for permission to issue stock had not yet been acted on. Development work for this firm is



*The Indiana tractor is adapted to haul any farm implement which requires three horses to draw it*



*Craig tractor plant in course of erection. This picture was taken Aug. 29, 1918*

being carried on in a leased building in Cleveland, but a new plant has just been erected for the firm in Euclid Village, just outside of Cleveland, by the Austin Company.

Harry Dwight Smith, president of the Fuller & Smith advertising agency, is president; Norman Craig, also of Fuller & Smith, vice-president and general manager; Arthur Judson, (Fuller & Smith) secretary and Roland T. Meachem, investment broker, treasurer. Other directors include Heman Ely, secretary of the Timken Roller Bearing Co.; H. J. Porter, special representative in Detroit of the Timken Roller Bearing Co., and Charles P. Hine, a Cleveland attorney.

The preliminary program of the company called for a production of 1200 machines during the first year. The purpose is to turn out a high-grade tractor, which, as Mr. Craig expressed it, would occupy in the tractor field about the same position as a Cadillac car occupies in the automobile field. While it is realized that such a tractor will cost considerably more than the farmer has been accustomed to pay, it is believed that the increased reliability and greater satisfaction derived from the use of such a machine will more than make up for the increased first cost. The new plant referred to is the Austin company's No. 1 design, measuring 60 x 180 ft. A full description of the Craig tractor, which was designed by John Dietrich, formerly chief engineer of the Republic Motor Truck Co., will appear in another part of AUTOMOTIVE INDUSTRIES.

#### J. T. to Have New Model

The J. T. Tractor Co., which occupies premises at 5810 Euclid Avenue, has been engaged in the development of a creeper-type tractor for some time. It has completed two successive models, which have been tried out in practical work, and is now building a third model, which will be completed within a few weeks and will embody a number of improvements over the previous models. It is intended to use the chief model, manufactured by a concern newly organized at Port Huron, Mich., by Harry Erd, formerly of the Erd Motor Co.

The tractor is to be a three-plow machine and will be equipped with a four-cylinder  $4\frac{1}{2}$  x 6 in. engine. A feature of the creeper construction is that the driving sprocket engages with both ends of the track pins. There are 32 shoes in each track, and each shoe has only a single gripping projection, this having been found preferable to the double projection, because with the latter construction the space between the two projections on each shoe will fill up with dirt, which will adhere to it, thus making the projections partly ineffective. A Detroit Gear & Machine Co. three speed transmission is used. This is similar to the same company's automobile transmission, except that the intermediate speed is the direct drive and the high speed is geared up. The three speeds of the tractor are  $1\frac{1}{4}$ ,  $2\frac{1}{2}$  and 5 m.p.h. This new model will be known as Model N and will be rated as a 16-30-hp. or three-plow tractor. Its weight will be about 6000 lb. Kerosene fuel will be used, the company also having developed a kerosene carbureter, which is being manufactured also for the general market and is now in regular production.

A sectional view of the carbureter is shown herewith. It is of the type in which the fuel nozzle is completely closed when the engine is not running. This permits of using the carbureter without a float if so desired, and it has been successfully used on tractors in this way. In the illustration, however, the carbureter is shown with a float. The float is of the spun metal type and acts on the float valve through a pair of balance levers. The kerosene flows from the float chamber through a communicating passage to the spray nozzle, in the top of which is a taper metering valve. This valve is carried by a cylindrical block of metal, which forms the plunger of a dash pot. Connected to this plunger by a number of radial arms is an air valve which when the carbureter is not in operation completely closes the space around the spray nozzle. The ends of the air valve or ring are tapered out. When the engine is started up and a suction is created in the upper part of the carbureter, the air valve is lifted, and with it the fuel valve.

It will be noticed that the fuel valve proper is held in a brass holder, which has a tapering seat in the mouth of the spray nozzle. The greater the suction, the more the air valve and the fuel valve will lift. Owing to the tapering end of the valve holder, the kerosene drawn out of the spray nozzle spreads over the upper surface of the metering valve seat and the part surrounding the nozzle, referred to as the mixture adjusting slide, and as it reaches the edge of this surface, it is taken up by the air coming up through the restricted passage between the mixture-adjusting slide and the air valve. At this point of the air passage a sort of Venturi effect is produced, which results in a very strong atomization of the fuel. The dashpot connected to the air valve and metering valve prevents any fluttering of these parts when the throttle valve is suddenly opened or closed.

For starting, a rich mixture can be obtained by moving the mixture-adjusting slide upward by means of a lever and link connection to an operating device located convenient to the driver. Vaporization of the kerosene is effected by preheating the air drawn into the carbureter by passing it through an air heater combined with the exhaust manifold. In using this carbureter on the J. P. tractor, it has been found that the kerosene can be turned on after running on gasoline for a distance of 400 ft., this, of course, referring to full load operation. The J. P. kerosene carbureter is manufactured in 1,  $1\frac{1}{4}$ ,  $1\frac{1}{2}$ ,  $1\frac{3}{4}$  and 2-in. sizes.

#### Standard Parts Has New Wheel

The Standard Parts Co., of Cleveland, which manufactures a great variety of parts for automobiles and motor trucks, also supplies numerous parts to tractor makers, including springs, gear blanks, Bock roller bearings, bands for built-up wheels, and steel tubing, either straight or bent according to specifications. The company has developed a special design of tractor driving wheel having an ordinary plain rim, with quick detachable lugs. The wheel has solid round spokes, which are welded to the hub and rim. Owing to the pressure of war work, it is very doubtful whether this wheel will be put in production while the war lasts.



e K. W. Ignition Co., manufacturer of magnetos and ignition parts, supplies magnetos to a great many tractor manufacturers. It was the originator of the impulse which is now almost universally used on tractors having magneto ignition. This company is also supplying magnetos for Government work, and this, in connection with its ignition replacement business, keeps it quite busy.

#### Has Big Gas Tractor Maker

Marion, Ohio, is located the Huber Manufacturing Co., one of the largest manufacturers of gas tractors in the state. The firm has been building steam traction engines for threshing for 40 years and it took up the gas tractor at a very early date. In fact, so far as it has been able to learn, it was the first gas tractor in the country, and the writer was shown a clipping from the *American Thresherman*, of June, 1911, according to which the Ferguson Implement Co., of Kansas City, Mo., who at that time was acting agent for the Huber company, was exhibiting what was referred to as a gasoline engine, made by the Huber company, which was mounted on a gas tractor, with a single cylinder upright engine. Referring to the machine, the paper went on to say that it was claimed to be a powerful puller and very economical in operation, as this fuel, gasoline, is cheaper than coal in producing a good power. The Huber company also has a letter from F. J. Collinson, of Willmar, Minn., stating that in November, 1898, I bought one of your gas tractors, No. 101. It was the first gas tractor ever landed in old Illinois. People came from miles to see it work. It was a single cylinder hot tube engine. It had only the old hot tube for ignition and worked with a match."

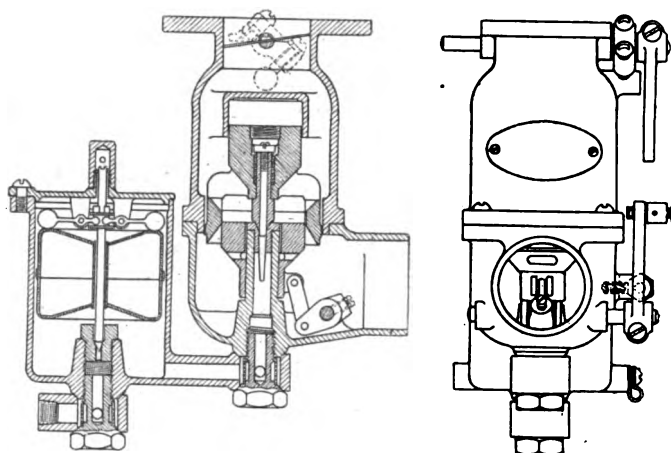
Barlow, of the Huber company, states that this was the first or the second machine that they turned out. They began with either No. 100 or No. 101. They put through a lot of thirty machines, but later gave up their early manufacture. However, they continued thinking of tractors and developing their ideas until they got into production in 1910. For some years they manufactured quite an extensive line and adopted the slogan: "A tractor to fit every farm"; but later on they reached the conclusion that the advantages of standardization and quantity production outweighed those of a well sounding slogan, and they are making only a single model, a three plow machine. During the past year the Huber company turned out approximately 2000 tractors, and material has been purchased for 3000 for the coming year, but owing to the recent action of the War Industries Board, the program may have been curtailed.

#### Aultman-Tailor Small Model

Aultman-Tailor Machinery Co., located at Mansfield, Ohio, manufactures a wide line of agricultural machinery, and has been in business for 54 years. A number of years ago it took up the gas tractor and now produces four models, at 15-30, 18-36, 25-50 and 30-60 hp. The smallest model recently brought out only quite recently and is equipped with a single cylinder engine, while heretofore the company has manufactured all parts of the tractor itself, with the exception, of course, of such parts as magnetos, carbureters, etc. During the past year the demand for tractors was unusually strong, and many more could have been sold than it was within the capacity of the company to produce. The actual output was between 600 and 700 tractors. The company's program for the coming year has not yet been laid down, as its year begins Nov. 1.

Shelby, the Shelby Tractor & Tractor Co., which was organized about a year ago, has completed a 3-ton truck model and is working on another. Owing to the fact that the company is engaged in producing to its full capacity, it is not likely that tractor production will be started upon before the end of the war. The tractor which is now being designed will have a 4½ x 6 in. engine, a Foote Bros. transmission, Bierman clutch and steering gear. It will be rated as a 2-3 plow tractor and will weigh about 4700 pounds.

Shelby Tractor & Tractor Co. was organized as a corporation in March, 1918. It took over the properties of the Arbenz Motor Car Co., Cleveland, and of the Standard



Section views of J. T. kerosene carburetor

Manufacturing Co., Shelby, Ohio. W. R. Kerr is president and general manager; S. R. Feil, vice-president; W. J. Bailey, secretary, and A. A. McCormick, treasurer. Messrs. Feil and Bailey are not active in the affairs of the company, however.

The Ohio Manufacturing Co., Upper Sandusky, Ohio, manufacturer of the Whitney two-plow tractor, which was described in *AUTOMOTIVE INDUSTRIES* some time ago, is working on a lot of 300 of these tractors, but has been much delayed, owing to inability to get material in promptly. The company was formerly engaged in the agricultural implement business, but for several years past manufactured a single cylinder tractor, which was marketed through the International Harvester Co. About a year ago the company began to develop its present tractor, which is equipped with a Gile, two cylinder engine, of the opposed type.

#### Delays Caused by Shortage of Angle Shapes

The writer was told that the delays have been especially in angle shapes and efforts have been made to obtain missing material by buying job lots.

A somewhat novel design of tractor has been manufactured during the past year at Findlay, Ohio, by the Star Tractor Co., which occupies a new concrete block factory, 50 x 156 ft. Heretofore the tractor has been known as the Star, but recently a sales arrangement was entered into with the Indiana Silo Co., of Anderson, Ind., and hereafter the machine will be known as the Indiana. The writer was told that a reorganization has just been effected, which will result in greatly increased production, but details could not yet be given out. The original company was organized in June, 1917, with a capital stock of \$100,000, J. L. Bicknell being president; C. A. Schubert, vice-president, and C. A. Jordan, secretary and treasurer. About 160 tractors have been built to date.

#### Indiana Tractor

The Indiana tractor has a rating of 5-10 hp. and is a 1-2 plow machine. The strong point made in connection with it is that it can be used for any farm purpose for which three horses are now used. It also has a very high ground clearance and therefore is especially suitable for cultivating. The tractor is equipped with a four-cylinder, 3½ x 4½-in. Leroi engine, with Atwater Kent ignition and Kingston carburetor. Gasoline is used as fuel and a supply of 7 gal. can be carried.

The engine is fitted with a governor, which maintains its speed at 950 r.p.m. The final drive is by chain and four speeds are obtained by interchanging the sprocket pinions, viz.: 2.1, 2.4, 2.7 and 3.6 m.p.h., the first two being for plowing and the last used for road work and in hauling a binder.

The machine bears some resemblance to the Moline Universal, in that the front wheels are the steering and driving wheels, steering being effected by swinging the front truck around relative to the frame, by means of a gear sector and pinion. The two rear wheels simply steady the tractor and carry practically no load. The weight of the whole machine is only 1700 lb., or about that of one horse.

# Recent Enemy Airplane Activities

Some New Planes and Engines Concerning Which Information Has Been Obtained Through Prisoners and From the Enemy Press

**W**HILE information concerning German airplane activities is very difficult to obtain, some seeps through by way of captured prisoners as well as through other channels.

Recently there was captured a two-seater L. V. G. type of German plane from which some interesting information was obtained. It has fitted a 220-hp. Benz engine having aluminum pistons and an adjustment on the carburetor for flying at high altitudes; Bosch magnetos of the Z. H. 6 type are fitted.

The L. V. G. is a biplane weighing 2095 lb. empty and built for a permissible load including full tanks of 947 lb., giving a total weight of 3042 lb. The span of the top plane is 42 ft. 6 in. and the chord 5 ft. 3 3/4 in. The lower planes each have a span of 18 ft. 8 1/2 in. and a chord of 4 ft. 7 1/2 in.

The wings are of wood with main spars of box type construction covered with fabric. The ribs consist of spruce flanges and solid three-ply webs. Wooden compression members are used. The propeller consists of nine laminations of ash.

A new type of German single-seater biplane is the Siemens-Schuckert, which uses an eleven-cylinder rotary engine with a four-bladed propeller approximately 7 ft. 6 in. in diameter. The engine of 160 hp. is fitted to the front of the fuselage and has a spider around the fuselage permitting a bearing to be fitted behind the propeller.

The upper plane has a span of approximately 30 ft. and there is a gap of 5 ft. between planes. The chord of the upper plane is 6 ft. and that of the lower plane 4 ft.

The fuselage, of streamline design, is short and deep. Ailerons fitted on both planes are partly balanced. The upper ones are larger than the lower ones and extend further along the plane toward its root.

Another new type of German aircraft is the Benz two-seater biplane, and there are reports that Benz is also building single-seater planes.

There seems to be a tendency in Germany to return to the monoplane for certain uses. As near as can be learned, there are two types of monoplanes in existence in Germany, namely, the Junker, with a stationary engine, and the Fokker, with the rotary engine.

Monoplane-seaplanes have been reported operating on the North Sea. These were supposed to be Brandenburgs. The fuselage is above the wings and not fitted with armor. These

monoplanes are said to have a speed of 100 knots per hour and a flying capacity of 5 hours.

The new 200-hp. Opel engine is a six-cylinder type with bore of 145 mm. and a stroke of 190 mm. It is fitted with two carburetors and has the inlet pipe water-jacketed. Dual ignition is fitted, and the weight empty, including propeller boss and exhaust pipe, is 726 lb.

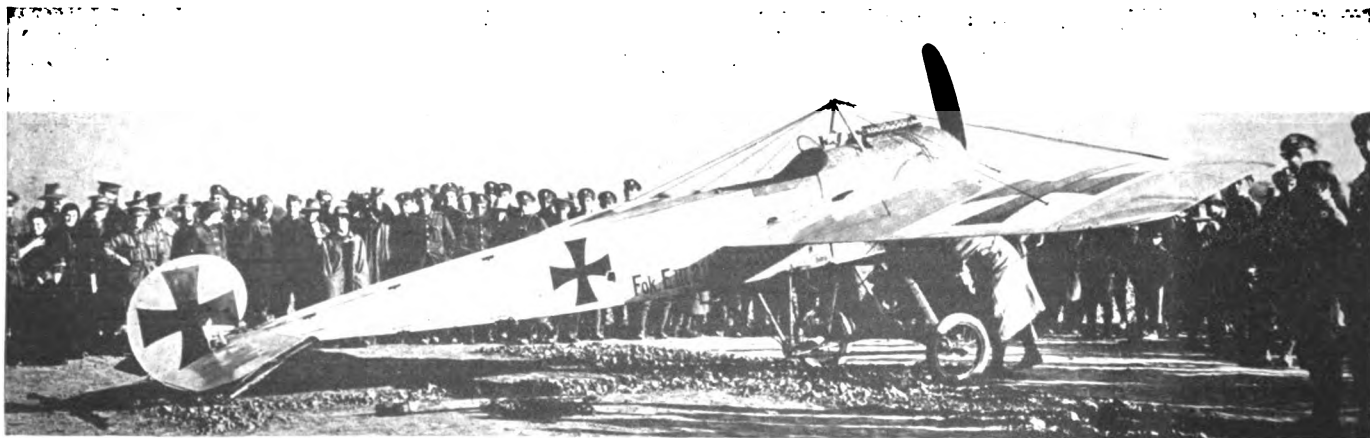
There are reports of a new 190-hp. Rapp stationary engine. The Maedler Engine Co. is one of the new German organizations which is expected to manufacture an engine of this name. It is a single-cylinder type which is reported to develop 160 hp.

## Fliers Learn Air Acrobatics Quickly

WASHINGTON, Oct. 7—Airplane acrobatics, contrary to popular belief, are learned quickly by fliers. In fact, according to an announcement made by the War Department, fliers who loop the loop at 4000 ft. altitude, who do nose dives, side slips and the other twirls and stunts learn them in 8 hours or do not learn them at all. Cadet fliers are given the instruction in acrobatics for the end of their training and after they have secured complete control of their planes. This is necessary so that they learn the knack of throwing the machines in and out of the whirls and loops.

Great care is taken in choosing instructors for this work and in selecting the planes. Expert riggers are assigned to check the alignment of the planes after each flight. Mechanics go over the engines just as carefully. At Kelly Field there is a special stage set for the instruction, and to insure safety for the cadets and their instructor all planes not engaged in acrobatic instruction are required to keep entirely away from the territory over which the stunts are being performed.

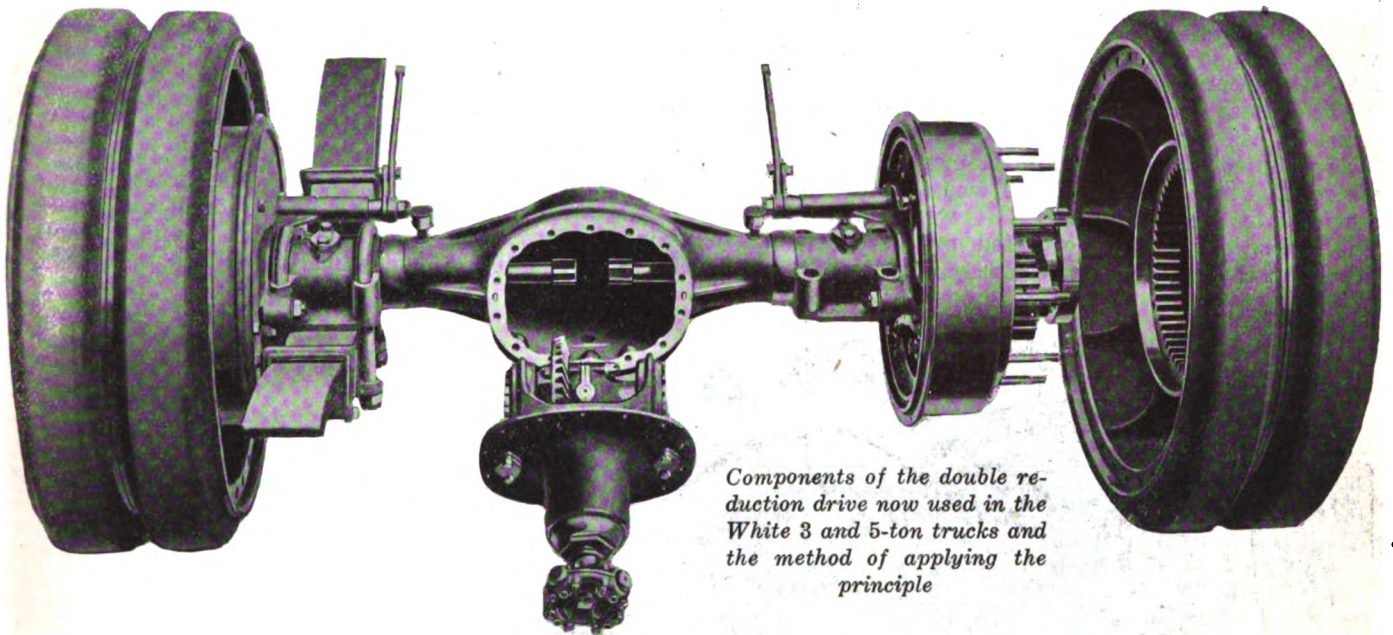
No student or instructor is allowed to stunt under 2000 ft., and practically all of the work is done between 2000 ft. and 4000 ft. When a student reports for instruction in acrobatics he is assigned to a teacher who takes him up and performs the required stunts. The student is then given control and directed to repeat the maneuver. After the third or fourth time he is usually able to perform alone. However, in no instance are the students allowed to fly alone until they show themselves well qualified.



*Fokker monoplane shot down behind the British lines*

# New White Trucks with Double-Reduction Axles

## Unit Power Plant and Transmission Brake



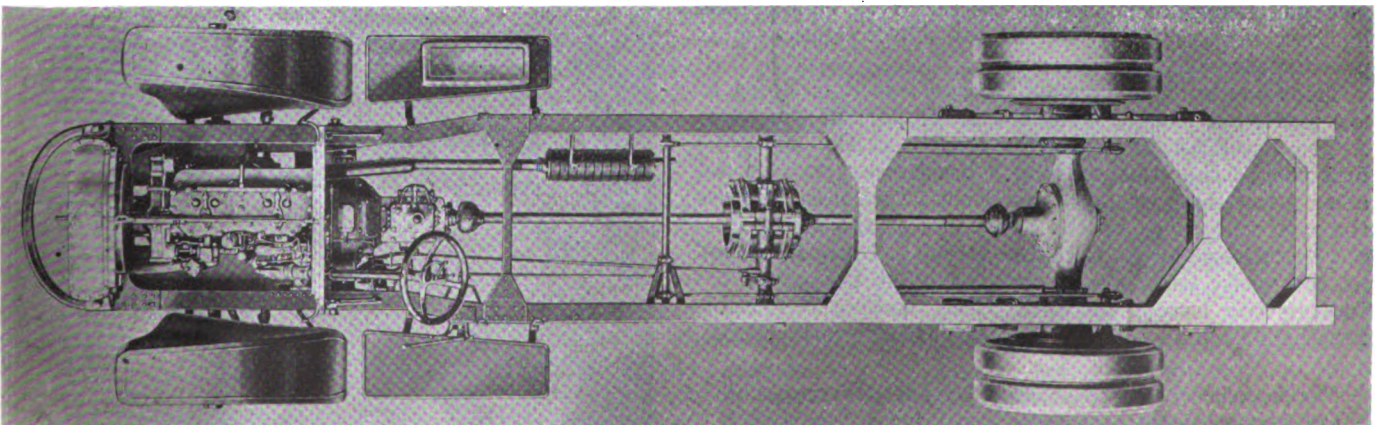
*Components of the double reduction drive now used in the White 3 and 5-ton trucks and the method of applying the principle*

**D**DOUBLE-reduction axles have taken the place of chain-drive axles in the new 3 and 5-ton trucks of the White company. Chain drive has been discontinued. The double reduction axle has one reduction in the differential housing, which is in the center of the axle, and the other is an internal gear reduction in the wheel. The axle design is, however, different from the general internal-gear type in that the axle-drive shafts are within and concentric with the axle housing. These drive shafts are floating types, permitting of quick removal. The second reduction within the wheel hub is through a spur pinion on the drive shaft, which meshes with the second gear, which in turn meshes with an internal gear attached to the road wheel inside of the hub case. This type of construction permits of the complete axle mechanism being encased and running in oil.

The bevel drive and differential gears are carried in the ball bearings mounted on a detachable axle plate, which may be removed as a unit from the forward face of the axle, to which the plate is bolted. The axle housing affords a clearance very nearly the same as that of a straight axle design. The axle housing is a steel casting, and the unsprung weight is said to be less than that of the chain-drive type.

In addition to the new drive system, improvements and refinements have been made in a number of features of its 3 and 5-ton trucks. Among these are a unit power plant, which is an evolution of the White block engine; a cast radiator of the vertical-tube type with a removable head and a new system of brakes.

The 3 and 5-ton are identical in design, the only difference being in the size. Both use a unit power plant, comprising a four-cylinder block engine with a removable



*Plan view of the new White heavy chassis, showing the rearranged braking system*



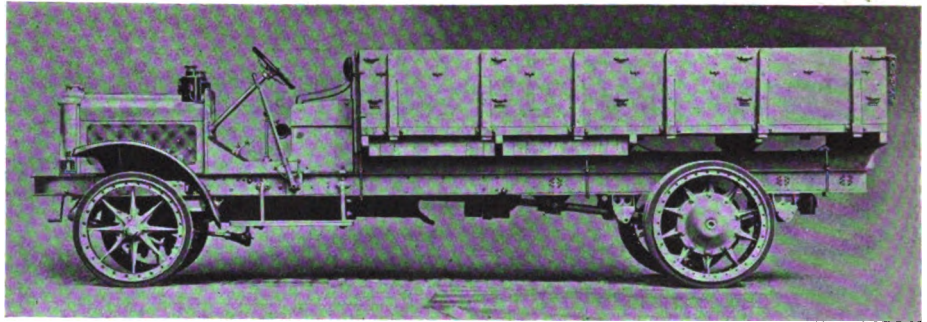
cylinder head. In the 3-ton truck the bore is  $3\frac{3}{4}$  in., and in the 5-ton  $4\frac{1}{4}$  in. The stroke in both is  $5\frac{3}{4}$  in. The cylinders are L designs. Pressure oiling is used for the crankshaft bearings.

The radiators have cast removable heads, permitting quick replacement of damaged tubes. The radiator is flexibly mounted on springs. The clutch is a single-plate type, operating in oil. The gearset affords four speeds forward. Fuel is fed by vacuum to a White carbureter.

The service brakes operated by pedal, contracts on a drum on the drive shaft in the rear of the gearbox. It is mounted amidship on a cross-member of the frame, where it is more accessible and where a larger braking service can be used than if it were on the wheel. The emergency brakes, operated by lever, expand in drums on the rear wheels, completely inclosed and pro-

vided with a simple external easily-operated adjustment.

Metal wheels are standard equipment, and on the 3-ton truck carry 36 x 5 solids in front, and 40 x 5 dual solids, S. A. E. rear tires. The pressed-on type is standard equipment, but demountable may be obtained at extra cost. The 5-ton truck has 36 x 6 solids, in front, and 40 x 6 dual solids in the rear.



*External appearance of the new double-reduction-drive White truck*



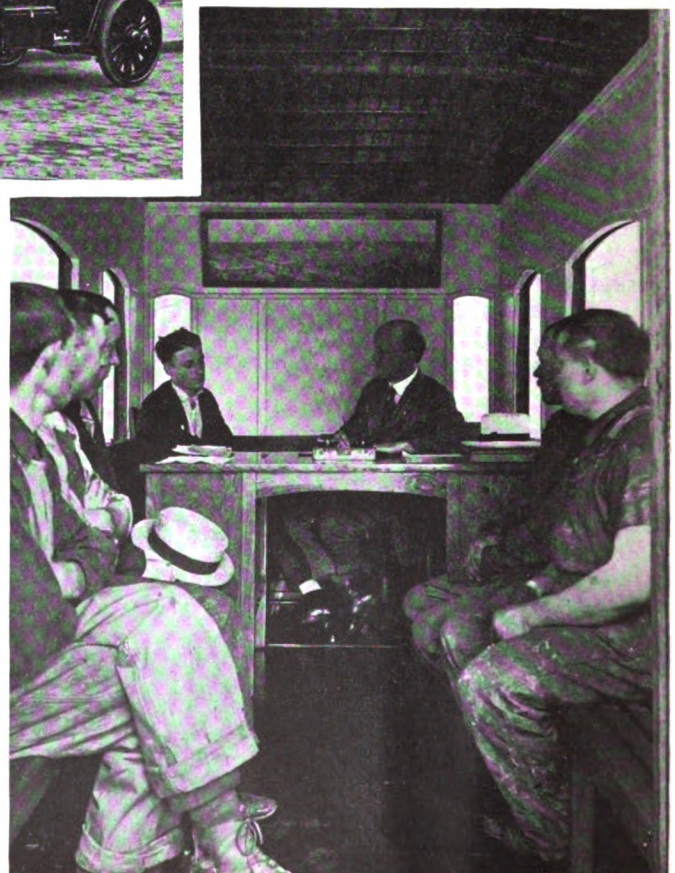
*The mobile employment department used by the Packard Motor Car Co. to visit various districts of the city for the purpose of obtaining labor*

## A Mobile Employment Department

ONE way of meeting the labor shortage has been found by the Packard Motor Car Co. Instead of waiting for men to apply at the office of the employment department it sends out a wagon to round up the men and bring them back to the factory. This scheme has been in operation by the company for 2 months and is proving very satisfactory.

Trips by the "Employment Wagon," as it is styled at the plant, are usually made the latter part of the week. A great number of applicants appear at the office the first part of the week, making it unnecessary to send out after men, which, in fact, would not be possible, because the men who write up the applicants at the office could not be released to go with the wagon. Toward the end of the week, when fewer men apply at the office, the interviewers have little work to do, making it possible for them to take the wagon and do their work outside.

*The interior of the truck, showing how the applicants are accommodated. There is space for fifteen men to travel in comfort*



# Lack of Confidence

## *Between Employer and Employee*

### The White Plague of Labor Efficiency

Individuality of Worker Must Be Recognized—The Worker's Ability Cannot Be Computed With An Adding Machine—200 Years of War in Industry—Present Status of Belligerents

By Harry Tipper

#### Six Items From Recent Events :

- 1—"The Steel Corporation adopts 8-hour day."—Daily newspaper.
- 2—"A plank in the recently adopted platform of the Socialist Party of New York State demands a 6-hour day."—Report of Convention.
- 3—"President Wilson requests telegraph companies to waive their rights to discharge men who had joined a union."—Daily newspaper.
- 4—"The great majority of the causes of industrial unrest specified in the reports have their root in certain psychological causes. Want of confidence is a fundamental cause."—British Commission Report.
- 5—"The commissioners have been struck with the fact that employers generally appear to have taken a broad and sympathetic view of the conditions of the employees and of the need that in many respects exists for improvement in present as well as in pre-war conditions, while on the other hand the employees collectively do not offer any demands that are extravagant or incapable of being met by the friendly co-operation between employer and employee."—British Commission Report.
- 6—"On all sides it has been recognized that the closest co-operation of employer and employee is necessary if the full resources of the steel industry are to be thrown into the scale on the side of democracy."—The Iron Age.

THESE items, picked from events of recent date, indicate the nature of the warfare continually being waged between capital and labor, the interferences of Government in the matter, because of its necessities, and the hopes of progressive settlement as seen by authoritative observers.

For a century the history of the relations of employer and employee has been the history of warfare—a warfare between the more or less organized bodies of employees and the more or less organized groups of industrial employers. Year after year has witnessed the offensive and defensive measures of warfare, the losses and destruction incident to which reach appalling figures. From time to time the Government has been obliged to interfere with the interest of the general body of the people, each interference establishing new limitations and new compromises.

Perhaps this will sound far-fetched to the average

manufacturer who has no recollection of any desire—except for the peaceable continuance of his business and enjoyment of his profits.

Nevertheless these industrial relations have caused more turmoil, more legislation, loss and fundamental changes in Government than all other political exigencies combined—up to the time of the present conflict.

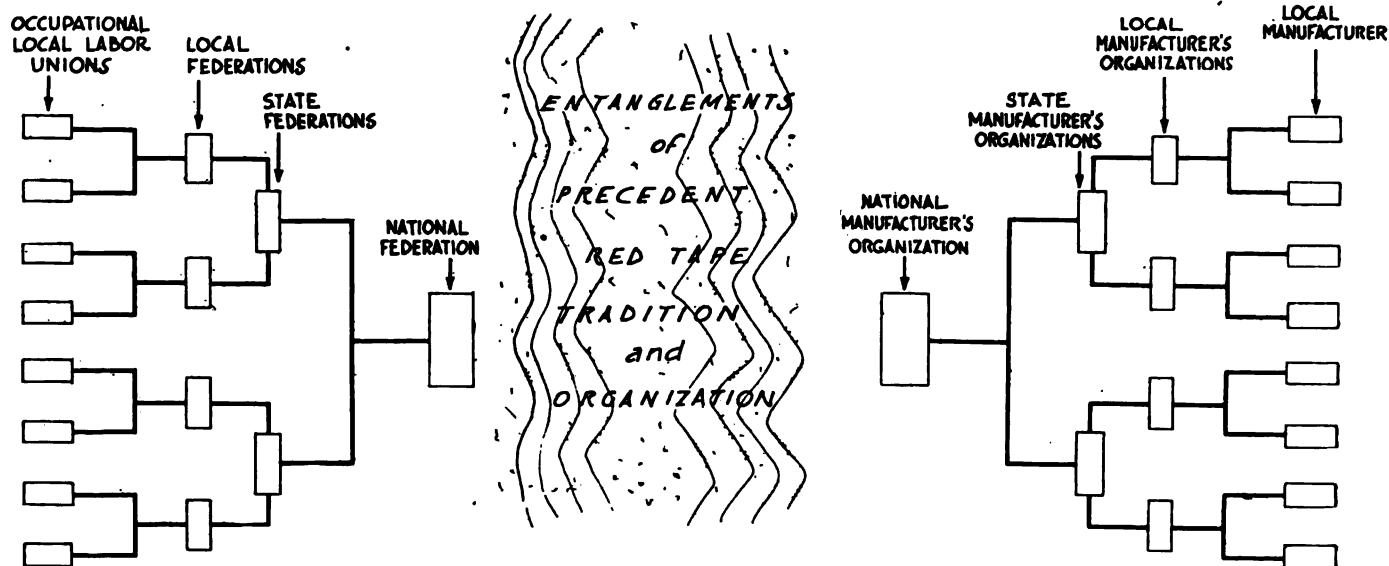
A century ago the owner's control was absolutely autocratic. The records of conditions in many of these early manufacturing establishments read like the records of the enslaved workers in German occupied areas.

The growth of labor organizations began in the revolt against such conditions and was the original reason for the bitterness of feeling among workmen against employers and the common action of employers in the defense against these attacks.

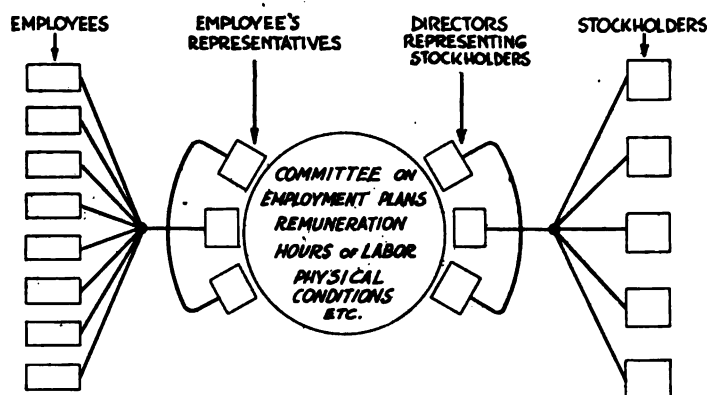
The worker contends that no amelioration of his condition had been offered to him until he has fought his



## WHICH?



## Opposing Armies of Industry—or



## Co-operative Army of Industrial Democracy

way up to it, and the history of the conflict shows that the influence of the employer has been exerted quite generally to avoid higher payment of wages, lessen the hours or alleviate the conditions of work. While his political pressure has been exerted, continually, to prevent the passage of legislation limiting his control.

The employer contends that the workers' demands are frequently unreasonable, that the owner of the business should control and that he is willing to do everything which the competitive system will allow; and there is undoubted truth in his statements. But whatever the basis of these contentions, the fact remains that this warfare has been of grave moment, its consequences far reaching and of the utmost practical importance.

Some of these consequences are:

- 1—The increasing solidarity of labor and the rapid development of a class consciousness in labor, resulting in a class distinction fostered by labor itself.
- 2—The growth and increasing combination of labor organizations so as to consolidate power.
- 3—The increasing tendency for labor to influence legislation.
- 4—The constant increase in the demands for labor.
- 5—The suspicion and prejudice against capital.
- 6—The constantly increasing Governmental interference in industrial relations and a growth in the demand for Governmental control.

- 7—The utter failure of capital to hold its original position and its constant retreat as the matter has progressed.

But the most significant result has been the constantly increasing tendency to collectivist action—matters being considered by the whole body of industry and labor and frequently Government, where these should have been settled by the co-operation of a small group of individuals.

A man was discharged for drunkenness on a railroad in Great Britain and before the question was settled it involved the employment of 350,000 men, all the railroad communications and the Government of Great Britain.

A few days ago the entire telegraph communication of the whole country was imperilled because a few men were guilty of joining a union. The result has been Governmental control.

This collectivist action, in its neglect of the individual and constant increase of bureaucratic precedent, takes no account of the triviality of the case or the lack of reason for putting in motion the ponderous machinery of its warfare.

For the German, the Savajero incident was enough to start the whole nation to a complete interruption of the world's usual course, and for the Bolsheviks the name "bourgeoisie" is enough to cause a killing.

## Our Industrial Movement

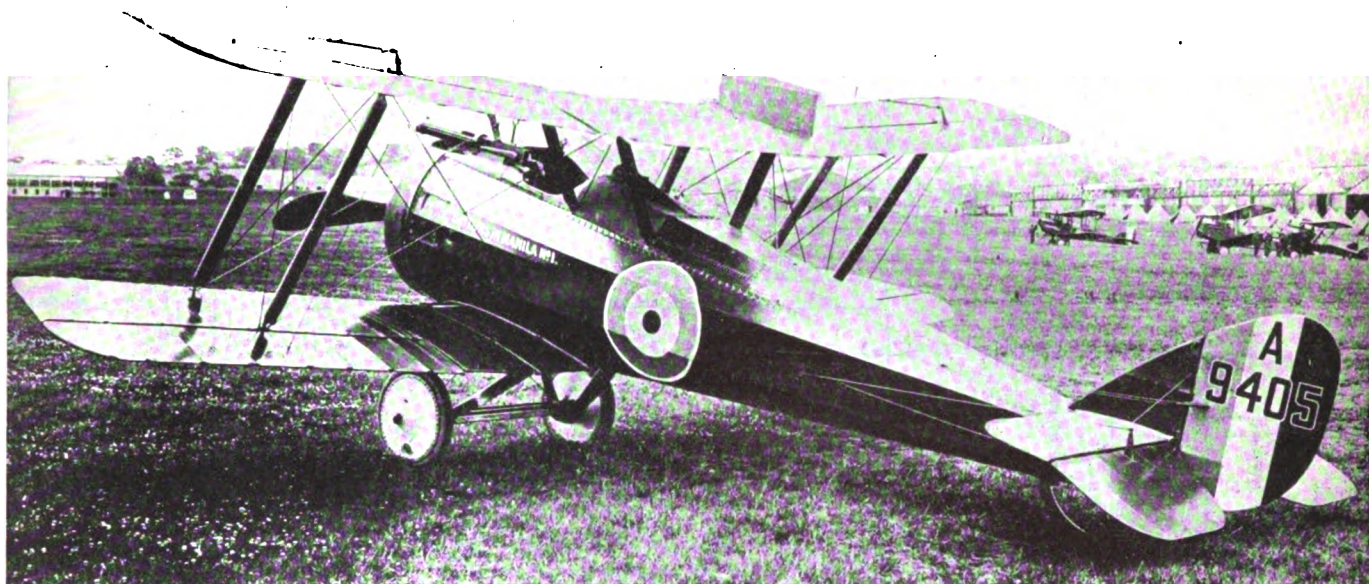
The important thing in the world just now is not just where we are, but in what direction are we moving?

All warfare is destructive, and this industrial warfare, carried to its logical conclusion, will destroy the basis of co-operative individualism upon which our political system is laid and upon which the industrial future must be founded. We need industrial peace in order to work out the opportunities and possibilities that lie before us. This peace requires construction, co-operation, not conflict; individual attention and action, not legislative attention and interference.

The present time is opportune for considering these constructive measures. The great war has swept away precedents, enlarged many problems and created new ones, reconstructed ideals and created in man's mind the desire for betterment, the willingness to reconstruct,

(Continued on page 629)



*De Haviland 5A single-seater fighter*

## De Haviland Single-Seater Scout

Equipped with Rotary Le Rhone Engine—Upper Planes Staggered Backward—  
Plywood Used in Fuselage Construction

**D**URING the summer of 1917 the British made use on the western front of a De Haviland tractor scout, the first models of which bore the number 5, and later ones, 5A. This machine was fitted with a 110-120-hp. Le Rhone rotary engine. The armament consisted of one Vickers machine gun, operated through the intermediary of a Constantinesco interrupter gear, for which 750 rounds of ammunition were carried.

This De Haviland scout has a total weight of 1250 lb. Its performance, according to the British official rating, is as follows: Endurance at 10,000 ft., including climb, 3 hr.; ceiling, 16,000 ft.; speed at ground level, 109 m.p.h.; speed at 10,000 ft., 102 m.p.h.; climb to 10,000 ft., 12 min. 4 sec. The machine has a span of 25 ft. 8 in., an overall length of 22 ft. and a height of 9 ft.

A brief technical description of the De Haviland 5 appeared in a recent issue of a German aircraft periodical and thence found its way into the British aircraft press. The particular machine described was manufactured by the Darracq Motor Co. in London and bore the distinguishing mark A9435.

The machine is a single pair-strutted biplane, the upper planes having a reverse or backward stagger of  $27\frac{1}{2}$  in. Both planes have a span of 25 ft.  $8\frac{1}{2}$  in. and a chord of 54 in. The upper planes are secured to a center section and the lower ones to wing roots on a level with the lower longerons of the fuselage. A dihedral angle of 172 deg. is formed by the wings, which have no sweep-back. Near the center section the angle of incidence of the upper plane is 2 deg.; near the tips,  $2\frac{1}{2}$  deg., while the lower planes have a uniform angle of incidence of  $2\frac{1}{2}$  deg.

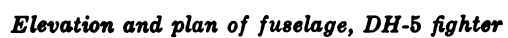
Spruce spars of I section are used. The ribs are spaced from 11 to  $13\frac{3}{4}$  in. Between each pair of adjacent ribs are placed two auxiliary ribs extending from the leading edge to the main spar.

Flying and landing cables are made of profile wire in single arrangement. Ailerons are attached to all four planes at the rear spar. Their control wires run outside the planes, below in front of the leading edge, above over the front spar. The corresponding ailerons are connected by profile wires. The conventional wire-braced wood-framed fuselage, with four longerons, is strengthened in front, to a point behind the pilot's seat, and behind below the fixed tail-plane, by planking of plywood of  $\frac{1}{8}$  in. thickness.

By the mounting of fairings, the front part of the body is given an almost circular shape. The fuselage is covered with canvas. The solid wooden non-covered landing gear struts are of streamline section. The through running axle rests between two auxiliary streamlined covered ones. There is no limit to the range of spring action. The one-piece tail-plane is secured to the stern end of the body, with an angle of incidence of 1 deg., and is without the arrangement for changing the angle of incidence, which has so far been generally used. Each part of the divided elevator is provided with levers with single control cables.

The engine is a 110-hp. Le Rhone rotary, which has given 130 hp. by earlier tests. The main fuel tank, with a capacity of  $26\frac{1}{2}$  U. S. gal., and the oil tank, with a capacity of  $5\frac{1}{2}$  gal., are mounted behind the pilot's seat. In addition, a gravity tank of 7 gal. capacity is placed on the right upper plane. Fuel is fed from the main tank by compressed air, which is obtained from a small propeller-driven air-pump, fixed to the left landing gear strut. The fuel supply suffices for a flight of about 2 hours' duration.

In the pilot's seat are arranged the instruments. To the right of the pilot there are two gasoline tubes with stop cocks; there is also an arrangement for a spring relief of the elevator management. In the middle are



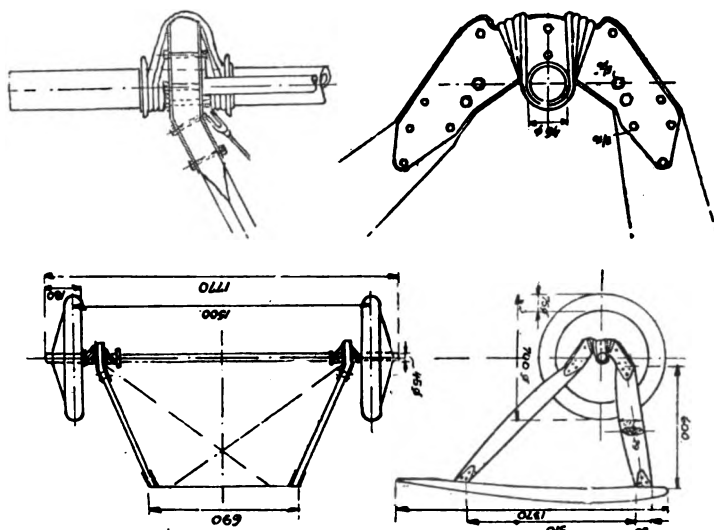
found a tachometer, speedometer, altimeter, contact-breaker, watch and compass. To the left there are the gasoline and charge control levers, and the control of the hand air-pump.

Two other airplanes of the same type, which were manufactured by the Aircraft Mfg. Co., Ltd., London, show a considerably more convenient arrangement of the instruments, and are also provided with electric lights for night flying.

The machine is armed with a fixed machine-gun of the Maxim type, mounted on top of the cockpit to the left of the pilot's seat. Hydraulic control is used, and release is by means of a Bowden wire. From remains found in the fuselage it was ascertained that the cartridge belt was a metallic one. The belt-box lies below the machine-gun, directly behind the motor.

The weight of the airplane empty was 1015 lb. The weight of the fuel, if the tanks are filled, amounts to 237 lb., so that the total weight without passenger is about 1250 lb.

This machine became obsolete in October, 1917.



### Details of landing gear

## Lack of Confidence Between Employer and Employee

(Continued from page 626)

which makes it possible to progress without the usual resistance.

But this constructive program must be based upon a study of human necessities and requirements at least as adequate and patient as the study which we have given to the mechanical side of industry. It must begin with the individual—not as a unit. There is no such thing as a human unit, but the individual, different from all other people in some respects. We must recognize the statement of the philosopher:

"The teachers and leaders, whose voices are presently drowning better counsel, are assuming in all their proposals that there exists such a substantial uniformity among men that a counting machine can rightly evaluate policies and destinies. In their meager imagination, uniformity seems a lovely thing, whereas it would be the night in which all cows are black. Nature, life, will not allow uniformity. It insists on differences."

The greatest concern of the individual is the status of himself as an individual, the welfare of his family and the condition of his community.

## Recognition of the Individual

Those things are so definitely the major part of his consideration that it is only in times of great national necessity that the interests of the ordinary individual extend beyond his community. The closest concern of the individual worker lies in his recognition as an individual and his recognition as a responsible part of the organization. All general questions of labor organization, capitalistic groups, governmental control, are far away from him. They obtain their strength because, lacking individual recognition, these large, impersonal matters are offered to him as a panacea by which he can obtain the rest of the items close to his concerns.

In a corner of New England there are two mills of about the same size and not many miles apart:

Mill A pays higher wages, has better physical conditions and more material advantages, yet its record of 10 years is one of a series of labor troubles from beginning to end. Its labor turnover is three or four times as high as its neighboring mill.

Mill B has never had a serious labor disturbance. I asked the general agent of these mills why. He said: "Mill A manager is a keen business man, but he has no human sympathy and understanding. Mill B manager knows each worker by name and something of their history—he understands them and they believe in him."

Then I asked which is the most profitable. Immediately came the answer, "Mill B."

The British Commission's statement is significant:  
 "Want of confidence is a fundamental cause.

"The board of directors and officers of the Midvale Steel & Ordnance Co., Cambria Steel Co. and subsidiary companies, recognizing the fact that the prosperity of the companies is inseparably bound up with the general welfare of its employees—"

It is around the council tables of the individual organization that executives and employees of that organization—with full knowledge of its local and immediate necessities—can settle the questions contingent upon this co-operation, and not through large impersonal bodies of labor unions and industrial groups.

In individual cases this has been done, successfully, for years—despite general tendencies to the contrary, and it can be done by others. Labor turnover, production, efficiency and industrial stability depend upon the settlement of these questions for each individual concern and they need that individual study and attention.

## Method of Treating Positive Electrodes

**A** NEW method of treating the positive electrodes of primary batteries, with a view to introducing metallic oxides as depolarizers, has been invented in France, says *The Engineer*. The electrode consists of a shallow plate of copper or iron presenting numerous conical points to the alkaline element in the cell. The edges of the plate are bent so that it becomes a form of shallow box into which the depolarizing oxide is introduced. This material is mixed in a powdered state with a suitable alkaline hydrate or alkaline earth, and introduced into the interior of the box formed by the positive and a zinc plate as negative. The whole is sealed with rubber, a small vent being inserted to allow for the escape of gases, and cased in metal stiffening bands.



# High Ideals Pursued in Craig Tractor

Leather Boots, Anti-Friction Bearings and Oil-Less Bushings Used Liberally—  
Engine Lubrication Force Feed and Lubricating Oil Cooled in  
Radiator—A Universally Adjustable, Comfortable Seat

By P. M. Heldt

**A** YEAR or so ago one of our largest industrial organizations delegated a number of Cleveland men to make a canvass of the tractor field to determine the prospects for a high-grade tractor transmission which the concern referred to was developing. The result of their investigation led these men not only to make a most enthusiastic report regarding the transmission proposition, but to organize among themselves a company for the production—on an assembling basis—of a tractor, which, though comparatively high in first cost, should appeal to the farmer on account of its staunch and well-thought-out design and its consequent reliability and low up-keep cost. The Craig Tractor Co. of Cleveland, to which reference is made, is not yet in regular production, but a factory has been completed for it at Bliss Road, Cleveland, the design of the tractor has been finished and the components have been selected and condition contracts for them let.

The Craig is a three-plow tractor with a 15-25-hp. rating. This rating in itself points to high efficiency. The usual proportion of belt to drawbar power being 12-25, thus showing that the amount of power required to propel the tractor itself is low in the Craig. Another interesting feature of the machine is that it is of the frameless or backbone type, the engine and transmission housings forming a structure connecting the front and rear axles. This, in part, accounts for the moderate weight of the tractor—4500 lbs.—which, of course, has a bearing on the efficiency.

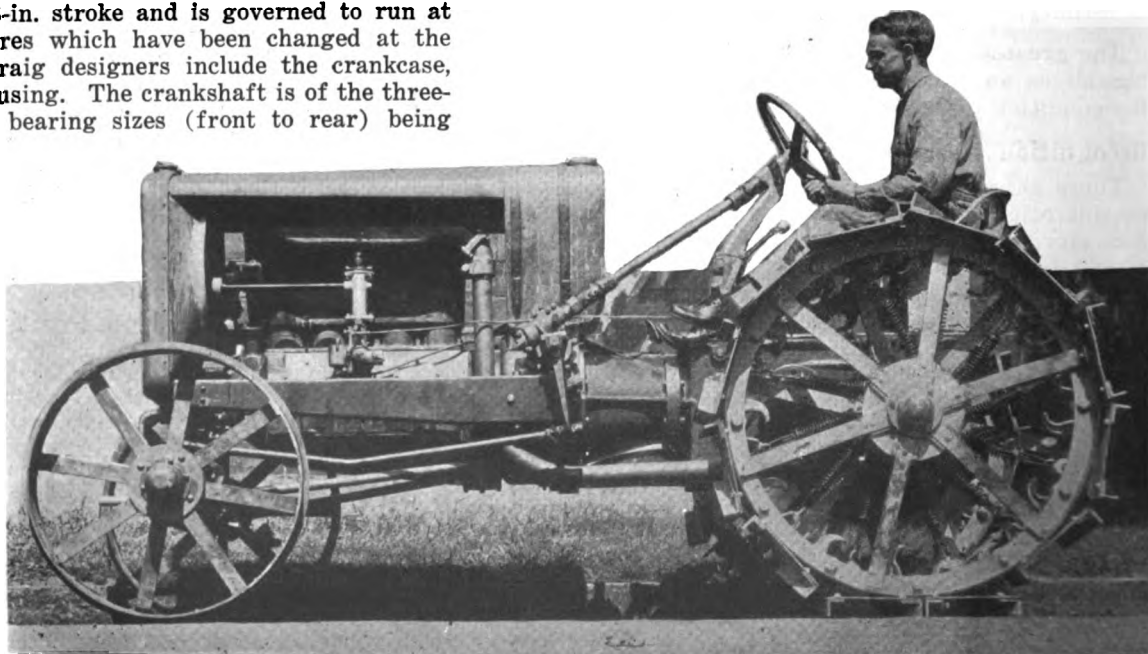
The engine is of Beaver manufacture, but departs somewhat from the standard Beaver design. It is of 4½-in. bore and 6-in. stroke and is governed to run at 950 r.p.m. Features which have been changed at the instance of the Craig designers include the crankcase, oil pan and bell housing. The crankshaft is of the three-bearing type, the bearing sizes (front to rear) being

2⅜ x 2¾ in. These dimensions show that the crankshaft is very rugged and has very substantial bearings, which in conjunction with the forced lubrication, to be referred to later, should exclude all danger of hot bearings. The size of the engine, i.e., the piston displacement, is considerably above the average for a three-plow tractor, but the designer of the Craig, John Dietrich, who has had considerable motor truck experience, holds the view that the reason why there has been so much trouble with tractor engines in the past, as compared with truck engines, is that the former have been made to operate too near their limit.

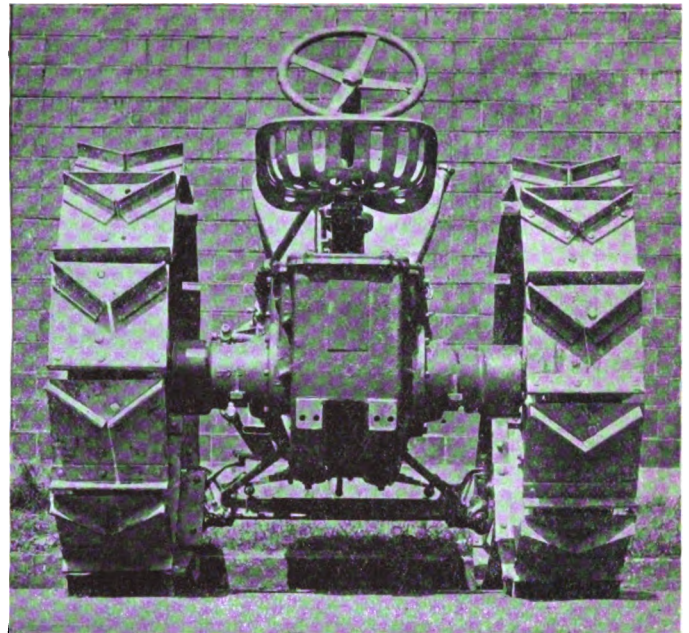
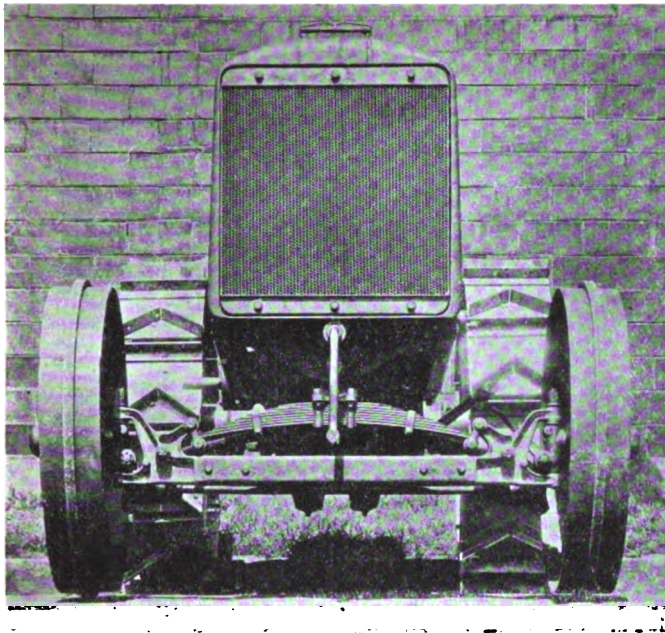
Cylinders are cast in a block, and the valves are located in the detachable heads and are protected by two cast-iron cover plates. A copper-asbestos gasket is placed between the cylinder block and cylinder head casting. The valves are 2 3/16 in. in diameter at the throat and have a lift of ⅜ in. The cylinders are offset ½ in. relative to the crank axis, a feature which is of particular advantage in a low-speed engine. The piston pins are clamped in the connecting rods and rock in Non-Gran bushings in the piston bosses. Four bolts are used to hold the caps to the connecting rods. The rods are 12½ in. long or more than twice the length of the stroke.

While the waterjackets extend far down the cylinders, considerably beyond the lower end of the stroke, they do not extend quite to the cylinder flange.

Coming now to the crankcase, this, of course, is an iron casting, with a separate cast oil well bolted on below. There are small hand holes in the crankcase proper,



*The Craig is a three-plow tractor rated at 15-25 hp., the total weight being 4500 lb.*



*Front and rear views of the Craig tractor, showing the similarity to standard automobile practice in the use of springs, steering knuckles and rear axle. The gearset is a Nuttall*

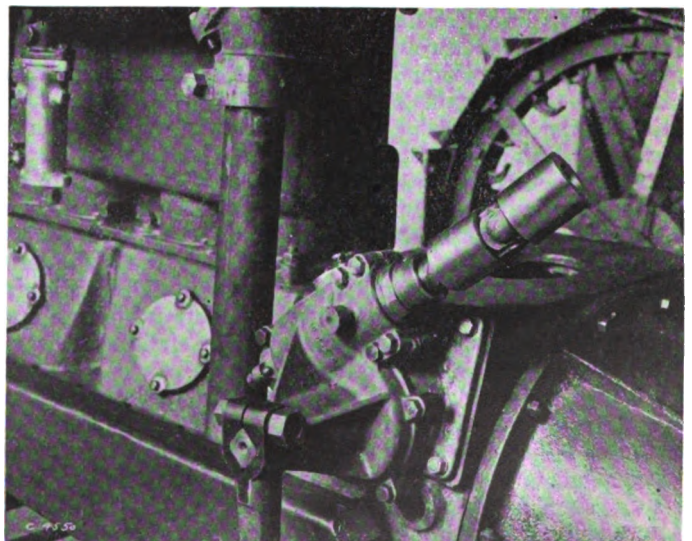
but in the Craig engine there are, in addition, two 11 x 14 hand holes on each side of the oil well or base, through which the crank pin and main bearings can be adjusted. The camshaft is of the type with enlarged bearing journals, which can be withdrawn complete from the crankcase at one end. Its bearing dimensions (front to rear) are as follows:  $1\frac{3}{4} \times 3$  in.,  $2\frac{1}{2} \times 3\frac{1}{8}$  in.,  $2 \times 2\frac{5}{16}$  in. The camshaft proper is  $1\frac{1}{4}$  in. in diameter. The gears for driving the camshaft and accessories shaft are cut with helical teeth. The camshaft gear meshes directly with the crankshaft pinion and in turn drives a third shaft from which the fan, water pump and magneto derive their motion. This latter shaft, of course, revolves at crankshaft speed.

A bell housing is cast integral with the crankcase at the rear, and this conforms to the S. A. E. standard except that  $\frac{1}{2}$ -in. cap screws are used instead of  $\frac{3}{8}$ -in. There are four supporting arms cast on the crankcase, two at the forward end and two on the bell housing, and two pressed steel channels are bolted to these arms, the channels extending some distance forward of the engine, where they have a drop-type pressed steel cross member riveted to them.

Kerosene is the fuel used in normal operation, and a fuel tank with capacity for 25 gal. kerosene and  $3\frac{1}{2}$  gal. gasoline sets on top of the bell housing, which is made flat on top for the purpose. In fact, the arrangement of the fuel tank on top of the bell housing, the manner of holding it in position by fabric-lined steel bands and the method of bolting the steering gear housing over one core hole in the bell housing and closing the opposite one with a plate on which are cast instructions regarding clutch adjustment and shifting collar lubrication, form together one of the cleverest features of the whole design. The top of the fuel tank conforms to the top of the radiator and has a hood ledge secured to it. The tank is made of No. 16 gage terne plate, double lap seamed. At the bottom of the tank in an accessible position to one side is a three-way valve with strainer and drain. In the central position all fuel is shut off from the carbureter; in one extreme position gasoline is fed, and in the other, kerosene. The radiator is fitted with a motometer, and this indicates to the operator when it is time to change over from gasoline to kerosene.

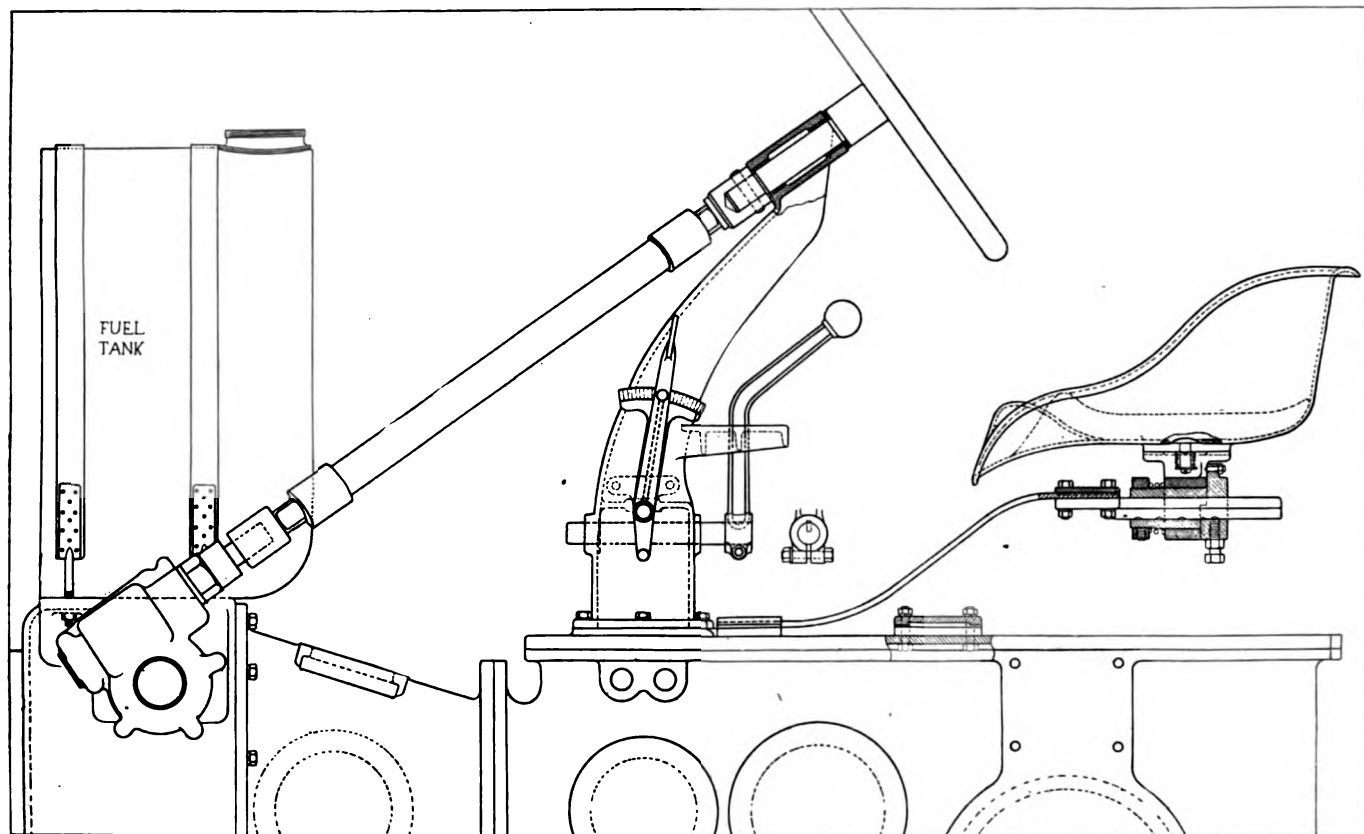
A Stromberg  $1\frac{1}{2}$ -in. carbureter is used and a special design of combined inlet and exhaust manifold which differs from that shown in the photographs. In this the exhaust passage surrounds not only the horizontal portions of the inlet manifold, but the vertical part as well, coming right down to the flanged carbureter joint and then turning backwards at an angle. The single throttle valve in the inlet passage is acted on by both the governor and the hand throttle lever. The former is the Pharo hydraulic type, mounted in front of the engine. It is completely enclosed, yet adjustments to obtain changes in governing speed are easily made. The throttle lever is of very substantial design, with a fish-tail grip and mounted on a side-ratchet sector on the steering bracket. Ignition is by a Berling magneto with impulse starter. The spark plugs are located in the cylinder heads on the opposite side from the magneto, and the ignition cables are carried across the cylinder heads between the two valve covers through a Y-shaped cast cable tube, making a neat construction. What is known as fixed-spark ignition is used.

Oiling is by a combined force and splash system. A



*Type of steering gear used on the Craig tractor*





*Arrangement of steering gear, controls and operator's seat on the Craig tractor*

gear pump at the bottom of the crankcase forces oil under a pressure of about 30 lb. per sq. in. to all main bearings and through the drilled crankshaft to the crank-pin bearings. Two gage cocks on the oil well serve to determine how the oil level in the well stands with relation to the high and low limits, and a pressure gage mounted in direct view of the operator indicates the oil feed pressure. The cylinder walls, piston pin bearings, camshaft bearings and cam followers (the latter of the roller type) are lubricated by the spray thrown off by the revolving crankshaft and by the splash from sheet metal troughs under each connecting-rod head.

A highly interesting feature of the oiling system is the provision made for keeping down the temperature of the oil. A part of the radiator, about 3 in. in width, on one side, is partitioned off and is connected in the oil circulating line. From the delivery outlet of the pump the oil is forced through a neatly arranged pipe to the top of the oil cooler and from the bottom of the oil cooler it is led to the main distributing pipe, which is cast in the engine crankcase. The engine is provided with a breather similar to that used on the Liberty truck engines, which comprises a poppet valve which opens to let excess air out of the crankcase but closes when there is suction in the case. Mention may also be made in this connection of the Breese petcocks for the cylinders, which are provided with spring covers. The ordinary petcock on a tractor engine always fills up with dust and grit, which is washed down into the cylinders every time the engine is primed.

Lubrication of the valve rockers on top of the engine is effected by means of two good sized oil cups which require filling once every day or every other day. It was first planned to carry an oil lead from the main lubricating system to the valve housings, but as this would have involved outside piping and the breaking of joints every time it was necessary to get at the valves, the present system was considered preferable. A horizontal pipe

extends through each of the two valve housings with an outlet over each valve rocker bearing, the rocker hub being formed with an oil pocket containing a felt pad. The oil cups are screwed to the outer ends of these distributing pipes.

There are also a number of original features in the cooling system. The water spaces around the combustion chamber are very liberal, and water is carried all around the spark plug bosses and extension glands. The rubber hose used between the radiator inlet and pump outlet is of a special type. It is inlaid with half-round wire and there is no fabric inside the wire, hence there is no possibility of the rubber perishing and the fabric coming loose and choking up the pipe. Moreover, the hose is capped, that is, the fabric does not come through to the ends, which does away with fringing and consequent deterioration.

With the flat side of the half-round wire toward the inside, the inner wall of the hose is very smooth, insuring the most rapid circulation. The fittings for the return of the water from the engine to the radiator are so designed that only a short length of hose is required, and this does not need to be bent in any way. Circulation is effected by means of a centrifugal pump already referred to. The radiator is a Modine with removable core and sets on brackets riveted to the front pressed steel cross member. Its top and bottom tanks and side supports are formed in a single casting. About 7 in. back of the radiator sets the 20-in. fan with four curved blades riveted to a 3/16-in. steel spider. The arms of the spider are of considerable length and support the blades rigidly, thus minimizing the warping of the blades with each change in speed, which is often the cause of breakage of the spider in large fans. Drive of the fan is through a 1 5/8-in. belt at twice crankshaft speed. Belt adjustment can be made by means of an eccentric fan bearing housing. A length of pipe is screwed into this housing radially and serves to carry the oiler and also



for turning the housing by tightening the belt. To prevent grass, etc., being drawn into the radiator and choking up its air passages, a screen is mounted in front of it. All radiator fittings are flanged fittings.

There are core holes in the cylinder head casting at both ends, and the plates closing these openings are formed with hooks by which the cylinder head can be lifted off. The part bolted over the forward hole is, however, not a simple plate, but the water outlet fitting. The cylinder head is very rigidly held in place by means of 19 studs. Complete, the engine weighs 1050 lb.

The clutch is the Twin Disc, which was selected by reason of its easy adjustment without the use of tools, and its smooth action. It is operated by means of a hand lever and is positively opened and closed, having no spring return. We expect to describe this clutch and illustrate it in a forthcoming issue.

The transmission is the new Nuttall described in AUTOMOTIVE INDUSTRIES for September 19, of the type combining the transmission proper with the rear axle. The only important change from the Nuttall standard design is that the bell housing extension is left off to shorten up the machine. Two 1-in. bars extend from lugs on the bottom of the engine bell housing to corresponding lugs on the transmission case. They serve to stiffen the backbone or frame construction and also as guides when sliding the transmission back if it is desired to remove the clutch or in dis-assembling the power plant. The belt pulley is 11 x 7½ in., and the belt speed at 950 engine r.p.m. figures out to 2700 ft. per minute. The weight of the transmission with axle is 1385 lb.

A standard Gemmer worm and wheel type steering gear is used, the regular 2-ton truck model. It gives a reduction of 8.5:1 in the gears, and a total reduction of about 11:1 is obtained through levers and gears combined. Steering is effected through a 20-in. cast iron steering wheel, the rim of which has an inverted V section. As already stated, the steering gear housing is bolted to the side of the engine bell housing, and the upper end of the rearwardly inclined steering post or shaft has a bearing in a combination bracket bolted to the transmission housing where the control plate was intended to go. This bracket carries the throttle lever and gear control lever in addition to the steering post. There are two universal joints incorporated in the steering post or shaft, of the ball type as used on machine tools, as there is no means of holding the lower and upper steering post bearings in rigid alignment. These joints are inclosed in leather boots held in place by buckled leather straps.

There is a sheet steel hood over the top of the engine extending from a ledge on the fuel tank to a ledge on the radiator, and being held in position by means of four bolts passing through hood and ledge, two at each end. The sides of the engine space are normally open, so that the air can circulate freely all around the engine, helping to cool the engine and immediately carry off all dead gases. However, to protect the engine against the weather, especially when the tractor is standing in the field for extended periods, heavy tarpaulin curtains are provided on both sides of the hood. These are ordinarily rolled up and held up by three straps. In deciding upon the use of this type of engine enclosure, in preference to the removable type of hinged sheet metal hood used on passenger cars and trucks, the designer was motivated by the consideration that the farmer is apt to let loose sheet metal parts lay in the field in rain and shine, so that they soon take on a coating of rust and the machine begins to look shabby.

A special design of cast seat is furnished. It is somewhat similar to the standard implement seat, but is

deeper, so that you sit in it instead of on it. The seat is supported on a flat spring of vanadium steel and there is an auxiliary spring below it to take the shock when the tractor wheels drop into holes. This permits of making the main spring light and flexible without danger of its breaking at the base when the machine receives a severe jolt. The seat support is quite a mechanism, and it is evident that the designer has had an eye toward the comfort of the operator. In the first place, the seat can be adjusted fore and aft to suit operators of different stature. Then the seat can be swung around a vertical axis, either one-eighth or one-quarter turn, to enable the driver to readily mount and dismount. Finally, there is an adjustment around a horizontal axis so the driver may sit straight up whether the tractor is running with one wheel in the furrow or on level soil. The two last-mentioned adjustments can be made without the use of a wrench, the seat being held in position by means of heavy springs and locking dogs engaging into notches.

The front axle is an I-section drop forging, and is identical with a standard size truck axle, except that it is provided with brackets for a half-elliptic cross-spring and with bosses for radius rods. The cross spring is of vanadium steel, provided with self-lubricating bushings and shackled at both ends. To the middle of the spring is clipped a swivel pad which has a pivot joint with the front drop bar of the engine. A universal joint of the ball type is incorporated in each radius rod near the rear end, which end is fastened into a lug on the bell housing. A leather boot protects this universal. It will readily be seen that with this construction a very flexible running gear is obtained. The tie rod is back of the axle in a protected position, but the steering gear and the drag link, with its joints, are exceptionally accessible. The front wheels are 32 x 6 in., and, owing to the narrowness and height of the engine frame, the tractor can be turned in the relatively small circle of 17 ft. radius.

P-T pad wheels are fitted at the rear, 44 x 12 in., with 2-in. cleats on each pad. Two pads are always in contact with the ground. The pads can quickly be replaced with wider ones (special) for use on soggy ground. Fenders of No. 16-gage stock, stiffened by angle iron, extend practically halfway around the wheels, and dust guards come down on the inside of the wheels to the axle housing. These fenders are built up, and no spot welding is used in their manufacture.

To a web at the bottom of the transmission housing is connected the drawbar. It has a spring behind it to absorb shocks, and is swiveled around a horizontal axis so that the height of the hitch can be varied by raising or lowering the rear end by means of a link depending from a bracket bolted to the upper part of the transmission housing. Thus the height of the hitch can be varied between 12 and 18 in. At the end of the drawbar is a horizontal crossbar with a number of holes in it, which gives a range of 6 in. for sideways adjustment of the hitch. There is a clearance of 16 in. at the bell housing and 10½ in. at the rear housing.

The exhaust pipe from the engine is carried to the rear of the tractor and the exhaust gases are discharged in such a way that the driver will not be annoyed by them. However, for certain kinds of work, such as hauling a binder, hay loader, etc., the low rear exhaust involves some fire danger, and for such use the company will furnish, at an extra cost, a special exhaust pipe which carries the exhaust gas straight up 3 ft.

The Craig tractor has an 88-in. wheelbase and a 52-in. tread, figured to the outside of the front and the center of the rear wheels.

# Analysis of Automobile Merchandising in New Zealand

## PART II

### Service Was Started with American Car Sales—Good System of Macadam Roads Linking Cities—Possibilities of Truck Sales—Leading Industries

By G. A. Worrall\*

**T**HE closing paragraph of last week's article on New Zealand told how good roads have been a potent factor in the heavy sale of American automobiles in New Zealand during the last 3 years, how practically all cities of 5000 population are linked together by a system of metal and macadam roads.

Once off this system of metalled roads the automobilist finds himself on dirt roads of all kinds. The nature of these dirt roads is best evidenced by the fact that the government has seen fit to place automobile springs on the free list. There is no local spring making industry worth while and a good quota of repair springs is needed in all parts of the two islands. The roads are also particularly hard on axles and steering parts, all of which have to be liberally stocked in the stores of the dealers.

All seasons of the year are suitable for the automobile in New Zealand. Being south of the equator, the seasons are opposite to those in America. The summer selling season begins in November and continues until April. These months constitute the dry season. The months from April to the end of October can rightfully be classed as a wet season. These wet months are accompanied by high winds. New Zealand is located in what is known as the "roaring forties." There are times when motor cars have been carried off mountain roads by the winds. It is not unusual to see signs along the mountain roads and passes advising the tourist to be-

ware of the winds. There are cases on record of where the top has been carried off a car and has been found over 50 miles distant.

The motor truck business in New Zealand has just been touched. It is here and awaits the hand of the manufacturers and dealers who are ready to take up the development of it. The great possible truck selling field is that of what is known as the "country carrier." He would be called a drayage man in America. His main job is to transport the 100,000 tons of wool from the country districts to the cities. This means a haul of from 5 to 50 miles. Generally 5-ton trucks are best suited for this work. Few of the large station owners or sheep raisers own their own trucks, they preferring to turn the wool transportation over to these large country carriers. Practically 95 per cent of these country carriers use horses. They know of the motor truck, and if they can be financed they are very good prospects for the motor truck.

There is a good opportunity of truck sales in the road building field, which generally calls for a 5-ton truck with power dumps. These trucks are purchased by borough and county councils.

Fewer trucks are used by the carriers or drayage firms in the city than the country carrier. The cities are not manufacturing places and the main use of the truck is to transport raw products to the wharves and transport the imported wares to the warehouses.

The cities offer the same field for a variety of sizes of motor trucks and deliveries that cities of similar sizes

\*Mr. Worrall spent 11 months in New Zealand as special representative of the foreign department of the White Co. He traveled on both islands and studied conditions for automobiles and trucks.



The village Stratford in Taranaki Province, New Zealand, which is typical of many selling places in that country. This shows the main street of the village, in which are located three garages. Stratford is in the heart of a dairy country and one in which some wool is produced

in America do. Store delivery and other problems are generally met with.

The advent of the American automobile in New Zealand started the movement of service necessary for the good of the industry. Previous to the war the European manufacturers had given little thought to service, which was largely due to the fact that importers in New Zealand who handled a wide line of merchandise classed automobiles as one line of merchandise. These importers were not familiar with service. It was entirely foreign to them, and it was not until the American manufacturer began selling in quantities that service became a tangible factor in New Zealand.

Of signs of service prior to the war there seemed to be none, and when cars were in need of spares it required from 3 to 6 months to have them forwarded from England. Passenger cars were not very numerous and trucks could be counted. Oversea manufacturers did not insist upon a stock of spare parts, and their importance was not really recognized because of the limited number of buyers and the representations being in the hands of large importing houses who either bought the machine outright and sold it for a profit or ordered it on a commission basis. At least their profit marked the end of their interest.

This practice has brought a great many high-grade motor vehicles into ill repute and has been no little source of annoyance to the reputable manufacturer.

With the flood of American motor vehicles manufacturers in some cases have sent out a representative to co-operate with the agent. In all cases good resulted. The agents have progressed along American lines, stocking in large amounts of spare parts, as is the case with the Ford, Dodge, Chevrolet, Overland, Republic and White trucks.

While many manufacturers have secured representation through commission houses, and are now making ready and secured sales, they must not expect to hold this trade after peace is established, but those who are now organizing and have caused large investments in spare parts and are insuring the owners of their products, their satisfactory performance will necessarily be more than on an even basis to hold their own.

The word service as applied to foreign trade does not mean to simply have spare parts on hand, but there should be a personal touch between the manufacturer and

the owner. This is particularly true of the truck business; a live, obliging factory representative's visit to an owner will please and flatter him. From many of these weather-beaten owners invaluable material may be obtained to hold the market successfully. A local agent in good standing paying a client a visit in company with a direct factory representative goes a long way toward securing a repeat order, but the agent should be the salesman and the factory representative an adviser.

It is regrettable that the large and powerful independent houses have secured valuable agencies and right from motor makers. It is not advisable to grant any of these houses selling rights, as they are not equipped to back up their sale and sooner or later the products come to grief because of inexperience, lack of attention to the purchasers, lack of spare parts and an absolute indifference on the part of the selling firm unless additional profits are involved. Thus, in the end, the manufacturer's good name suffers, which is exceedingly difficult to regain no matter how meritorious the product.

At present mechanics are very scarce throughout New Zealand, the best men having gone to the war. In peace times mechanics are scarce, as New Zealand is agricultural rather than inclined to manufacture, making it necessary to train all mechanics. Wages for mechanics are high and repair rates approximately \$1.25 per hour for work. All labor is in the hands of unions. Repair jobs are generally very slow in coming through.

To-day motor trucks in operation in New Zealand do not equal 3 per cent of the horse vehicles in use. Some enterprising firms, such as the New Zealand Express Co., are using trucks on their long hauls. The truck situation relative to the horse has not been studied sufficiently to make the motor vehicle popular.

In the largest cities, motor trucks will not pay on the short haul to the wharfs, where they must wait in line for hours before discharging their load. Most of the port cities are extremely hilly, with very little width, but running miles along the harbor edge. Along the length of these cities where a run of several miles is necessary to deliver a load the truck pays well, but for delivery to the residential sections, the all-around truck has not yet been demonstrated consistently. The ideal should be light, with plenty of power.

(To be continued)



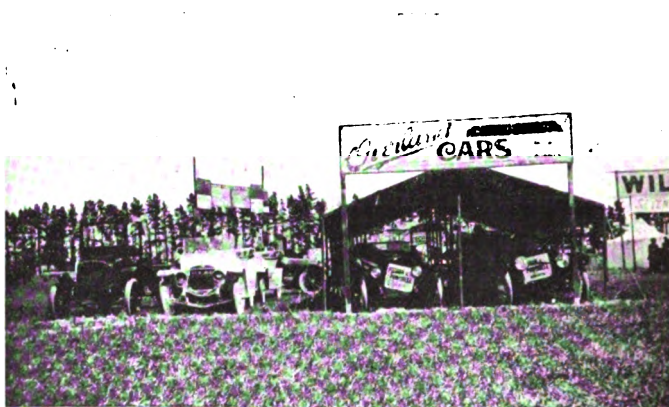
Newton King, garage in Stratford, New Zealand, a town of three thousand population, is represented of the best type of garage in such a city. King represents the last of a type of merchant importers of New Zealand who have handled automobiles. He was formerly a wool auctioneer, after which he entered the farm machinery and grain field and six or seven years ago took up the automobile business. He has a chain of garages and salesrooms in seven or eight towns of Taranaki. He handles Studebaker, Hudson and White



Throughout New Zealand fairs are held in November, which is not the fall month but the opening spring month in New Zealand. This is at the start of the automobile selling season. It is a good selling period for motor trucks, as the wool crop has just been sold at this time. This fair was held in Hastings and similar fairs are held in every small town in New Zealand. While different kinds of farm machinery, etc., are shown at these fairs, the automobile has been the dominant factor. Each agency exhibits its cars in its own tent

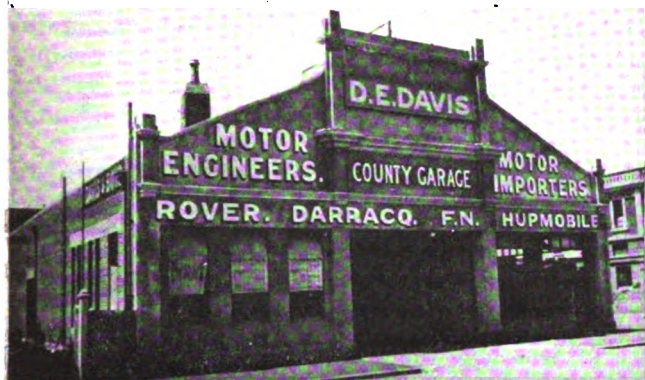


## An Outdoor Motor Car Show in New Zealand





## Types of New Zealand Salesrooms in Smaller Cities



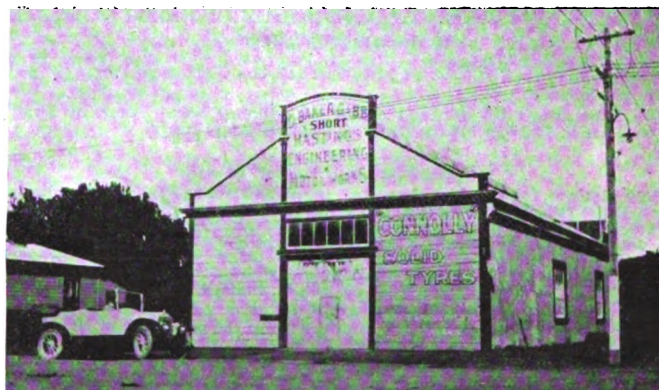
*This garage in the town of Hastings, population 6000, is typical of the average garage and represents the new type of building that has sprung up all through New Zealand as the result of the increased sale of American cars during the last few years. This agency handles Dodge, Saxon and Hupmobiles*



*This is another new garage built in Hastings but is slightly above the average. Studebaker, Packard, Romer and Scripps-Booth are sold. Hastings is in the Hawkes Bay section of New Zealand and in it is the City of Napier, approximately the same size as Hastings*



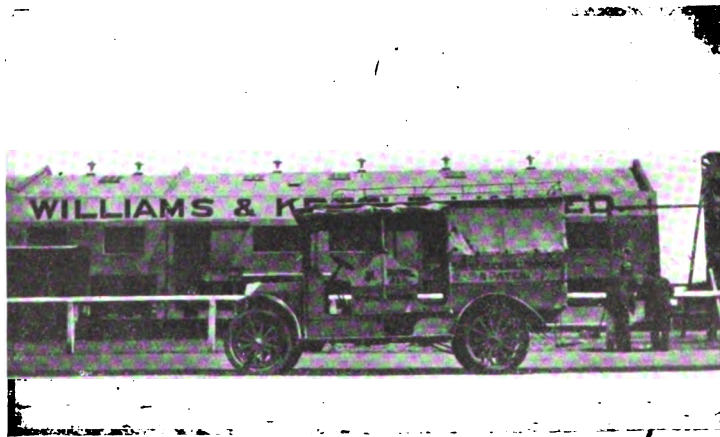
*This garage in Wellington, New Zealand, is typical of a kind being built as the result of the increased sale of American cars and the adoption of American service and selling methods*



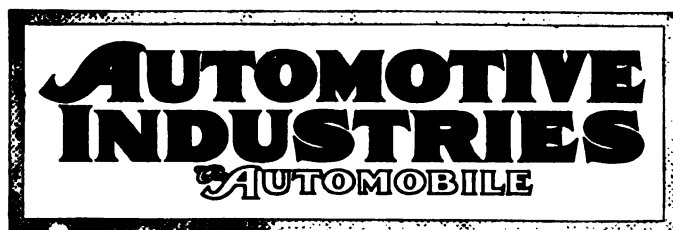
*This is the average garage of a sub-agent who may sell a dozen cars in a year. He has a small garage combined with a workshop which represents the entire business of the owner*



*This is an average garage in a city of ten thousand population located in a fertile wool area but with little dairy production. There are eight garages of this type in this city. Each has a good repairshop, with lathe, drill press and shaper, and some of them have battery departments*



*This garage in Hastings, New Zealand, is typical of many seen in a city of six thousand population. It affords not only garage space but repair facilities, and is fitted with the usual line of lathe machinery needed for making pretty careful repairs on various makes of cars*



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## Quality in Tractor Construction

AGRICULTURAL machinery in the past has been mainly cheaply constructed machinery, judged by present-day standards in the automobile and similar lines. Not as much attention has been paid to eliminating friction and conserving power and to insuring long life of the machines as would seem desirable.

There was, of course, one very good reason why no more capital than absolutely necessary should be spent on such machines as self-binders. These are used perhaps six days, and at most twice that length of time, in a whole year. Consequently, the capital tied up in them is largely dead capital. During the six or twelve days of its actual use the machine has to earn interest for a whole year on the capital invested in it, and in order to keep down this interest charge the manufacturing cost must be kept down.

The same applies to a great many other farm tools, such as seeders, hay loaders, corn planters, corn

harvesters, etc. Each is used only during a short season, and during the rest of the year it stands idle in the shed—or in the field.

A tractor, in this respect, is in a different class. While the chief use of the tractor on the farm is in plowing, it has many other uses, such as harrowing, disking, seeding, hay loading, harvesting, threshing, filling the silo, etc. It is, in fact, a machine for which work may be found nearly all the year around. Hence the tractor should be designed for greater efficiency and durability than is usually aimed at in agricultural implements.

If power is wasted in it due to poor design, this waste goes on practically all the year; and if it lacks durability due to improper protection of working parts, inadequacy of bearing surfaces, poor lubricating devices, or insufficient strength in vital parts, its usefulness will soon be at an end owing to the more or less continuous use.

Some of the manufacturers of tractors do not seem as yet to fully realize this condition of things, but it is bound to be brought to their attention sooner or later.

No frills are wanted in tractors, and not a cent should be spent on features that are merely matters of appearance or designers' hobbies. But those things which affect the working efficiency, the reliability and durability of the machine must not be slighted.

## Why Truck Curtailment?

WHEN transportation is the greatest need of the nation it seems rather unusual to start up a program of curtailing it. The motor truck was declared a 100 per cent essential, and yet we are given a 25 per cent reduction. This seems inconsistent. These are not days to curtail the greatest essential of the nation, namely, transportation.

It seems that no definite program on a specific cut in truck production should be made, but rather that truck production should be classed with railroad rolling stock and steamboat production and given steel up to the last limit of possibility. Wherever there is a steel surplus it should go to the truck industry, rather than saying that trucks must cut 25 per cent irrespective of the steel situation.

It is further unfortunate that after the War Industries Board has made a ruling on permissible truck production that there should remain open channels of appeal by which varying degrees of extension are allowed in accordance with the determination of the protest made. If a 25 per cent reduction is just, then that should be final. If, however, it is possible to get 50 per cent increases on this 25 per cent scale, then why the use of the 25 per cent ruling at all? Why should it be necessary to make a ruling and then immediately provide means for changing it according to representations that may be made for such changes?

The motor truck is a 100 per cent national necessity, and it should be handled as such. There should be no 25 per cent reduction. Take another



aspect of the unfairness of this ruling. Firms that are filled up on war orders which they did their best to secure, and which are not manufacturing for commercial uses, are operating at capacity, and those who are not fortunate enough to get war orders are not given a chance to take full advantage of the commercial field, but have to face a 25 per cent curtailment on a 100 per cent essential. You cannot

have all war work and commercial work, too; and you cannot go entirely on commercial work and war work also; but there is no reason why the commercial end should not be given all the steel available rather than being cut to a certain level and then left to go to the trouble of getting the limit raised, providing strong enough representations can be made to secure such.

## Advertised Tractor Performances

**T**HE very general adoption of the farm tractor east of the Mississippi, where it meets with varied geographical and topographical conditions, as in Pennsylvania, New York, New Jersey, Maryland and in the agricultural states, suggests the necessity of a more rational rating of tractor speeds, capacity for plowing per day, and fuel consumption per acre than has been given out by most manufacturers.

The advertised figures of tractor performances have generally been based on performances on the large farms of the Mississippi Valley, where tractors plow furrows from  $\frac{1}{2}$  to 1 mile in length, where the ground is level and where there is not a stone to be encountered.

When a tractor company endeavors to apply figures of tractor speed, tractor plowing capacity, and fuel consumption per acre made under these Mississippi Valley conditions to the farms of Pennsylvania and New York State it is generally giving to the farmer a set of figures which it is impossible to live up to under very many conditions. When the tractor has to operate on the rolling land of Pennsylvania and do its work in fields ranging from 8 to 40 acres in extent the advertised speed of the tractor is in some cases cut in half and the plowing capacity per day correspondingly reduced. If conditions are less favorable and stones are encountered the fuel consumption rises.

During the past summer the numerous tractor demonstrations in several of the Eastern States have failed because dealers and distributors have held out misleading figures on these vital points of tractor performance. The situation is such that many farmers to-day do not believe them, and their opinions of the tractor dealer, distributor and sometimes the tractor manufacturer are impaired because of the figures on performance and fuel consumption.

It is unwise to give out many of the figures showing tractor performances that have been used this year. They work to the detriment of tractor introduction. The farmer is most interested in seeing just what a tractor will do on his particular farm and it is not necessary to make the sale of the tractor depend on its plowing speed and its fuel consumption. As hundreds of farmers have already learned in the Eastern States, these items are often not the major considerations in operating a tractor. The farmer is most interested in seeing that a tractor will operate and continue to operate successfully and how it meets all conditions. He wants a tractor that will keep working and he will invariably select

a tractor that will operate continuously even if it uses 4 gal. per acre as compared with another tractor that claims to operate on 2 gals. per acre, but has a poor mechanical record.

Already some of the tractor manufacturers have wisely recognized the basic differences between tractor operation in the East and in the West. Some of the leaders are producing a tractor primarily intended for Eastern conditions and are not expecting too much of it in the West. In fact, they have not even demonstrated it in the Mississippi Valley. This is *prima facie* recognition of the fundamental differences in agriculture in the East and in the West.

For next year tractor manufacturers should not endeavor to sell their tractor in many parts of the East on the performances in the West. There should be one set of plowing performances for the Mississippi Valley and another for east of the Alleghenies, and in those older sections of the country where fields are small, hills are general and stones frequently encountered.

It would be unfortunate to continue endeavoring to sell a tractor in an eastern state on the basis of it plowing at 2 gal. per acre when it will use 3 to 4, and on the basis that it will plow  $2\frac{1}{2}$  m.p.h. when it has difficulty in plowing at 2 and more frequently plows at  $1\frac{1}{2}$  to  $1\frac{3}{4}$  m.p.h.

The future of the tractor and a general impression on the farmer will be much more favorable when honest conservative figures of performance are given. It is injudicious to attempt to sell a tractor to cultivate the rolling hills of Maryland on a performance made on the level stretches of Kansas or vice versa.

Hand in hand with this more conservative rating of tractor speed, tractor plowing capacity and tractor fuel consumption must come that of horsepower rating. Too many of the tractors are rated too high for general conditions. The ratings have been found too high where tractor conditions are favorable and they are correspondingly higher under unfavorable conditions in the east.

There are some tractors in parts of Pennsylvania and New York that have not been able to cultivate the areas where sold because of the hills. This trouble must not be laid to the manufacturer but rather to the merchandiser and it is poor merchandising to try to make an initial sale and place a tractor in a field it is not intended or not fitted to fill.

Let us, in these days, when tractor demand is greater than tractor supply, be conservative.

# □ Latest News of the

## Airplane Factories at 40% Output

Future Orders Slow in Coming  
—Production Hampered—  
Outsiders Get Orders

NEW YORK, Oct. 7.—The fact that as a total our factories manufacturing airplanes are not operating at over 40 per cent capacity is sufficient to create serious views regarding the future of the aircraft industry in America. Our total daily production of planes of all types to-day is little over sixty but our factories have capacity if given definite orders to go ahead on production to build 160 to 180 per day.

It seems almost impossible to understand why with airplanes one of the great essentials in the war we should be operating at only 40 per cent capacity. Not only is the 40 per cent figure a very distressing one but the way matters are running at present, several of our airplane factories will be cleaned up on present orders in a month or 6 weeks and by the first of the year several of the factories practically will be idle. There are other factories that have contracts that could keep them running until next July.

### No Assurances of Contracts

The factories have a very poor assurance of more contracts so that they can get materials ordered and the factory tooled up and organized for production manufacture. Since June some of the factories have been asking for such but as yet nothing is coming through and they are uncertain as to whether they are going to get a single additional contract after the present ones are completed and they face the prospect of having factories equipped for airplane production on their hands and nothing to manufacture. Instead of our factories at the first of the year operating on a 40 per cent capacity it looks to-day as if they may be operating on scarcely more than an average of 25 per cent capacity, or not that much.

There are other distressing viewpoints to the airplane situation, namely that outside factories are being given contracts whereas existing airplane factories are not. There is the case of one factory in an inland portion of Michigan that has received an order for three times as many airplane parts as some of the organized airplane factories that have been in production for a year and are now facing the prospect of not getting more orders.

This new company in question has

never previously manufactured an airplane. It has secured a new factory. It is impossible to understand just why such an outside factory should be started when the organized airplane factories are at 40 per cent capacity and looking for orders and when several of them in particular are tooled up to manufacture these same airplane parts and have been manufacturing them for nearly a year.

There are at present rumors to the effect that one or two other large establishments that have never built airplanes are to be given contracts which would seem to point to a reduction of production in existing factories. In this connection there are rumors that the Pullman Car Company of Chicago will be given contracts and others that the Brewster Company of Long Island City, automobile body builders, will be given contracts. The question is not one of getting new factories but rather of giving the existing factories contracts to go ahead on.

### Cut Passenger Car Tax to 5 Per Cent

WASHINGTON, Oct. 10.—The Senate Finance Committee has cut in half the 10 per cent tax which the House placed on the sale price of new passenger cars, motorcycles, tires, tubes and accessories, bringing it down to 5 per cent. The tax is now the same as that on commercial vehicles.

It is the intention, of the Treasury Department, if the bill is passed, to tax dealers 5 per cent on all parts in stock after they are sold, a proceeding which would be very costly and unjust to the dealers.

Alfred Reeves and Hugh Chalmers representing the N. A. C. C. have already suggested to the Senate Finance Committee that the tax should only be placed on those parts which have been shipped to dealers since September 1, 1918, when the bill was presented to the House.

The details of such a plan are now being worked out by Reeves and Chalmers, in co-operation with the National Automobile Dealers Association. This plan would be considered most equitable. Reeves has consulted F. W. A. Vesper, president of the N. A. D. A. and expects to meet the members of the dealers association here in the next few days. An objection raised by the senators to placing the tax on parts shipped after September 1 was that so long as department stores, for example, would have to pay a tax on everything taxable regardless of how long they have been in stock dealers should do likewise. Reeves and Chalmers pointed out that this would be unjust because department stores can reduce stocks at any time by means of sales while dealers must carry parts until the demand arises for them.

## Ahara Carbureter Patent Upheld

Stromberg Wins Decision Over  
Zenith, Finally Disposing  
of All Litigation

CHICAGO, Oct. 10.—Another example of a final patent decision coming almost at the end of the 17-year life of the patent is the Stromberg-Zenith carbureter controversy based on the Ahara patent owned by Stromberg, and which suit has been finally settled in favor of Stromberg by ruling of the Circuit Court of Appeals for the Seventh District of Illinois.

The Ahara patent, covering basic features in the operation of the Stromberg and a Zenith model, was issued on October 15, 1901, and so expires on October 15, 1918, or less than 2 weeks after the final decision was handed down.

By the decision the Zenith design in question is held to infringe the Ahara patent, which is sustained by the decision. The court has directed an accounting of profits by Zenith. No injunction was asked against Zenith to prohibit its continuing to manufacture this model, as the expiration of the Ahara patent is so close at hand.

The Ahara patent was issued to George V. Ahara of Beloit, Wis., and later purchased by Stromberg. It basically covers what is familiarly known as the atmosphere type of carbureter in which the richness of the mixture at high speeds is eliminated by means of an air tube in conjunction with the fuel spraying nozzle, this air tube being open to the atmosphere and also having a connection with the fuel feed in the nozzle. By this means more air in proportion to fuel is furnished at high speeds, the result being the same as that obtained by the auxiliary air valve as used on many makes of carbureters.

The controversy between Stromberg and Zenith arose over the fact that Zenith was manufacturing the same basic type under what is known as the Baverey patent No. 907,953 which covered a type of operation on the atmospheric principle and similar to that covered by the Ahara patent. The trouble seems to have been that the Zenith carbureter in question was not manufactured strictly in accordance with the Baverey patent. This was established by the ruling handed down by Judge A. L. Sanborn in the District Court of Illinois in February of 1914, at which time he stated: "If the Zenith were made substantially in accordance with the drawings on the Baverey patent (Continued on page 648)"

# Automotive Industries □

## Discard \$23,000,000 Aircraft Parts

### Scrap Training Planes, Engines, Trucks, Cars, Oil, Batteries and Other Parts

WASHINGTON, D. C., Oct. 8—Following announcements during the last 3 months of the discarding of certain airplane engines, parts, etc., by the War Department comes another statement that the Division of Military Aeronautics will practically discard \$23,000,000 of products made up of engines, training planes, lubricating oil, batteries, motor trucks, motor cars, motorcycles and other apparatus. No reason is given for the discarding of these parts other than that some of them have become obsolete and others deteriorated because of not being used.

The total of \$23,000,000 is not all American, as it includes 3500 French Gnome airplane engines valued at \$10,500,000, which were ordered by the French High Commission. The money to buy these was advanced by the United States to the French Government and will eventually be paid by the French. It is reported that these will be sold for junk at prices ranging from \$25 to \$120,000 per ton.

In addition to these engines there are 2000 tons of parts for them. Very few of the parts are completed. Some have not been started upon and the steel billets remain as when purchased. Others are 90 per cent finished; some are only 5 per cent finished, and some of these parts have been shipped abroad.

The Gnome engine was one time one of the most popular French types, and its manufacture in this country was carried on at the factory of the General Vehicle Co., Long Island City, which factory has recently been taken over by the Wright-Martin Airplane Corp.

The list of scrapped parts of the American airplane program includes 300 Penguin training planes valued at \$750,000. These are small primary training planes, fitted with a small two-cylinder engine which was manufactured by the Excelsior Mfg. Co., Chicago. These planes do not leave the ground but hop along. They have been used by the French for primary training, and it was on the recommendation of the French and the initiative of the army that the order for these was placed for the American training program. It seems they have not been used in our training program and apparently the army has decided that they do not fit into the present scheme of training.

The list of discards further includes 1500 JN-1 training planes valued at \$9,000,000 and 500 additional engines valued at \$750,000. These JN-1 training planes were manufactured by the Standard Aircraft Co., and there were some manufactured by the Dayton-Wright and others by the Fisher Body Co. of Detroit. They were fitted with the four-cylinder Hall-Scott engine, which does not seem to have been suited to the job, although no particulars are forthcoming. There is no reason why these planes could not be fitted with some of the eight-cylinder types of engines now satisfactorily used for training planes. It is questionable if these planes will be destroyed as they will undoubtedly be fitted with other engines.

Another list of discarded planes is 128 L.W.F. training planes valued at \$1,427,000. These, so far as can be learned, are a perfectly satisfactory type of plane, and were fitted with Thomas-Morse and Sturtevant engines. If it is a case of the engines not being adapted to the plane, there is apparently no reason why these could not be fitted up. So far as can be learned there have been no complaints regarding the engines in these planes.

In all of the ordering and deciding on this part of the airplane program the technical decisions regarding production of these different types had to come originally from the joint Army and Navy Board together with a request from the Signal Corps. The requirements originated with these organizations. The recommendations would then be presented to the Aircraft Board with its advisory power to recommend favorably or otherwise.

More than 7500 storage batteries valued at 40 cents each will be scrapped. These were found in storage practically useless through deterioration.

Inventories of the supplies of the Division of Military Aeronautics revealing these useless articles have been taken by the Surplus Inactive Supply Service of the General Staff. Additional surplus supplies, not obsolete, but not useful to the department, and valued at more than \$10,000,000, were also uncovered. These included motor cars, motor trucks, motorcycles, lumber, wood, iron and steel-working machines and oil. One hundred and fifty thousand gallons of oil worth \$75,000 and of no use to the Division of Military Aeronautics is included in the above. Four hundred and seventeen typewriters worth \$25,000 and of no use to the division are included.

At the Middletown Pennsylvania depot 9000 gal. of dope worth \$47,500 was discovered and immediately put into use. Other surplus supplies located were included.

## Export License Plan Simplified

### Priority Certificates Not Needed for Export Licenses Covering Iron and Steel

WASHINGTON, Oct. 8—The system of securing export licenses from the War Trade Board, priority certificates from the War Industries Board, or permits from the Steel Section of the War Industries Board has been simplified by new rules and regulations.

Hereafter it will not be necessary to secure priority certificates or permits from the Steel Section before requesting the applications for export licenses for the exportation of iron or iron and steel products.

All commodities listed on the export conservation list of the War Trade Board and which are also named on the preferential list recently announced by the War Industries Board will automatically be given class C priority rating by the War Industries Board in conjunction with their export licenses.

In other words the license itself will be evidence that the articles covered by it are in priority class C, if the particular commodity is listed on the preferential list of the War Industries Board.

In those cases where the Priority Committee believes the commodity for export is entitled to a particularly high rating, priority certificates for ratings higher than class C will be issued by the Priority Committee and forwarded with the export license without further request from the applicant.

Consequently, export licenses issued on and after Oct. 16, 1918, for the exportation of iron and steel or the products manufactured from them, which are not covered by special priority classification, will in themselves be permits approved by the director of steel supply, and steel or iron mills will fill the orders for the quantities specified in the export license without requesting special permission.

The War Industries Board and the War Trade Board urge exporters and manufacturers not to manufacture, purchase or produce any articles on the export conservation list for fulfilling export orders until they have secured licenses.

### Detroit Priorities Office Opened

DETROIT, Oct. 8—A priorities section of the production division of the Army Ordnance has been established in Detroit under the direction of F. J. B. Sevald. Heretofore it was necessary for Michigan manufacturers to apply for priorities to Chicago.



## Air Mail Records 100% Perfect

September Service Between  
Washington, New York and  
Philadelphia Maintained  
Without Break

Total possible number of flights..... 100  
Total possible mileage..... 10,900  
Total perfect (uninterrupted) flights  
made..... 97  
Total interrupted flights made..... 3  
Total flights defaulted on account of  
weather..... 0

Pilot	Perfect Flights		Forced Landings		Total Flights	
	Number	Miles	Interrupted Flights	Uncompleted Flights	Number	Miles
Dana C. DeHart..	33	3,483	2(a) 0	0	34	3,708
Robert F. Shank..	33	3,616	1(b) 0	0	34	3,708
Maurice A. Newton..	30	3,270	0	0	30	3,270
Max Miller.....	2	218	0	0	2	218
Total.....	97	10,592	3	0	100	10,900

Cause of Forced Landings:  
(a) DeHart, Sept. 18, compass disturb-  
ances in storm; Sept. 21, ignition  
trouble.  
(b) Shank, Sept. 24, water system trouble.

Following is the arial mail operation  
for the month of September 1918:

Date Sept.	Miles Flown		Hrs. of Flying		Mail Carried		Percent of Performance	Arrival	
	A	B	C	D	E	F		Wash.	N. Y.
2..	436	5 29	27	515	100%	2.44	2.40		
3..	436	5 30	31½	580	100%	3.15	2.15		
4..	436	5 39	39½	617	100%	3.10	2.20		
5..	436	6 11	36	581	100%	4.00	2.08		
6..	436	5 35	35	608	100%	3.05	2.35		
7..	436	5 37	35	589	100%	3.18	2.13		
9..	436	5 51	48½	563	100%	2.47	2.59		
10..	436	6 3	38½	585	100%	3.05	2.48		
11..	436	6 50	36	573	100%	2.36	3.04		
12..	436	6 45	35½	603	100%	3.05	2.27		
13..	436	6 13	34	559	100%	3.05	2.05		
14..	436	6 22	34	558	100%	4.00	2.15		
16..	436	6 11	33½	582	100%	4.05	2.00		
17..	436	5 26	35	482	100%	3.30	1.50		
18..	436	7 11	39½	444	100%	7.30	2.50		
19..	436	6 8	35	608	100%	4.05	1.53		
20..	436	6 29	33	574	100%	3.50	3.12		
21..	444	6 4	31	618	100%	5.00	2.30		
23..	436	5 48	34½	598	100%	3.05	2.44		
24..	436	6 17	36½	575	100%	3.31	3.30		
25..	436	6 41	31	361	100%	4.31	2.37		
26..	654	9 3	34½	771½	100%	4.10	2.39		
27..	661	9 25	32½	857½	100%	3.42	2.42		
28..	436	6 41	34	589	100%	5.05	1.48		
30..	436	5 43	34	367	100%	3.08	2.42		
Total.									
	21,351	156	..	874½	14,325				

Note: Number hours of dead flying for the  
month, 14 hr. 40 min.

Explanation of Tabulation:  
A. Miles flown: Leg from Washington to  
Philadelphia, 123 miles; leg from Philadel-  
phia to New York, 90 miles. Miles flown  
for the day, whether one, two, three or four  
legs of the trip have been made. The aim is  
to get exactly the number of miles flown  
in connection with the mail service each  
day. Therefore, mileage of partial trips  
should be indicated.

B. Hours of flying: To include the actual  
hours and minutes machine is in the air  
with mail.

C. Mail carried: In this column, under  
A, give pounds of airplane mail; and under  
O, give pounds of ordinary mail.

D. Per cent of performance: Round trip  
Washington-New York consists of 4 legs.

each leg valued at 25 per cent if completed  
by airplane and not by train before close of  
day.

WASHINGTON, Oct. 4—The record  
of the Air Mail Service between Wash-  
ington, Philadelphia and New York for  
the month of September was 100 per cent  
perfect.

The operation of the airplanes, con-  
structed for the Post Office Department,  
by civilian pilots of the postal service  
was inaugurated August 12. The rec-  
ord of all the flights from this date to the  
first of September, except two was 100  
per cent perfect.

The September report covers the first  
full month of operation under entirely  
civilian organization, and the round trip  
flight was made each day without a break  
in the service. The distance covered by  
these flights was 11,351 miles; the total  
time consumed 156 hours and 9 minutes,  
and the total weight of mail carried was  
15,199 lbs.

During the month there were but three  
forced landings and these were not such  
as to interrupt the flights.

## Ingenuity Needed in Airplane Repairs

"Trouble Shooters" Find Op-  
portunity to Overcome  
Temporary Difficulties

WASHINGTON, Oct. 4—Airplane re-  
pair is developing new types of motor me-  
chanics and engineers on the flying  
fields in this country, where shortage in  
airplane parts handicaps the training of  
aviators, and Yankee ingenuity is taxed  
to work out relief in some form or an-  
other. Many of these repair men, who  
are called "Trouble Shooters," soon quali-  
fy as engine experts.

At Ellington Field recently a scarcity  
of wrist pins for airplane engines de-  
veloped. A wrist pin in an engine has to  
stand a tremendous amount of strain and  
for one to break in the air would result  
in a serious accident. On account of the  
present immense demand for steel, it has  
been difficult to meet this wrist pin prob-  
lem, until a lieutenant, searching for ma-  
terial in a scrap heap, picked out an axle  
of an abandoned "jitney" automobile.  
This he treated by a special process and  
then cut and shaped the pieces into a  
number of wrist pins. They were placed  
in several engines, the cylinders contain-  
ing them plainly marked, and sent out  
for testing.

Some of these improvised wrist pins  
have had 170 hours of service and are  
still holding up as well as any others.  
The result has been a great saving of ma-  
terial and time, as well as increasing the  
number of flying hours for engines at the  
field.

### Colt-Stratton Adds D-E Trucks

NEW YORK, Oct. 7—The Colt-Strat-  
ton Co., Dodge Brothers distributor, has  
been appointed metropolitan distributor  
for Day-Elder trucks produced by the  
Day-Elder Motors Corp., Newark, N. J.

## Ordnance Output Stimulated

Well-Known Speakers Address  
Factory Workers on Win-  
the-War Subjects

DETROIT, Oct. 5—Production of ord-  
nance work in the Michigan territory is  
receiving much impetus through the in-  
troduction of an idea created by John A.  
Brown, special production assistant of  
the Detroit Section of the Ordnance De-  
partment.

Well known speakers are being sent to  
the factories engaged on ordnance work  
to give 15 to 20 min. talks to the work-  
men and foremen. About fifteen talks  
are given during the day, four or five  
speakers being at different plants at one  
time.

When the speaker arrives at the appointed  
hour the entire plant shuts down and the  
men are asked to assemble in a place large  
enough to accommodate the gathering. In  
plants where the number of employees is  
great only a few departments are closed  
down to allow the men to hear the talk.

In every plant that has been visited by a  
speaker a difference in spirit and attitude of  
his workmen has been observed since the  
talk was made. Commendatory letters have  
been received by the Ordnance Division from  
all the plants thus visited. It has been noted  
that the talks have materially stimulated  
production.

A number of points are covered in the  
speeches. The main issue is to impress upon  
the minds of the men the importance of the  
work they are doing and the aid they are  
giving in shortening and winning the war.

Some of the talks have been so effective  
that aliens have desired naturalization. The  
necessity for men to stick at their present  
work rather than change from one plant to  
another is another point that is forcefully  
emphasized.

Another form of direct appeal to the work-  
men which is proving a great inspiration to  
the men in stimulating production has been  
devised by the Timken-Detroit Axle Co.,  
Detroit, and is now being employed in its  
large shop.

A large illuminated board has been built  
along the wall of the plant on which appears  
in large figures the tonnage to be produced  
on each day of the month. This standard  
has been set at a higher figure than was ever  
hit before. On wires along the base of the  
board are two life-size figures of soldiers,  
one representing the Yank, the other the  
Hun, both of which are movable.

If the production of a day exceeds the  
standard represented by the figures on the  
board, the Yank remains ahead of the Hun,  
but should the tonnage fall below the day's  
quota the Hun is put in the lead. The posi-  
tion of these figures has a psychological  
effect on the workmen and they are ever  
striving to exceed the standard set by the  
company that the Hun may not be placed  
ahead of the Yank.

During August the output exceeded the  
average production of the previous 6 months  
by 26 per cent. September also showed a  
substantial increase.

### U. S. Employment Service Program

WASHINGTON, Oct. 4—Orders  
have been issued to the United States  
Employment Service by the Director-  
General outlining the program whereby  
replacement of men by women and the  
introduction of women into new fields of  
war industries may be intelligently di-  
rected.

Two women will be added to each of  
the Community Labor Boards which have  
been established throughout the country,  
one representing the women workers and  
the other industrial management.

When women are desired by employers  
engaged in war work for work not here-

tofore customarily undertaken by female labor the applications will be submitted to the Community Labor Board for the particular district.

The board will consider whether the work is proper for women to perform, whether conditions surrounding the job are satisfactory for women, what modifications in conditions must be made to allow employment of women, and what, if any, limitations are necessary as to the ages of the women to be employed.

The women to be selected to serve with the Community Labor Boards will include preferably those who have worked in industries, to be selected after consultation with local labor groups, and those to represent management to be selected after consultation with local representatives of management.

#### Milwaukee Gets M. T. C. School

MILWAUKEE, Oct. 7—Milwaukee has been selected as the seat of a government motor transport training school. A contract was signed Sept. 28 with the War Department by the board of directors of the Association of Commerce, by which the big State Fair Park at West Allis, a suburb of Milwaukee, will be turned into a school, accommodating 1000 soldiers at one time. Motor Hall, the fireproof building used by the Milwaukee dealers for their annual fall shows on the fair grounds, together with several other large exposition structures on the grounds, will be used to house the men. The first course will open Nov. 1, with 1000 men, and the period of training will be 30 days. On the first of each succeeding month this number of soldiers will arrive to enter the school. A large refectory will be erected immediately to fill the need for mess facilities. Otherwise the present establishment will serve all purposes.

#### Aids Less Essential Firms

WASHINGTON, Oct. 7—Legislation to authorize the war finance corporation to lend money to less essential industries which the Government has forced to curtail business during the war may be recommended to Congress soon by Secretary McAdoo. Amendments to the war finance corporation act to broaden the powers of the corporation in this and other respects have been drafted by Treasury advisers and are under discussion with directors of the corporation and members of Congress.

Most officials have agreed that the Government should extend financial aid to the curtailed industries to preserve them for after-the-war activity and minimize the general business disturbance at this time.

#### Col. Drake Nominated Brigadier General

WASHINGTON, Oct. 4—The nomination of Colonel Charles B. Drake, Chief of the Motor Transport Corps of the United States Army, as brigadier general, has been sent to the Senate by the President.

## Airplane Inspectors to Make Flights

### Officials to Fly Frequently in Planes They Have Inspected

WASHINGTON, Oct. 3—Government inspectors of airplane and aeronautical engines who work in factories or on the ground at flying fields will hereafter be required to make flights at frequent intervals in all of the planes that they inspect. This follows the inauguration of a similar plan at Fort Sill, Oklahoma, where the commanding officer requires the mechanics in charge of airplanes to take an air trip at least once a week. This order at Fort Sill applies also to the repair department of the field, with the result that on completion of repairs, the chief of mechanics responsible for the work is required to make the initial trip with the pilot trying out the machine. It is said that this insures the utmost care on the part of the mechanics and repairmen.

At Fort Sill, a day off is now granted the crew of mechanics whose engine most successfully meets the requirements of the tests each week and the competition thus engendered has resulted in a more rapid repair of engines.

#### No Indiscriminate Housing Help

WASHINGTON, Oct. 7—Unless a serious shortage of housing facilities for war workers exists in any particular industrial center and there is no other relief available, the United States Housing Corp. will not extend aid. This statement was made here recently by O. M. Eidlitz, head of the Government housing program, who stated that those communities under the impression that an unlimited national fund for housing has been voted and will be apportioned without Government scrutiny of conditions have a misconception of the plan. The Federal Government will build houses for war workers only as a measure of final relief, and not until every community concerned has exhausted its own resources. The housing corporation has arranged to secure priority orders for private housing enterprises which are inaugurated to relieve congestion in war working districts.

#### Ontario Has Car for Every 39

TORONTO, ONT., Oct. 7—That the motor traffic in this province is rapidly growing and that trucks are forming a considerable portion of this increase is indicated in the report of the Department of Public Highways for 1917, which has just been issued by the Deputy Minister, W. A. McLean. Motor vehicle registration in 1917 consisted of 78,861 passenger cars and 4929 commercial vehicles, a total registration of 83,790. This is nearly twice the registration of 1915. There is now in Ontario one car for each 39 of population. It is true in

Canada, as it is also true in the States, that agricultural communities, rather than manufacturing, contain the greater number of cars in proportion to population. In Saskatchewan the registration is one car to each twelve of population. In Ontario 23,408 cars are owned by farmers, an increase of 11,335 in 1917.

Of the 4929 motor trucks registered in Ontario last year, nearly 75 per cent were classed as one ton or less; over 97 per cent were 3½ tons or less, while less than 3 per cent were four tons and upward.

#### 89 Per Cent Dort Dealers to Continue

FLINT, Oct. 7—As a result of a canvass made of its dealers the Dort Motor Car Co. has compiled statistics showing that 89 per cent of all the dealers will stay in the automobile business regardless of whether or not they get cars. Only 6 per cent will go out of business, and 5 per cent are doubtful as to whether they will continue. Ten per cent are subject to military call. The following percentages indicate to what extent Dort dealers are interested in other lines: 67 per cent operate service departments; 38 per cent are exclusive Dort dealers; 56 per cent maintain garages; 49 per cent handle trucks; 32 per cent are agents for tractors; 60 per cent handle accessories; 75 per cent handle miscellaneous lines; 44 per cent have gas filling stations; 62 per cent handle other makes of cars and Dort.

#### Big Calcium Carbide Plant Being Established

MILWAUKEE, WIS., Oct. 5—A calcium carbide manufacturing plant costing more than \$500,000 is being established at Keokuk, Ia., by Milwaukee capital in order to meet Government requirements for material for manufacturing acetylene gas for the oxy-acetylene welding and cutting process. The work is being carried out by the Gas Tank Recharging Co., Milwaukee, which several years ago opened a small shop for recharging lighting tanks for motor cars and has since developed its business along broad lines. The capital stock, increased some time ago to \$250,000, has just been increased to \$1,000,000. The enlargement was made Oct. 1 to cover the financing of the new project at Keokuk. The plant will contain a Moore electric furnace with a daily capacity of 30 tons, two 80-ft. Stacy-Smith steel lime kilns, and a battery of eight beehive coke ovens of the Connellsville type. The works will be ready to begin operations Jan. 1. The company will continue to have its general offices and headquarters in Milwaukee, where a large compressing works is being maintained. Fred J. Pagels is treasurer and general manager.

#### Motor School at Camp Taylor to Cost \$182,233

WASHINGTON, Oct. 4—A contract has been let for construction of buildings for a motor school at Camp Taylor to cost \$182,233. The buildings will include quarters, barracks, administrative office, class rooms and a motor school.

# Tractors Fall Below Scheduled Plowing Performances

Stones, Hills and Weeds in Pennsylvania State Tests Cut Speeds 30 Per Cent and Increase Fuel Consumed

HARRISBURG, Oct. 9—Two additional reports on the Pennsylvania State tractor demonstrations held on Sept. 23 and 24 on the State Farm, near here, have been given out by the Department of Agriculture. One of these reports covers plowing by the different tractors on varied surfaces, one of the fields being perhaps as bad a plowing test as ever faced at a tractor demonstration. It was a 2-year old corn stubble covered thickly with weeds 5 ft. in height and with stones pretty generously scattered over the field. Several of the tractors had to cross a deep gully necessitating a very stiff pull when going each way of the field.

The report of this plowing by nine tractors shows that it is quite impossible to work up to the advertised speed. There was not a single tractor operating in the corn stubble that approached its advertised plowing speed. It was impossible for some of them to average one-half of their advertised speed. This was not always due to the tractor, but very frequently to the plows which gave a good deal of trouble with the tall weeds. The last column in the report of this plowing gives some indication as to the loss of time because of the plows. An official

observer accompanied each tractor throughout so that the plow stops are accurate.

Some of the tractors had particularly severe experiences with stones on this work. In this respect Parrett, Allis-Chalmers, Plowman and Plowboy suffered most. They had, with the exception of Parrett, the combination of crossing a fairly deep gully with a stiff climb at each side and each hillside with some very large rocks which were impossible to loosen with the plows. The Parrett met with very severe stone conditions.

The fuel consumption of four of the tractors which had heavy experience with stones and weeds ran over 4 gallons per acre. This is a high figure, but it represents consumption in heavy Pennsylvania plowing. While these figures may appear very severe in view of advertised fuel consumption by many companies they nevertheless give a pretty clear idea of what tractor fuel will cost the Pennsylvania farmer when he expects the tractor to do his very roughest work.

The Cleveland and Moline tractors which used gasoline pulled two plows each had fuel consumption close to 4 gallons per acre, the Cleveland running a

little over this figure and the Moline going just below it.

None of the tractors in the heavy corn stubble averaged much over .75 acre per hour, Huber and Parrett being the only ones to get slightly over this figure and several of the others averaging less than 5 acres per hour.

These figures are valuable in that they represent what a tractor can actually accomplish under very severe conditions in a small field in the east as compared with what they can accomplish on the long level stretches of Kansas or Nebraska.

On the final day of the Pennsylvania demonstrations the different tractors were given an opportunity of demonstrating what they would do in fitting the soil, for winter wheat and seeding it. In this part of the demonstrations each tractor was given approximately a 4-acre field 76 rods in length to fit and seed using whatever combination of discs, harrows and other implements considered best for the work. In these tests the assumption was that all tractors pulled approximately the same capacity of equipment, as the load when drawing these instruments is not so great as when plowing.

## Pennsylvania State Tractor Demonstration—Fitting and Seeding Records Tuesday, September 24, 1918

No.	Make of Tractor	Rating		Acres Fitted and Seeded	Gallons Kerosene Used	Gallons Gasoline Used	Gross Time	Net Time	Tractor Stops	Implement Stops
1.	Emerson-Brantingham	12-20	Emerson 8-ft. double-disc and spike-tooth harrow .....	3.886	4.56	.687	1:50	1:50	0	0
			Emerson grain drill, 12 x 7 .....	3.886	5.375	.375	2:34	2:34	0	0
2.	Knickerbocker	22	Withdraw							
3.	Reed	12-20	Withdraw							
4.	Parrett	12-25	Bissell 8-ft. double-disc and Superior grain drill, 11 x 8 ...	3.886	5.00	.125	2:22	2:22	0	0
5.	I. H. C.	8-16	Withdraw							
6.	Cleveland	12-20	Oliver 8-ft. double-disc and Oliver 8-ft. pulverizer .....	3.886		4.25	1:54	1:26	0	28
			Massey-Harris grain drill, 10 x 7 .....	3.886		4.00	1:48	1:23	25	0
7.	Case	9-18	Superior 8-ft. double-disc and Oliver pulverizer .....	3.886	4.00	.125	1:25	1:19	0	6
			Superior grain drill, 11 x 8 .....	3.886	4.00	.375	1:40	1:34	0	6
8.	Huber	12-25	Oliver 8-ft. double-disc and Oliver pulverizer .....	3.886	4.187	.375	1:27	1:27	0	0
			Superior grain drill, 11 x 8 .....	3.886	3.00	.187	1:09	1:04	0	5
9.	I. H. C. Titan	10-20	Withdraw							
10.	Plowman	15-30	Oliver 8-ft. double-disc .....	3.886	3.25	1.00	1:53	1:53	0	0
			Emerson grain drill, 12 x 7 .....	3.886	4.437		1:48	1:48	0	0
11.	Plowboy	13-30	Oliver 8-ft. double-disc and Oliver pulverizer .....	3.886	4.50	.50	2:09	2:09	0	0
13.	Waterloo	12-25	Withdraw							
14.	Frick	12-25	Massey-Harris 8½-ft. double-disc and pulverizer .....	3.886	4.56	.25	1:52	1:41	11	0
15.	Allis-Chalmers	10-18	Bissell 8-ft. disc and Oliver pulverizer .....	3.886	3.50	1.50	2:06	2:00	0	6
			Superior grain drill .....	3.886	3.00	.50	1:55	1:55	0	0
16.	Moline	9-18	Moline 7-ft. double-disc and roller .....	3.886		5.50	1:43	1:43	0	0
			Superior grain drill, 11 x 8 .....	3.886		4.00	1:36	1:36	0	0



These records show the fuel used in cultivating and seeding the 4 acres which varied considerably. Generally it approximated 1 gallon per acre although in several cases it fell below this, Allis-Chalmers, Plow-Man and Huber getting below this figure. With the Cleveland and Moline using gasoline, the consumption approximated 1 gallon per acre.

#### Detroit Subscribes Three-fifths of Quota

DETROIT, Oct. 7—Nearly three-fifths of Detroit's quota of \$74,000,000 was subscribed for at the close of the first week of the Fourth Liberty Loan campaign. The subscriptions now total approximately \$56,000,000, with \$28,000,000 still to be subscribed. Employees of the factories have pledged in excess of \$6,000,000 of the total reported up to Saturday noon, and they are looked to for at least \$10,000,000 more this week.

Henry Ford and the Ford interests announced a subscription for \$10,000,000. Seven million dollars will go to the Wayne County quota, while \$3,000,000 will be credited to branch factories. This is \$4,000,000 more than was subscribed in the last loan, including factory assembly branches. The Ford Motor Co.'s subscription, taking in the employees of the Highland Park plant and the shipbuilding yards, is given at \$6,000,000.

#### Chalfant Engages in Export Trade

NEW YORK, Oct. 7—E. P. Chalfant, one of the pioneers of the automobile industry, has resigned as eastern division manager of the Anderson Electric Car Co. to become general manager of Automotive Products Corp., an export house organized in 1917 by the American Steel Export Co. for the purpose of specializing as direct foreign representatives for American manufacturers of automotive products of every nature.

## Third B Truck Order for Detroit

### Makers in Michigan-Ohio Territory to Make 35% of Latest Government Contract

DETROIT, Oct. 8—Exactly 35 per cent of the order for Class B trucks recently placed by the Government will be produced in the Michigan-Ohio territory. Every manufacturer is rapidly adjusting his facilities to get into early production, and it is expected that within 10 days all will be engaged on this work. The orders in this section represent a value of \$26,250,000. The companies awarded contracts in Michigan and Ohio are given in the following tabulation with their respective quantities of trucks to be produced:

United Motors .....	500
Signal .....	500
Denby .....	1,500
Lewis-Hall .....	500
Republic .....	2,000
Wilson .....	500
Clyde .....	500
United States Motor Truck.....	1,500
Gramm-Bernstein .....	2,000
Standard .....	750
Midland .....	500

Companies in other parts of the country awarded contracts follow:

Vim .....	500
Winther .....	500
Rockaway .....	1,000
Diamond T. ....	2,000
Bethlehem .....	1,500
Rowe .....	500
Sterling .....	750
Indiana .....	1,500
Maccar .....	500
Service .....	750
Atterbury .....	750
Velle .....	2,000
Selden .....	2,000

Of those truck manufacturers awarded contracts in Michigan and Ohio nearly 75 per cent have not had Government work within their walls.

#### General Motors to Acquire United

NEW YORK, Oct. 9—Negotiations covering the absorption of the United Motors Corp. by the General Motors Corp. are practically complete, and as was told in AUTOMOTIVE INDUSTRIES early in February of this year, the United Motors as a separate company, will shortly be dissolved. A special meeting of stockholders of the United Motors Corp. will be held Oct 30 to vote on a plan calling for the dissolution of the company and to consider an offer of the General Motors Corp. to acquire all assets and liabilities of the company. The consideration will be an exchange of 110,164 shares of common stock and 330,492 shares of preferred stock of the General Motors Corp. If such a plan is approved, the assets of the United Motors Corp. remaining after debts are paid, will be distributed among the stockholders and the corporation dissolved.

#### Akron Goes "Over the Top"

AKRON, Oct. 7—Akron has exceeded its fourth loan quota of \$10,645,050 by more than \$100,000, and has achieved a distribution fully 50 per cent wider than in the third loan. A total of 65,000 subscribers were reported. When all pledges are completed it is expected that not only will the total subscribed jump several hundred thousands, but the Akron Liberty Loan committee is confident the total of subscribers will be above 80,000. Two million one hundred thousand dollars each was subscribed by the management and employees of the Good-year and Goodrich companies.

### Pennsylvania State Tractor Demonstration—Second Day's Plowing Monday, September 23, 1918

No.	Name	Rating	Plows	Entered Speed	Speed in Work	Acres Plowed	Acres per Hour	Gallons Kerosene per Acre	Gallons Gasoline per Acre	Gallons Kerosene Used	Gallons Gasoline Used	Gross Plowing Time	Net Plowing Time	Tractor Stops	Plow Stops
1.	Emerson-Brantingham	12-20													
2.	Knickerbocker	22	Withdrawn												
3.	Reed	12-20	Withdrawn												
4.	Parrett*	12-25	3-14	2.375	1.779	4.24	.755	4.01	.059	17.00	.25	5:37	4:44	8	45
5.	I. H. C.	8-16	Withdrawn												
6.	Cleveland*	12-20	2-14	3.50	2.474	1.423	.699	....	4.22	.....	6.00	2:02	1:42	1	19
7.	Case	9-18	2-14	2.25	2.489	2.23	.704	2.916	....	6.50	....	3:18	3:18	0	0
8.	Huber*	12-25	3-14	2.50	1.962	2.670	.834	2.902	.187	7.75	.50	3:125	2:545	0	18
9.	I. H. C. Titan*	10-20	Withdrawn												
10.	Plowman*	15-30	3-14	3.00	1.425	2.389	.605	5.102	.078	12.187	.187	3:57	3:46	9	2
11.	Plowboy*	13-30	3-14	2.33	1.143	1.423	.485	5.270	.966	7.50	1.375	2:56	2:31	0	25
13.	Waterloo	12-25	Withdrawn												
14.	Frick	12-25	3-14	2.30	2.079	3.19	.882	2.351	.191	7.50	.609	3:37	3:13	0	24
15.	Allis-Chalmers*	10-18	2-14	2.25	1.667	1.866	.436	4.183	.904	7.75	1.687	3:57½	3:28½	0	29
16.	Moline*	9-18	2-14	3.50	1.479	1.067	.418	....	3.925	....	4.187	2:33	1:46	0	47

NOTE.—Tractors No. 2, 4, 6, 8, 10, 11, 15, 16 plowed in a two-year-old corn stubble field that was overgrown with weeds 5 feet high, contained many large stones in some sections and had several gullies and grades. This was the hardest plowing test during the entire demonstration. All other plowing shown on this report was done on sod fields. The corn stubble plot was divided for 1 hr. 15 min. work for each machine. Tractor No. 2 withdrew during the day, and tractors No. 5, 9, 13 did not report, and tractor No. 1 was engaged in work which appears on Table No. 1.

## Beware of Motor Stock Offers

### Treasury Department Issues Warning Regarding Speculative Securities

WASHINGTON, Oct. 2—Ten promoters of questionable speculative motor company enterprises offering securities on the market are under investigation by the Capital Issues Committee of the Treasury Department. These companies will probably be blacklisted if they do not cease their present activities. "Continued offering of the stocks or bonds," it is said, "will result in the advertising of the enterprises as working against national policies during the war." Blacklists will be published and displayed by post offices, chambers of commerce, district attorney's offices, etc. These motor companies are offering about \$30,000,000 worth of securities to the public. One, in Minnesota, has already sold \$2,000,000 worth of stock, 50 per cent of which went to salesmen as commission. Liberty bonds were taken in payment and then sold on the market.

Private investors desirous of conserving credit for war purposes directly or indirectly contributing to the war are asked by the committee to refuse to buy stocks or bonds which have not been approved and to inform the Capital Issues Committee, Treasury Department, Washington, D. C., of any offerings of stocks or bonds which have not been so approved.

The Capital Issues Committee was organized to prevent the offering of stocks or bonds which have not been so approved.

The Capital Issues Committee was organized to prevent the offering of stocks or bonds that are not compatible with the national interest during the emergency, and which will result in the advertising of the enterprises working against national policies during the war.

It is also investigating 250 oil companies which are offering more than \$100,000,000 worth of stocks, and other concerns violating the regulations.

### Acid Rulings Modified

WASHINGTON, Oct. 4—The Price Fixing Committee of the War Industries Board has modified its ruling of Sept. 26 as follows: "The maximum prices for acid below 92 per cent H<sub>2</sub>SO<sub>4</sub> shall be figured on the price for 60 degrees Baumé Sulphuric acid, and above 92 per cent H<sub>2</sub>SO<sub>4</sub> on the basis of 66 degrees Baume Sulphuric Acid."

### Mechanical Engineers Establish Cleveland Section.

CLEVELAND, Oct. 3—The American Society of Mechanical Engineers has established a section in Cleveland which will be known as the Mechanical Section of the Cleveland Engineering Society. This new section includes a territory having a society membership of approxi-

mately 260. A joint meeting of the Council of the A. S. M. E. will meet at Indianapolis on Oct. 25-26 and at this meeting will gather the Indianapolis, Cincinnati, St. Louis, Chicago, Milwaukee, Detroit and Cleveland sections. The Indianapolis section of the Society of Automotive Engineers, the Indiana Engineering Society and the Indianapolis-Lafayette section of the American Institute of Electrical Engineers have also been invited. Headquarters will be at the Claypool Hotel.

### Goethals a Member of the War Industries Board

WASHINGTON, Oct. 5—Major General George W. Goethals, Assistant Chief of the General Staff, and Director of the Division of Purchase, Storage and Traffic, has been made a member of the War Industries Board. General Goethals takes the place on the board formerly filled by his assistant, Brigadier General Hugh A. Johnson, who has been assigned to a field brigade for active service. General Johnson's position as assistant to General Goethals is being filled by Gerard Swope of New York.

### Motors Division, Vehicle Section, Q. M. C. Has New Address

WASHINGTON, Oct. 5—The Motors Division, Vehicle Section, Quartermaster Corps, which has charge of the procurement of motor vehicles for the Army, excepting tanks, tractors and airplanes, has moved from Seventh and B Streets to Nineteenth and B. The Motor Transport Corps under Brig. Gen. C. B. Drake, which has complete charge of operation, maintenance, engineering and also the technical supervision of all of the trucks and motorized vehicles of the Army, will remain at Seventh and B Streets.

### Complaints Against Misleading Advertising

WASHINGTON, Oct. 2—Formal complaint has been filed against the Silvox Co., South Bethlehem, by the Federal Trade Commission, which states that it has reason to believe the company has employed misleading advertising. The complaint alleges the Silvox Co., following a test of its spark plugs by the United States Bureau of Mines, misrepresented in its advertising that the Bureau of Mines had "certified" the plugs. The concern is cited to appear before the Commission in Washington, Nov. 13.

### Owners Ask for Adequate Supplies

REGINA, SASK., Oct. 5—Automobile owners of Saskatchewan are about to ask legislation requiring a full line of automobile supplies for all makes to be carried in at least one place in the Province, so that they may be assured of securing repairs quickly when desired. They will also ask that the full line of supplies for automobile makes that have been withdrawn from the market be carried for at least three years.

## Utz Completes Work in France

### Resumes Place with Standard Parts Co. After Year on Special Service

WASHINGTON, Oct. 5—Jack Utz, formerly in charge of engineering for the Motor Transport Service of the Quartermaster Corps under Christian Girtl, who went to France for the service to aid in the construction and organization of the Motor Transport depots there, has returned to Washington.

Mr. Utz has completed his work for the Quartermaster Department, having rounded out the full year for which he was engaged and during which he was released by the Standard Parts Co., and has again resumed his connection with that company, under Mr. Girtl.

The motorized vehicle equipment with the American Expeditionary Forces, according to Mr. Utz, is not entirely complete, as there are less than 30,000 motorized vehicles. This has been caused by the lack of shipping tonnage, priority having been given to trucks rather than repair parts, and to repair parts rather than to machine shop equipment, with the result that machine shop equipment for making repairs has been sent over in negligible quantities.

### Salvage Depot Operated

A huge salvage depot employing 6000 men is operated under Colonel Hegemann of the Quartermaster Corps. The Motor Transport Corps is headed by Brig. Gen. H. L. Walker as the Director of the Corps with Colonel E. L. Rogers as Deputy Director under Gen. Walker.

Organization of the Motor Transport is just taking place. A new kind of organization was worked out, partly with the aid of Mr. Utz, and is now being enacted. A liaison arrangement is planned so that officers of the Motor Transport Corps in France will exchange with officers of the Motor Transport Corps in this country, bringing to each of the Corps the knowledge of the activities on the different sides of the ocean.

The British and French truck services are practically perfect. Both armies have as many vehicles as they require per corps or division. The French have established a group plan operating throughout the country and far from the lines by which small groups of trucks are established as depots in different communities and are directed by headquarters to carry freight or men as the case may be.

### No War Hospital at Speedway

CHICAGO, Oct. 4—Work of turning the Chicago Motor Speedway at Maywood into a permanent army hospital, which has been under way for several weeks, has been halted by the authorities at Washington. The plan for turning the plant into a reconstruction hospital for men maimed in the war was rejected yesterday.

## Gasless Sundays to Continue

Statistics Show Fuel Conservation to Be Necessary for Some Time

WASHINGTON, Oct. 5—Gasolineless Sundays will continue for the present, according to an announcement made by the Fuel Administration to-day. Statistics on the available supply of gasoline, it was said, show the necessity for a continuance of the motorless period.

Following a suggestion from Governor Samuel McCall of Massachusetts that the restriction from Sunday automobiling should be removed to allow the public to use their automobiles and secure the fresh air that would combat the epidemic of influenza which is prevalent in the eastern states, Fuel Administrator H. A. Garfield made public an opinion from Brigadier General Charles Richard, Acting Surgeon General, United States Army, that automobiling would not influence the influenza epidemic one way or another.

The total available gasoline in the United States outside of California for the week ended Sept. 23 was 3,302,000 barrels of motor gasoline and 281,000 barrels of aviation gasoline, announced Mr. Garfield. This, it was stated, is a decrease from a stock of 11,000,000 barrels on April 1 and 8,000,000 barrels on Aug. 1.

The gasolineless Sundays, according to the Fuel Administration, have resulted in a saving of between 450,000 and 500,000 barrels of gasoline. The Fuel Administration states that 300,000 barrels or 10 shiploads of gasoline have been shipped abroad, which would otherwise have not been available, as a result of the gasolineless Sundays.

### Janesville Machine Co. Building Motor Cultivator

JANESVILLE, WIS., Oct. 5—The Janesville Machine Co., which recently was acquired by the General Motors Corp., already has arranged to enlarge its line of products by undertaking the manufacture of a motor cultivator, which is the first of a number of power machines to be built in quantities at Janesville. Work on the new tractor plant at Janesville is progressing well and it is hoped that the actual production of Samson Sieve-Grip machines will be started shortly after Nov. 15.

### 40,000,000 Barrels Fuel Oil Wasted

WASHINGTON, Oct. 5—Of 160,000,000 barrels of fuel oil used last year, 40,000,000 barrels were wasted because of inefficient operation of plants and improper firing. The fuel oil wasted was sufficient to operate the railroads of the United States for one month, and five times the amount of fuel oil necessary for the Army and Navy. It represents a value of \$140,000,000 yearly. This waste has been discovered by experts of the

Bureau of Mines, who have been co-operating with the Fuel Administration in a survey of the use of fuel oil for power purposes in the United States. They state that the 40,000,000 barrels of fuel oil lost each year is equivalent to 10,000,000 tons of coal.

The Bureau of Mines as a result of the investigations has compiled a handbook for boiler plants and locomotive engineers, giving instructions in the efficient use of fuel oil. These handbooks will be forwarded to all plants using fuel oil as soon as they are completed.

### Kansas City Manufacturers Apply for War Contracts

KANSAS CITY, Oct. 4—A group of Kansas City manufacturers has formed an organization, with James Lapsley, vice-president of the Beggs Motor Car Co., as chairman, to secure war contracts which the firms are especially adapted to fill. The group is aiming at contracts for truck bodies in particular. Included in the organization are the Huttig Mill Work Co. and the Federal Sash & Door Co., the Kansas City Forging Co., J. A. Elberg, the Anderson Coupling & Supply Co. and Western Trailer Co. and C. J. Welch, president and general manager of the Western Trailer Co. The idea is that each member of the group would assemble a certain proportion of the bodies ordered. The group is known as the Kansas City Association of Truck Body Builders. Other firms in the city with limited capacity shops of various kinds have indicated their willingness to take over the assembly of small quantities under any orders secured.

### American Red Cross Needs Drivers and Mechanics

CHICAGO, Oct. 3—Eighteen hundred men familiar with the mechanism of the automobile are needed by the Red Cross for overseas duty immediately following a mechanical and military training of from three to five weeks. This training will be given in barracks known as Camp Scott, Chicago. Pay will be \$40 per month, half pay being given while undergoing instruction and in addition a paid up life insurance policy for \$1,000 will be handed each man on embarkation. All men, except those in class 1 of the draft, are eligible. Minimum service is for a year and maximum is for the duration of the war. Recruiting headquarters are at 528 Peoples Gas Building, Chicago, and the new department is under the direction of Major H. P. Harding.

### Hupmobile Distributors to Retire

NEW YORK, Oct. 7—Charles E. Reiss & Co., Hupmobile distributors, are shortly to retire from the automobile trade, the company's sales and maintenance business having been taken over by the Marmon Automobile Co. of New York. The sales and service staffs of the two companies will be consolidated and all business will be carried on from the present Marmon headquarters.

## Lubricate Whole Car From One Point

Reservoir and Pumps Substituted for Grease Cups—Applied to Any Car

BRIDGEPORT, CONN., Oct. 7—A new system of chassis lubrication for cars and trucks by which all spring shackles, brake bearings, rear axle spring pads, steering heads, pedals, etc., can be supplied simultaneously with oil under pressure by turning a small lever conveniently situated in front of the driver's seat is being manufactured by the Smith & Egge Mfg. Co., Bridgeport. The invention, which is the subject of a patent by B. H. Skelly of the Smith & Egge Co., consists of a combination reservoir and multiple plunger pump located under the front seat or other central position, from which proceed a number of flexible steel tubes to the several points requiring lubrication on the chassis.

A car fitted with the system has been in operation over a year with satisfactory results. The lubricator as made at present has thirty separate plungers and corresponding tubes, displacing a like number of grease cups. The plan is that of applying the system to cars by simply removing the grease cups and screwing into their places the elbows or unions which are attached to the ends of the flexible tubes. A spring ball check in each of these unions prevents any leakage of oil over that required for lubrication by closing the tube as soon as the pressure is released.

Selling arrangements are not yet completed but it is proposed to establish agents in large towns who will fit the system. As supplied from the manufacturer the system includes the lubricator, oil unions, clips and about 200 ft. of flexible steel tubing.

This lubricating system marks the entry of the Smith & Egge Co. into the automotive field, though it has been manufacturing force feed lubricators for stationary engines for many years.

### New Amazon Cord Tire

AKRON, Oct. 7—The Amazon Rubber Co. is marketing a new type of cord tire under the trade name "Amazon Cord Supertire." The tire has a black tread and gray side wall, and is made in these sizes: 34 x 4½, \$67.25; 36 x 4½, \$70.55; 35 x 5, \$83.60; 37 x 5, \$87.60; 36 x 6, \$109.50.

### Lane Gets Priority Order

KALAMAZOO, Oct. 7—The Government has granted the Lane Motor Truck Co. a priority order permitting it to build a quota of 70 trucks a month for the balance of 1918. The company has a large number of orders on its books for trucks to be used by concerns in essential war work. A production of one truck a day has been reached, which number will be doubled within a week.



## August Exports Gain 3.8% on July

Figures Are 5.7% Better Than Those of the Same Month Last Year

	1918		1917	
	Cars	Value	Tr'ks	Value
Aug.	2,710	\$2,818,259	909	\$2,337,904
July	3,442	\$3,624,870	601	\$1,527,519
				2,771,193
	1917		1917	
Aug.	3,605	\$2,909,606	929	\$2,677,695
				2,195,564

WASHINGTON, Oct. 7—Exports of passenger cars, trucks and parts (not including engines and tires) during August were valued at \$8,228,919, an increase for the month of 3.8 per cent as against the figures for July. The increase in comparison with August of last year is 5.7 per cent.

Passenger cars show a falling off, but the number of trucks exported during August has increased no less than 51 per cent in comparison with July, although slightly below August, 1917.

Taking the totals for the first eight months of the present year, including those relating to engines of various types, and comparing them with the figures covering a similar period of 1917 there is a slight falling off shown, the 1918 totals being nearly 2 per cent below those of 1917.

It should not be forgotten that the figures given do not include airplanes exported for military purposes. The export of tractor engines continues to increase steadily, and, as was the case in July, Australia is our best customer for passen-

ger cars in point of number at any rate. Taking the eight months' totals Canada is far in front as an importer.

### Receiver for Crow-Elkhart

SOUTH BEND, Oct. 5—A petition asking that the Crow-Elkhart Automobile Co. of Indiana and Arizona be declared a bankrupt and a receiver be appointed to take charge of the company's property and equipment at Elkhart, Ind., operating the factory for a limited time, has been filed in the Federal Court at Indianapolis by the Charles L. Monger Company and the Isbell Lumber and Coal Company, and Ora Neff of Lockhart. Judge Harmon of the Elkhart Superior Court has appointed M. U. Demarest receiver. It is claimed that the company has property and material worth \$350,000, and that a receiver named by the Federal Court would be to the advantage of the creditors. It said 150 cars would be manufactured from the materials on hand and that the plant could operate until Jan. 1, 1919.

### Ahara Patent Upheld

(Continued from page 640)

it seems there could be no infringement because there would never be a sub-atmosphere in the air tube in conjunction with the fuel nozzle. But the infringing Zenith device restricts the opening in the upper part of the air tube to one or two very small holes, while the patent drawings show the right-hand leg of the air tube very much enlarged with its upper end either wide open or covered only with a wire screen." The decision just handed down apparently ends the patent litigation.

## Truck Exports Show 95% Increase

August Exports from New York Show Total Increase of Over 10 Per Cent

NEW YORK, Oct. 7—The most satisfactory feature of August's exports from the Port of New York is the remarkable increase in the number of trucks shipped as compared with the figures for the previous month. During July a total of 239 trucks, valued at \$741,132, were exported through this port. The August figures are 443 trucks, valued at \$1,450,456, an increase of 85 per cent in number and 95 per cent in value.

Passenger cars show a slight falling off in number and also in value, and the value of parts is also lower, but the total exports for August show a gain of practically 10 per cent over those for July, the respective figures being \$3,834,346 as against \$3,486,980.

France is still our best customer for both passenger cars and trucks, but England leads as a buyer of parts. Countries to which automotive exports were made during August, and which were not represented in the July list, are China, Egypt, Iceland, Sweden and European Russia and Hong Kong. Spain continues to import on a satisfactory scale, and it is considered that this country offers a market worth careful cultivation.

### Rules for Exports to Sweden

WASHINGTON, Oct. 7—Exporters in the United States, before filing appli-

## Exports of Automotive Equipment for August and Seven Previous Months

	Month of August				Eight Months Ending August, 1918			
	1918		1917		1918		1917	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	8	\$175,100	1	\$2,500	15	\$219,753	137	\$1,061,707
Airplane parts		1,816,726		258,295		9,260,341		2,677,936
Commercial cars	909	2,337,904	929	2,677,695	6,417	16,043,139	9,503	23,298,943
Motorcycles	776	186,326	1,000	199,705	7,028	1,638,693	11,174	2,358,696
Passenger cars	2,710	2,818,259	3,605	2,909,606	28,743	27,023,315	44,729	33,658,548
Parts, not including engines and tires		3,072,756		2,195,554		22,106,375		19,289,875
Total (trucks, cars and parts value only)		\$8,228,919		\$7,783,855		\$65,172,829		\$76,247,366
ENGINES								
Automobile gas	1,935	\$233,115	4,067	\$430,871	21,751	\$2,850,259	23,048	\$2,617,580
Marine gas	488	438,531	726	154,778	3,614	1,848,396	7,348	1,421,874
Stationary gas	1,597	252,878	2,402	203,715	18,568	2,217,472	19,590	2,257,521
Tractor gas	1,190	1,763,846	857	941,489	17,389	17,843,952	7,100	9,198,509
Total value		\$2,688,370		\$1,730,855		\$24,760,079		\$15,495,482

### EXPORTS BY COUNTRIES AUGUST, 1918

	Passenger Cars		Trucks	
	No.	Value	No.	Value
Argentina	141	\$218,176		
Australia	337	315,560		
British India	7	10,000		
British South Africa	98	82,726		
Canada	264	240,491	234	\$253,063
Chile	131	219,608		
Cuba	207	251,484	51	129,677
Denmark				
Dutch East Indies	168	189,525		
France	249	137,030	305	1,151,489
Mexico	109	110,172		
New Zealand	115	114,789		
Norway	49	116,459		
Philippine Islands	53	58,869		
Russia in Europe				
Spain	147	160,050		
United Kingdom	2	1,842	142	443,122
Uruguay	10	14,157		
Other Countries	617	570,716	177	360,553
Totals	2,710	\$2,818,259	909	\$2,337,904

### EIGHT MONTHS ENDING AUGUST, 1918

Passenger Cars		Trucks	
No.	Value	No.	Value
1,360	\$1,412,585	43	\$39,863
3,041	2,519,421	.....	.....
56	43,498	.....	.....
762	622,345	.....	.....
7,538	6,101,407	1,038	1,260,777
1,293	1,664,083	.....	.....
1,459	1,929,912	367	778,032
2	4,100	.....	.....
564	670,897	.....	.....
913	1,052,190	1,764	6,563,985
1,417	1,002,571	.....	.....
1,091	905,375	.....	.....
96	240,897	.....	.....
1,335	1,129,999	.....	.....
10	8,325	2	5,454
583	692,839	.....	.....
340	959,044	1,758	5,200,760
1,126	667,944	.....	.....
5,757	5,295,883	1,445	2,194,268
28,743	\$27,023,315	6,417	\$16,043,139

cations for export licenses to Sweden, must secure advice from the prospective Swedish importer that an appropriate association or the Statens Handels Kommission has issued a certificate covering the proposed consignment.

The American exporter must secure the number of the certificate from the importer, and this number must be specified on the application for the export license.

Exporters are required to state on the application the name of the person or firm in whose favor the import certificate was issued.

The War Trade Board urges that purchases for export to Sweden and arrangements for the manufacture of any articles for export to that country should not be made until the export license has been secured.

### Urge B3 Priority For Trucks

NEW YORK, Oct. 5—That a B3 priority rating for truck manufacturers would do much to put them in position to get needed materials; and that the steel situation may change over night and be greatly relieved, were the two important matters which were brought before the meeting of the Motor Truck Committee of the National Automobile Chamber of Commerce on Thursday afternoon. There were 67 truck manufacturers in attendance, some of whom were not members of the N. A. C. C.

Charles C. Hanch, chairman of the Automotive Products Section of the War Industries Board definitely recommended a B3 priority rating for truck manufacturers, upon the plea that the truck is essential to both war and business and for this reason the industry must be continued. He stated that in consequence of a careful review of appeals made by certain truck manufacturers from the curtailment order of the War Industries Board, these makers had had their apportionments increased by approximately 50 per cent.

Hanch stated that he was not in position to know the attitude of the Priorities Division with regard to the production of trucks after Jan. 1, 1919. He hoped, however, that by Dec. 1 of this year he would have a decision upon which in conjunction with inventories filed by makers, to base an apportionment for the first six months of 1919. The production of new models will not be countenanced under any consideration, nor will the conduct of experimental work be looked upon with favor.

The statement that the steel situation may be very considerably relieved over night was made by George Graham, chairman of the Motor Truck Committee of the N. A. C. C. Such relief would hinge, according to information given Graham, by a steel maker of international reputation, upon the advance of the Allies by so little a distance as 12 miles on certain fronts. Such an advance would put the Allies in possession of the richest ore mines in the world—mines which would take care of all the steel requirements of the Allies, thus releasing great quantities of steel for commercial use.

## August Exports to Latin America

### New York Ships Automotive Products Valued at \$1,150,-802 During Month

NEW YORK, Oct. 7—During the month of August 591 passenger cars valued at \$721,056, 48 trucks valued at \$103,172 and automotive parts valued at \$326,575 were shipped from the port of New York alone to twenty Latin-American countries. The total value of these was \$1,150,802.

These figures are included in the table on this page, which gives the totals by countries for the eight months ending

Aug. 31, 1918. Chile holds the lead as a buyer of passenger cars and is followed closely by Uruguay in point of numbers, although not in average cost per car. Cuba alone seems to realize to the full the advantages of the truck as a means of rapid and economical goods transportation and affords a point of comparison with, for instance, Argentina, with her enormous possibilities for speeding up the transportation of meat products by the use of this form of transport.

### Republics Go to Japan

ALMA, MICH., Oct. 7—For the period from Jan. 1 to Aug. 15, the Republic Motor Truck shipped to Japan a total of 76 trucks. Preparations are now under way for a shipment of 152 trucks to reach the Pacific coast before Oct. 15 to be forwarded by boat a few days later.

### AUTOMOBILE, TRUCK AND PARTS EXPORTS FROM NEW YORK FOR AUGUST

	Cars		Trucks		Parts Value
	No.	Value	No.	Value	
Argentina .....	140	\$216,876	.....	.....	\$65,616
Australia .....	111	106,388	.....	.....	3,348
Barbados .....	2	700	.....	.....	251
Bolivia .....	1	1,139	.....	.....	303
Brazil .....	149	114,673	5	5,300	17,879
British Gulana .....	1	1,309	.....	.....	516
British Honduras .....	3	1,480	.....	.....	267
British Oceania .....	.....	.....	.....	.....	.....
British South Africa .....	98	82,726	.....	.....	14,055
British West Africa .....	13	12,323	11	12,060	3,732
Chile .....	126	216,528	10	14,928	16,309
China .....	26	26,056	.....	.....	1,785
Colombia .....	.....	.....	.....	.....	1,434
Cuba .....	58	60,787	21	71,252	19,889
Danish West Indies .....	4	1,681	.....	.....	141
Dutch East Indies .....	.....	.....	.....	.....	24
Dutch West Indies .....	1	815	.....	.....	153
Ecuador .....	2	1,695	.....	.....	1,461
Egypt .....	1	850	.....	.....	.....
England .....	1	720	69	238,130	498,806
France .....	249	137,030	245	913,900	156,291
French Africa .....	45	20,979	.....	.....	2,491
French West Indies .....	6	5,286	1	2,450	1,189
Greece .....	.....	.....	.....	.....	5,644
Guatemala .....	.....	.....	.....	.....	68
Haiti .....	3	1,958	2	1,200	1,307
Honduras .....	.....	.....	.....	.....	564
Hong Kong .....	.....	.....	.....	.....	85
Iceland .....	11	9,306	.....	.....	841
Italy .....	.....	.....	.....	.....	917
Jamaica .....	5	4,611	.....	.....	2,073
Japan .....	4	3,849	.....	.....	2,372
Mexico .....	10	11,749	.....	.....	693
Newfoundland .....	6	5,334	1	999	157
New Zealand .....	20	21,726	.....	.....	32,763
Nicaragua .....	6	4,856	.....	.....	238
Norway .....	49	116,459	39	99,180	4,538
Other West Indies .....	4	2,761	2	1,200	645
Panama .....	1	1,600	2	1,992	2,657
Peru .....	25	32,521	.....	.....	8,060
Portugal .....	1	3,700	8	36,200	267
Russia, European .....	6	6,605	.....	.....	50
Santo Domingo .....	44	31,816	6	6,500	10,652
Spain .....	147	160,050	19	43,165	26,425
Sweden .....	1	2,800	.....	.....	.....
Trinidad .....	4	3,600	.....	.....	1,265
Uruguay .....	10	14,157	2	2,000	4,986
Venezuela .....	6	10,700	.....	.....	2,479
	1,400	\$1,460,202	443	\$1,450,456	\$923,686

### EXPORTS OF AUTOMOBILES, TRUCKS AND PARTS FROM NEW YORK TO LATIN-AMERICAN COUNTRIES DURING EIGHT MONTHS ENDING AUGUST, 1918

	Cars		Trucks		Value of Parts
	Number	Value	Number	Value	
Argentina .....	910	\$996,178	33	\$32,921	\$1,052,396
Bolivia .....	11	15,191	2	9,000	2,646
Brazil .....	963	702,771	35	37,114	156,832
Chile .....	1,197	1,536,684	56	69,301	244,973
Colombia .....	95	66,715	1	600	19,204
Costa Rica .....	41	20,100	.....	.....	871
Cuba .....	488	531,055	195	470,026	521,335
Ecuador .....	56	59,577	1	.....	5,817
Guatemala .....	5	8,099	1	322	2,375
Haiti .....	77	42,388	9	8,789	16,505
Honduras .....	18	14,927	.....	.....	5,190
Mexico .....	157	147,689	32	72,710	49,074
Nicaragua .....	29	20,731	.....	.....	971
Panama .....	46	37,943	28	19,623	28,473
Paraguay .....	1	2,500	1	875	768
Peru .....	414	480,765	46	96,113	61,310
Salvador .....	22	28,678	.....	.....	3,731
Santo Domingo .....	171	124,267	12	10,100	26,810
Uruguay .....	1,044	591,982	11	11,000	113,410
Venezuela .....	89	64,469	5	15,900	34,580
	5,834	\$5,492,709	467	\$854,394	\$2,347,271

## Flying by Compass Field Training

### New System of Independent Courses on Triangular Route Inaugurated

WASHINGTON, Oct. 7.—To instruct flying by compass at the flying fields in this country, a combination field triangle has been inaugurated, using Kelly Field, Texas, and two of the five Texas cities where good landing fields have been laid out as the other points. The routes require 6 hours of flying time and cover 275 miles each. Using all five cities in Texas in conjunction with Kelly Field five triangles have been formed as follows: Kelly Field, Flatonia and Austin; Kelly Field, Flatonia and Beeville; Kelly Field, Austin and Victoria; Kelly Field, Victoria and Beeville; and Kelly Field, Beeville and Uvalde.

The first plane leaves Kelly at 7 a. m., flies to the first point in the course by compass, checking up the route and locating the landing field by map. The others follow at intervals of 10 minutes, which is considered ample time to necessitate each pilot's flying his own course rather than merely trailing the plane ahead. The second leg of the course is flown in "V," bombing, or triple-"V" formation, and the third, the return to Kelly Field, is flown in the same manner as the outgoing trip. The first and last ships of the 12 are piloted by instructors, each carrying a troubleshooter. The others are flown by students. All planes are equipped with compasses.

Advanced cross country flying thus serves as a combination and development of two earlier stages, primary cross country and primary formation, and accustoms the student to long hours in the air. Flying part of the route by compass gives the pilots experience in laying out their own courses and at the same time prevents the severe strain which 6 hours of continuous flying would give.

All who receive instruction on the advanced cross country stage are R. M. A.'s, Reserve Military Aviators, awaiting transfer. Every effort is made to keep this time awaiting orders from being wasted, and to continue their training as long as they remain at Kelly Field.

### Dort Speeding War Work

FLINT, Oct. 5.—The Dort Motor Car Co. will start production this month on its order for the government for

1-ton trucks. Production on the new order for cargo trailers has been started and the company reports that 700 government kitchen trailers have already been shipped.

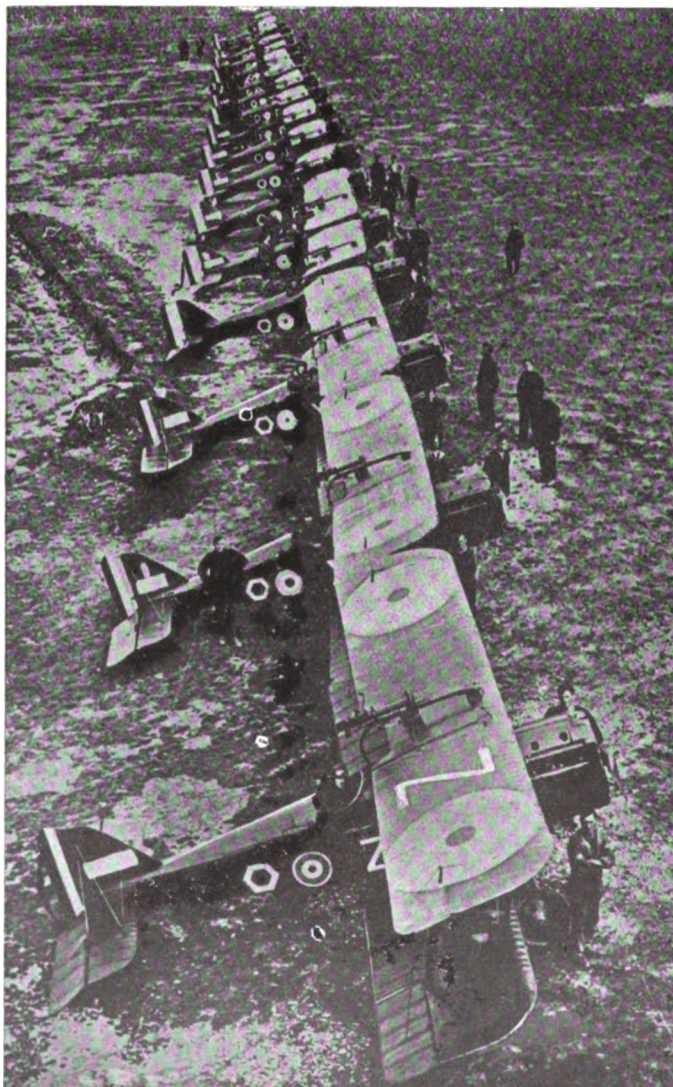
### Seven Deaths From Flying

WASHINGTON, Oct. 7.—Seven deaths resulted for the week ended Sept. 28 at flying fields in this country. This represents one fatality for every 2526 hours flown, or 202,080 miles of air travel. Following is the summary:

Baron Field, Everman, Texas.....	1
Bolling Field, Anacostia, D. C.....	1
Carlstrom Field, Arcadia, Fla.....	1
Ellington Field, Houston, Texas.....	1
Mather Field, Sacramento, Cal.....	1
Talliaferro Field, Fort Worth, Texas.....	2

### 1,694 De Havillands and 8,216 Liberty Engines Produced

WASHINGTON, Oct. 4.—Two hundred and thirty-four DeHaviland airplanes were produced last week, bringing the total production to 1694. Liberty engine production totaled 8216 up to last week. These figures were presented to the House Military Committee at a conference to-day.



Seventeen British bombing airplanes with their pilots in position and ready for work

## Army Balloon Corps Increased

### Demand from Expeditionary Forces Renders Additional Crews Necessary

WASHINGTON, Oct. 7.—The Balloon Corps of the Army is to be enlarged by 25,000 men and 1200 officers, owing to the increased demand from the American Expeditionary Forces for balloon crews. The present Balloon Corps totals 11,000 men of all ranks.

Authority has been obtained by the Air Service from the General Staff to induct men of draft age and to transfer officers from the other branches of the service. This increase will create many vacancies in the grades of colonel, lieutenant-colonel, major, captain and lieutenant.

Enlisted men and civilians who apply for officers' examinations will be required to take the cadet course of from 3 to 5 months, and training camps for this purpose will be conducted this winter in the South and on the Pacific Coast. The schools already established for this purpose are located at Old Point Comfort, Virginia; San Antonio, Texas, and Arcadia, California, near Los Angeles.

In addition to the important role played by the balloon in the control of artillery fire, it is now being used with infantry, a caterpillar mount for the winch by which the balloon is controlled having been successfully used on the front. This portable winch makes it possible for balloon companies to even keep up with infantry advances for observation and direction of attack.

In addition to the opportunities for immediate promotion, officers who join the balloon service will receive the benefit of flying pay when they actually do the work of observers and make flights in connection with army operations. Flying pay is 25 per cent of the base pay of an officer.

### Chicago-St. Louis Barge Service

ST. LOUIS, Oct. 4.—It has been announced officially here that a dependable barge service between this city and Chicago will open shortly. The freight rates will be about 80 per cent of the railroad rate and the bill of lading will be as useful as commercial paper. The service will be under direction of the Government, and will be through the Illinois and Michigan Canal, the Illinois River and the Mississippi.



C. W. Holloway has been appointed district manager of The Cleveland Tractor Co. for the southeast with headquarters in Atlanta, Ga., where offices have been established in the Healey Building. The territory comprises Georgia, Alabama, Florida, North and South Carolina and that part of Tennessee east of the Tennessee River.

G. D. Jones has been appointed sales engineer of The Cleveland Tractor Co., Cleveland. He has been connected with the tractor industry for the past 9 years, being associated with the State Department of Engineering of California for 6 years of this period. He will have charge of experimental work in developing plans and methods for increasing the efficiency of the tractor and its field of usefulness.

F. N. Morgan has been appointed district manager for the Cleveland Tractor Co. for the southwest with offices in the Colcord Building, Oklahoma City. The territory included in this district comprises Oklahoma, Texas, New Mexico, Arkansas, Mississippi, Louisiana and that part of Tennessee west of the Tennessee River. Prior to his present connection Mr. Morgan was assistant manager of the Studebaker Corp., St. Louis branch.

A. H. Pearsall has been appointed district manager by the Cleveland Tractor Co. and has established offices in the People's Gas Building, Chicago. The territory comprises the greater portions of Illinois, Wisconsin, Iowa and Missouri. Mr. Pearsall was associated with the Studebaker Corp. for 7 years.

#### Grip Hits Boston Trade

BOSTON, MASS., Oct. 5—Spanish influenza began taking its toll from among the automobile trade here this week. I. A. Howell, president of the Howell Motor Co., agent for the Liberty car, who had been ill for some time, was the first to go. Philip Hawley, formerly manager of the Studebaker branch, and later of the Hawley-Cowan Co., New England distributors for Saxon cars, also died. H. R. Cox, who came here from Rochester, N. Y., to take charge of the Bearings Service Co., was the third to go within the week. A number of men in the mechanical departments of the motor stations have been very ill and some of them died. John H. Johnson, of the Buick, who was the big factor in putting over the drive for members for the N. A. D. A., caught cold at a Liberty Loan meeting and he hurried away to Poland Springs, Me., to recuperate.

#### Order 25,000 "B" Axles

WASHINGTON, Oct. 8—The Motors Division of the Quartermaster Corps has placed orders for axles for the B 3-ton war truck as follows:

Timken-Detroit Axle Co., 15,000 axles.

Sheldon Axle Co., 5000 axles.

Standard Parts Co., 5000 axles.

Price to be paid by the Government for these axles is understood to be \$880 each.

## Men of the Industry

### Changes in Personnel and Position

#### Will Consider Exports to Denmark

WASHINGTON, Oct. 8.—Applications for export of all commodities except cereals and fodders to Denmark will now be considered by the War Trade Board. Exporters applying for licenses should use application form X and supplemental information sheet X-105. Exporters in the United States before applying for licenses must obtain advice from the prospective Danish importer that an import certificate has been issued for the consignment either by the Merchants' Guild of Copenhagen or the Danish Chamber of Manufacturers. Commodities exported to Denmark may be shipped only on vessels flying the Danish flag. Export licenses should be secured before any articles are manufactured for export to Denmark.

#### Coal Production Increases

WASHINGTON, Oct. 8.—Production of bituminous coal during the week ended Sept. 28 was 13,043,000 tons, an increase over the same period of 1917 of 1,863,000 tons or 16.7 per cent. This is the second time in the history of coal production that the output exceeded 13,000,000 tons in a week. At present there is a shortage of 10,897,000 tons of coal as against the estimates of coal requirements for the year. Anthracite production for the week ended Sept. 28 was 2,071,000 tons, an increase of 224,000 tons over the preceding week and 65,000 tons over the corresponding week of last year.

#### Dixie Highway Opens Oct. 15

MONROE, MICH., Oct. 7.—Completion of the Dixie Highway, which extends between Detroit and Toledo, through Monroe county, will be celebrated by the Detroit Automobile Club, Oct. 15 at Monroe and South Rockwood. Michigan State officials, including probably Governor Sleeper, Highway Commissioner Frank Rogers, members of the state highway preparedness board, road officials of Wayne and Monroe counties, Michigan, and Lucas county, Ohio, as well as city officials will participate in ceremonies marking the formal opening of the highway. A delegation of army officers may also attend the dedication, as the new road is of the greatest importance to the Motor Convoy service which has been sending motor trucks out of Detroit to France for the past year.

C. T. Schaefer, formerly chief engineer of the Globe Motor Truck Co., is now chief engineer of the Anvac Mfg. Co., Anderson, Ind.

S. V. Norton, manager of the truck tire sales of the B. F. Goodrich Co., Akron, is one of the several men to whom Gov. Cox of Ohio has assigned the task of working out a plan that will accelerate the development of motor truck transportation.

Horace N. Trumbull, advertising manager of the S. K. F. Ball Bearing Co., Hartford, Conn., has entered the reserve officers' training camp at New Haven, Conn.

#### Sweeney Goes to Firestone

DETROIT, Oct. 5—J. B. Sweeney, formerly assistant advertising manager of the Paige-Detroit Motor Car Co., has joined the advertising department of the Firestone Tire & Rubber Co., Akron.

H. H. Shuart, manager of the Detroit Automobile Dealers Association, which suspended its activities as a patriotic measure, has become associated with the executive staff of the Denby Motor Truck Co., Detroit.

John Squires, formerly chief engineer of the Signal Motor Truck Co., Detroit, has been made chief of the Materials Division of the Denby Motor Truck Co., Detroit.

#### Chicago May Embargo L. C. L. Freight

CHICAGO, Oct. 7.—Possibility of an embargo by the railroads on all less than carload shipments of freight within a radius of 100 miles of Chicago this winter is indicated in a letter sent out by the Chicago Association of Commerce to its members with the questionnaire designed to determine to what extent motor transport lines and the return loads system can be utilized by the shippers of Chicago. The association has been requested by the State Council of Defense to assist in developing a system of highways and trolley transport within the territory tributary to Chicago, and makes the point that the moving of all possible freight over the highways by motor trucks and on trolley lines is a wartime need and a patriotic duty.

Whether or not the suggested embargo by the railroads goes into effect, the State Council of Defense expects to be in a position to handle all l. c. l. shipments within a radius of 100 miles of the city according to the letter of the Association of Commerce. The important thing necessary at this time is co-operation by the shippers.

#### License Pyrites from Spain

WASHINGTON, Oct. 8.—The War Trade Board will authorize licenses for the importation of 56,400 tons of pyrites from Spain for the remainder of the calendar year. Original regulations restricted imports of 125,000 tons up to October 1, 1918, but since licenses have not been issued for the full amount the Board has arranged to allow the 56,400 tons to enter during the last months of the year.

## Air Cleaners at Twin City S. A. E.

Gravity and Liquid Types Compared—Their Efficiency Nearly Equal

MINNEAPOLIS, MINN., Oct. 3—Water or liquid types of air washers for carbureters were said to be little more than 2 to 3 per cent more efficient than centrifugal or gravity types by C. W. Clark at the opening meeting of the S. A. E. here to-night. Mr. Clark who is engineer of the Wilcox-Bennett Carburetor Co., declared that if the truth were known quite a percentage of the water used in liquid cleaners goes to keeping down the temperature of the explosive mixture, thereby assisting in the burning of fuel and he intimated that in some cases this was the reason for using a liquid type as compared with a gravity type. There is only one kind of dust which the gravity type does not handle efficiently or on 100 per cent basis and that is the fine lava ash or dust which is encountered in some of the western areas.

In his address on air cleaners Mr. Clark classified them into four divisions, namely, cloth cleaners, gravity cleaners, liquid cleaners, and inertia cleaners.

Mr. Clark said that if the correct size cleaner is utilized the power loss is negligible or in a 40 hp. motor one-tenth horsepower. If the carbureter is cut down to suit the change in gas mixture there is no trouble. Water cleaners take little power to keep the water whirling. A manometer shows only little difference between wet and dry cleaners in amount of power required.

The speaker had not tried a cleaner with a two-cycle engine, but it would make no difference from use with a four cycle. It made no difference whether the air was hot or cold. He contemplates trying oil or kerosene, but has not yet. He said also that there is no difference whether a one-cylinder or six-cylinder engine is utilized with a water cleaner, if it is made big enough so that with the one-cylinder it will not gulp the water. If a wave motion is started water is likely to get through. Speed of the water in the cleaner has not been ascertained nor how near it comes to the velocity of the air, but it is practically still at the point of the funnel. It is not expected to be run at more than 4500 feet a minute.

### Ration Gasoline; Abolish "Gasless" Sundays

WASHINGTON, D. C., Oct. 10—Gasolineless Sundays will be abolished within the next 2 or 3 weeks and a new gasoline conservation plan adopted. The new plan probably will include a voluntary rationing of weekly gasoline consumption by motorists. Pledges will be requested. An educational campaign will accompany this pledge system.

Although there has been a weekly saving of 150,000 bbl. through the gasoline-

less Sundays there has been no appreciable surplus of gasoline accruing on the Atlantic Seaboard, according to the Fuel Administration, and although more than 500,000 bbl. of gasoline have been sent to France for war uses through the voluntary conservation, a safe margin of reserve has not yet been established here or abroad.

At one time during the recent offensive it is said that there was but 9 days supply of gasoline in France. The Liberty twelve airplane engine consumption of 35 gals. of gasoline a hour, making a squadron consumption of 1575 gals. of gasoline for an average flight, combined with the heavy demand for gasoline for trucks, tanks, and other motor vehicles, created the original shortage.

The War Department, as a result, insisted upon maintaining more than 600,000 bbl. of gasoline on the Atlantic seaboard, and as this stock during the present season and up to the gasolineless Sundays at no time amounted to 650,000 bbl. the margin for domestic use was small.

### 5000 Trucks to France in September

WASHINGTON, D. C., Oct. 10—Five thousand motor trucks were shipped to France during September according to a statement by Acting Secretary of War Crowell. Practically all of these were knocked down, although some were carried on deck.

### Chalmers Investigates Draft Questions

WASHINGTON, D. C., Oct. 10—Hugh Chalmers is in Washington conferring with Provost Marshall Crowder relative to the operation of the draft and its effect on the automobile industry and also as regards the filing of affidavits with the questionnaire by automobile manufacturers. He will secure decisions on these matters in a few days and announce them to the industry.

### Overland-Moline Exchange Basis

NEW YORK, Oct. 9—The basis on which Willys-Overland, Inc., obtained control of the Moline Plow Co. has been made public by President G. A. Stephens of the latter company. Holders of Moline common stock are given the opportunity of exchanging it at 150 per cent per share, on a par value of \$100 for 7 per cent preferred stock in the following companies: Willys-Overland, 55 per cent; Electric Auto-Lite Corp., 30 per cent. Curtiss Aeroplane & Motor Corp., 15 per cent.

Under this plan a holder of 100 shares of Moline common aggregating a par value of \$10,000, would receive stock in the other companies aggregating a par value of \$15,000 as follows:

	Par Value
82½ shares Overland.....	\$8,250
45 shares Elec. Auto-Lite.....	4,500
22½ shares Curtiss.....	2,250
Total .....	\$15,000

The comptroller of the Moline Plow Co., which has been acquired by the Willys-Overland Co., has submitted to stockholders of the first named company

## Motor Transport Has New Insignia

Helmet and Wheel for Officers and Men—Corps to Have Regular Infantry Drills

WASHINGTON, Oct. 8—The Motor Transport Corps recently organized under Brig. Gen. C. B. Drake, which controls the operations, maintenance, engineering and technical supervision of the motorized vehicles of the army, has a new insignia. This corps is now a separate division of the army.

The insignia for the officers is an emblem 1¼ in. in diameter with an automobile wheel with a pneumatic tire and the service helmet with the wings of Mercury attached. The insignia for the enlisted men is 1¼ in. in diameter and is a motor truck wheel with a solid tire. The service helmet is in the center with the wings of Mercury attached. The insignia for the officers is composed of bronze and silver. The enlisted men's insignia is entirely of bronze.

The Motor Transport Corps is now arranging to give a certain amount of infantry drill to both the officers and enlisted men, designed to enable the men to enter into the fight at any time this is necessary in the course of their service abroad. Plans are also arranged for the equipment of all the trucks with machine guns so that they will form independent machine gun units in case of need and furthermore will be protected against enemy airplanes which frequently destroy trucks by dropping bombs.

The Motor Transport Corps is greatly in need of both enlisted men and officers. This division of the army, which is new, will require from 200,000 to 250,000 men within the next year with proportionate number of officers. Opportunities for promotion are considered excellent because of the expected growth of the division. Preference for service in the Motor Transport Corps can be stated in the questionnaire filled in by men eligible for the draft and those in deferred classifications may ask to be inducted in the Corps for service. In either case the recruit can also make application to enter an officers' training camp.

the following condensed balance sheets as of July 31, 1918, of companies in which the Willys-Overland Co. is interested and other information:

Willys-Overland and subsidiary companies:  
Assets—Fixed assets \$32,027,662, investments and advances \$12,270,264, inventories receivables, etc., \$38,687,463, cash \$16,154,156, deferred charges \$387,811, good will \$14,059,932; total \$113,587,288.

Liabilities—Mortgages \$169,000, current liabilities \$27,765,267, preferred stocks, \$17,334,300, common stock and scrip \$39,416,285, surplus and reserves \$28,902,436; total \$113,587,288.

Electric Auto-Lite Corp.: Fixed assets \$1,327,922, investments \$12,231,166, current assets \$7,072,869, deferred charges \$13,607; total \$20,645,564.

# AUTOMOTIVE MATERIALS MARKETS

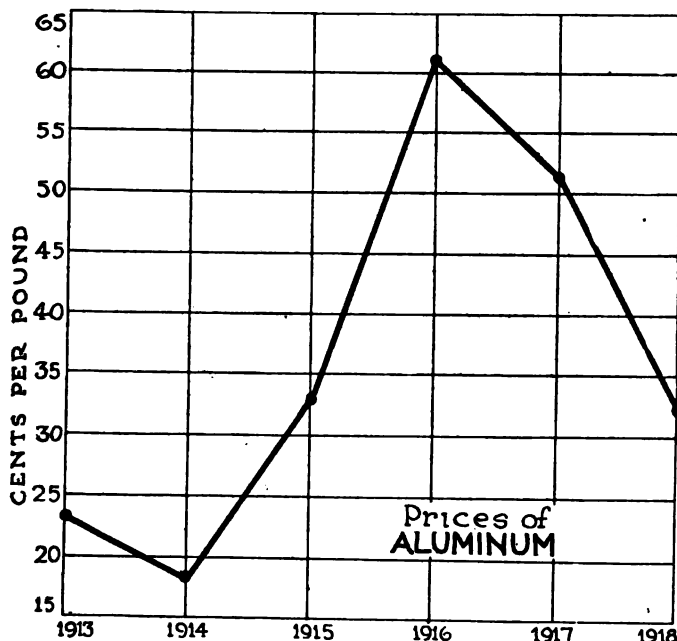
## Materials Market Prices

<b>Acids:</b>		
Muriatic, lb. ....	.02	-.03
Phosphoric (85%)... .	.35	-.39
Sulphuric (60), lb. .	.008	
<b>Aluminum:</b>		
Ingot, lb. ....	.33	
Sheets (18 gage or more), lb. ....	.40	
Antimony, lb. ....	.13%	-.14
<b>Burlap:</b>		
8 oz., yd. ....	.17½	-.17½
10½ oz., yd. ....	.21½	-.22

<b>Copper:</b>	
Elec., lb. ....	.26
Lake, lb. ....	.26
<b>Fabric, Tire (17¼ oz.):</b>	
Sea Is., combed, lb.	1.65-1.70
Egypt, combed, lb.	1.25-1.35
Egypt, carded, lb.	1.20-1.30
Peelers, combed, lb.	1.05-1.20
Peelers, carded, lb.	.95-1.05
<b>Fibre (¼ in. sheet base), lb. ....</b>	
	.50

<b>Graphite:</b>	
Ceylon, lb. ....	.07½-.25
Madagascar, lb. ....	.10-.15
Mexican, lb. ....	.03%
Lead, lb. ....	.08-.09
<b>Leather:</b>	
Hides, lb. ....	.18-.35%
Nickel, lb. ....	.40
<b>Oil:</b>	
<b>Gasoline:</b>	
Auto., gal. ....	.24½
68 to 70 gal. ....	.30½
<b>Lard:</b>	
Prime City, gal. ....	2.50
Ex. No. 1, gal. ....	1.70
Linseed, gal. ....	1.85-1.86
Menhaden (Brown), gal. ....	1.30-1.31
<b>Petroleum (crude),</b>	
Kansas, bbl. ....	2.25
Pennsylvania, bbl. ....	4.00

<b>Rubber:</b>	
<b>Ceylon:</b>	
First latex pale crepe, lb. ....	.58½
Brown, crepe, thin, clear, lb. ....	.52½
Smoked, ribbed sheets, lb. ....	.57½
<b>Para:</b>	
Up River, fine, lb. ....	.62½
Up River, coarse, lb. ....	.35½
Island, fine, lb. ....	.58-.58
Shellac (orange), lb. ....	.74-.75
Spelter ....	.09½-.09½
<b>Steel:</b>	
Angle beams and channels, lb. ....	.03
Automobile sheet (see sp. table), Cold rolled, lb. ....	.06½
Hot rolled, lb. ....	.03½
Tin ....	.80½-.82½
Tungsten, lb. ....	2.45-2.50
Waste (cotton), lb. ....	.12½-.17



Abnormal advances marked aluminum prices until the maximum base price was fixed by Government in March, 1918

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping.....	6.20	6.10
Automobile body stock, extra deep stamping .....	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
<b>Automobile Sheet Extras for Extreme Widths:</b>		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
<b>Black Sheet Extras to Apply to Narrow Widths:</b>		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Surplus Stocks Aid Tractor Men

NEW YORK, Oct. 10.—Tractor manufacturers are not all as yet definitely decided in their own minds as to just how the 25 per cent reduction in pig iron and steel for 1919 as compared with 1918 as requested by the War Industries Board is going to affect next year's production. In general, the result is going to be a reduction in the number of tractors produced by the majority of the concerns. There are some tractor manufacturers building heavy type tractors pulling ten and twelve plows and also building smaller types and in some cases the number of heavy type machines will be reduced and the pig iron and steel tonnage used in the lighter type, thereby increasing the numerical production of tractors.

There is little possibility for any of the tractor companies making very serious reductions in the amount of steel or pig iron used in their machines due to questions and design as it would call for a change in design which would delay production. Many of the large producers consequently state they will make no

attempt to redesign in order to reduce weight and keep up numerical production other than the refinements that are being carried through from time to time.

Some manufacturers are particularly fortunate in that they have a pretty heavy surplus inventory on hand as of Oct. 1, 1918, and as the ruling of the War Industries Board permits the manufacturer to work up this surplus in addition to his 1919 allotment those companies well fitted by way of inventories will not suffer so severely next year as they otherwise would.

Among all of the tractor manufacturers there is a very commendable spirit not to criticize the War Industries Board in any of its decisions but rather to be good soldiers and carry out the spirit of the ruling. At the same time there seems to be an underlying sentiment that greater farm cultivation is necessary which must be accomplished with reduced farm help and the tractor is one of the satisfactory and efficient means of making up for a reduction in help. The order or request came as a very great surprise to many of

the makers when the announcement was first made, but the ruling admitting of absorbing inventories on hand as of Oct. 1, has changed the situation to quite an extent as several tractor manufacturers were well stocked up with materials at that time which will go far to making it possible for them to maintain their 1919 production on a par and in some cases perhaps a little in advance of the 1918 schedule.

## Limit Imports of Varnish Gums

WASHINGTON, Oct. 8.—Hereafter varnish gums can only be imported into the United States if they have been shipped from abroad prior to Oct. 10, 1918, if for use for the United States Government, if from Mexico or Canada, if as returned cargo from Europe or Mediterranean Africa when the loading can be done without delay, if Manila gum from the Philippine Islands and if Kauri gum not to exceed 3,000,000 lbs. for the present calendar year. Varnish gums other than the above are banned for importation.



**A New Custom-Built Passenger Car**

NEW YORK, Oct. 8—The Automobile & Machinery Eng. Co., with offices at 1 East 42nd Street, and factory at Long Island City, is building a passenger car, designed by Otto R. Bieler, M. E., for customers who desire individuality, special body work, etc. The new car is built of standard parts, a Buda engine being used. Chassis weight is given as being 1900 lb., chassis price is \$2,700. The transmission is of four speed type, direct on third, and a special feature of the front fenders is that they turn from side to side with the wheels. Both front and rear fenders are attached to the axles. Owing to the difficulty in obtaining material, business is not being pushed at the present time, although several cars have been built and a number are on order. Plans are being made for extension as soon as conditions alter.

**Central Machine & Tool on War Work**

TOLEDO, Oct. 2—The Central Machine & Tool Co. is in quantity production on war contracts, furnishing war plants with jigs, dies, snap and tolerance gages and special machinery for war work. The company is now filling an order for special polishing machinery for a shell plant. It also makes testing machines for shells and dies and reamers for shell cases.

**Mason Tire to Make U. S. Raincoats**

KENT, OHIO, Oct. 5—The Mason Tire & Rubber Co. has closed a contract with the U. S. Army to manufacture rubberized raincoats. It is stated that quantity production was started Oct. 1. Additional plant capacity has been leased in Kent for the duration of the war. The company expects to be turning out 1,000 coats a day by the first of the year. If this production is reached the volume of business from this source will practically equal the company's total sales of tires and tubes during the 1917-1918 fiscal year ending Oct. 31.

**Square Turn Moves to Norfolk, Neb.**

CHICAGO, Oct. 4—The Square Turn Tractor Co. has removed its executive offices from Chicago to its factory in Norfolk, Neb. Several new buildings will be erected.

**More Room for Oakes**

INDIANAPOLIS, Oct. 4—The Oakes Co. is making a large addition to its factory.

**Air-O-Flex Transfers Offices**

DETROIT, Oct. 5—The Air-O-Flex Automobile Corp. has moved its offices from 570 Penobscot building to its factory at 519 Hillger Avenue.

**D'Arcy Spring Co. on War Work**

KALAMAZOO, Oct. 4—The D'Arcy Spring Co., manufacturer of seat or upholstery springs, is at present on about 80 per cent war work and will soon be on

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

100 per cent basis. The company is now producing springs for Colt revolvers, springs for Browning machine guns, springs for motorcycles, springs for bayonets, springs for ambulances, and other war products. The concern is delivering thousands of springs daily and has been notified that production must be increased immediately.

**Beaudette to Manufacture Transport Bodies**

PONTIAC, MICH., Oct. 5—The O. J. Beaudette Co., manufacturer of metal automobile bodies, has been awarded large Government orders for two types of transport bodies and for a touring car body, which will insure ample work in all departments in the very near future. The plant has been operating with only a small force for several weeks past owing to curtailment of automobile production.

**Andis Tool Co. Organized**

RACINE, Oct. 5—The Andis Tool Co. has been organized with a capital stock of \$25,000 to engage in the manufacture of tools, dies, jigs, machinery, etc. The incorporators are Mathew Andis, John Oster, Frank Bichalm and Henry E. Meltzer.

**Oshkosh Mfg. Co. Builds Addition**

OSHKOSH, Oct. 5—The Oshkosh Mfg. Co., maker of tools, dies and mechanical appliances, is building a one and two-story shop addition, 40 x 100 ft., to provide much-needed facilities for handling direct and indirect Government work.

**King to Make Kitchen Trailers**

DETROIT, Oct. 4—Production on the two-wheeled kitchen trailers for the government will be started by the King Motor Car Co. about the middle of October. The company has received an order for 3000.

**Dividends Declared**

The Willys-Overland Co., Toledo, has declared the regular quarterly dividend of 25 cents on common stock, payable Nov. 1 to stockholders of record Oct. 21.

Pierce-Arrow Motor Car Co., regular quarterly dividend, \$1.25 a share, payable Nov. 1 to stockholders of record Oct. 15.

General Motors Corp., regular quarterly dividend, \$3 a share on common and \$1.50 on preferred, payable Nov. 1 to stockholders of record on Oct. 18.

**Gearshift Company Completes New Plant**

EAU CLAIRE, WIS., Oct. 5—The United States Gear Shift Co., Eau Claire, Wis., has completed its new manufacturing plant, four stories high, and 80 x 100 ft., equipped for the manufacture of the Laursen hydraulic gear-shifting device for motor vehicles. The production of gearshifts, however, will be made subservient to a large Government contract for seven different parts for coast defense and battleship gun mounts. Work on the contract will begin at once.

**Victor Rubber Co. Adds to Factory**

SPRINGFIELD, OHIO, Oct. 5—The Victor Rubber Co. has completed a large two-story tile and concrete addition to its factory. This will be devoted entirely to the production of tires. It is being equipped with modern machinery in readiness for additional manufacture.

**Killen-Straight Co. in Receiver's Hands**

APPLETON, WIS., Oct. 5—The Killen-Straight Tractor Co. has been placed in charge of C. L. Marston of that city as receiver, upon petition of a committee of creditors. The receivership is instituted to conserve the assets and maintain the company as a going concern. Lack of adequate working capital has handicapped the company in its tractor manufacturing program, but arrangements are now being made to continue the business on a broader scale than heretofore.

**Rainbow Oil Co. Incorporates**

MILWAUKEE, WIS., Oct. 5—The Rainbow Oil Co., Milwaukee, has been incorporated with a capital stock of \$30,000 to establish and maintain oil wells, refineries, etc. The incorporators are John Borman, Bert Schroeder and Andrew Benzinger.

**Acheson Oildag to Double Output**

PORT HURON, MICH., Oct. 4—The Acheson Oildag Co. is increasing its output and will double its capacity. The new equipment will cost when completed in the neighborhood of \$30,000.

**Northern Foundry Co. Doubles Capacity**

MARINETTE, WIS., Oct. 5—The Northern Foundry Co., established last fall to manufacture automotive castings, will double the capacity of its plant at once. A complete pattern manufacturing department also is being established and the business and equipment of the Dost Pattern Works, Menominee, has been purchased for this purpose. Bruno E. Dost, proprietor of the concern, has joined the Northern company as pattern works manager. Work on a new cupola, core-room addition and other buildings is now being hastened to completion. The company specializes in tractor and gas engine castings.

**Champion Ignition Co. Enlarges Plant**

FLINT, MICH., Oct. 4—The Champion Ignition Co. has let a contract for the erection of a three-story addition to its plant to cost approximately \$50,000.

## Airplane Expenses 4 Cents a Mile

Mileage Rate Same as for Dog Sleds, Prairie Schooners and Buffalo Carts

WASHINGTON, Oct. 5—In a recent opinion from the office of the Judge Advocate General, officers traveling by Government airplane may draw expenses at the rate of 4 cents a mile, which is the rate of mileage allowed where the Government furnishes transportation by prairie schooners, dog sleds in Alaska, and buffalo carts in the Philippines. The allowance for travel on trains is generally 7 cents a mile. The distinction is made, not because airplanes are less modern than trains and therefore classed with dog sleds or prairie schooners, but because customarily there are only two methods of transportation used in the service, "train" or "otherwise." Airplanes fall in the latter class.

This decision settles a doubt raised in a former opinion that because the airplanes as used in military service were not vehicles, but instruments of war, there was no authority for the payment of individual expenses of those using them for travel. Major General William L. Kenly, Director of Military Aeronautics, made the point that although airplanes are employed for combat and other war purposes, the use of the airplane in the army as a means of conveyance was of constantly increasing importance.

He maintained that this use was two-fold—first in the theater of operations, in connection with troops; second, outside the theater of operations, in the transportation of officers traveling without troops, on permanent change of station or temporary duty. In the first case, travel would be performed by airplane as it would be by horse, automobile, or other means, and no mileage would accrue. In the second case, travel would be performed by airplane in lieu of railway, and mileage, at 4 cents a mile, should be allowed.

The chief reason for such travel, as maintained by General Kenly, was its expediency. When airplanes were available, he believed, they should be used, if only for the sake of practice. There would be no additional expense to the Government in using available airplanes for travel, he held, nor any diversion of the time of pilots from their duty. At the same time travel could be accomplished far more quickly than by train, even on short trips, whether for change of station, temporary duty or purposes of inspection. If no mileage was to be drawn for such travel, officers would themselves have to bear the expenses, and if, for this reason, they avoided travel by airplane, the result in the long run would be loss of time and loss of opportunity for the full development of the use of the airplane.

The point was also made that there

was no requirement known where travel must actually be performed by railway to entitle an officer to mileage, and examples were cited to the contrary, found in the Alaskan, Philippine, and Western Service, where, when railroads were not available, mileage had been granted for travel performed by other means of conveyance.

### Cars Increase in Australia

SYDNEY, AUSTRALIA, Sept. 10—Official figures on the registration of automobiles in New South Wales for the first 6 months of 1918 show a total increase in passenger cars in use in the country of 2557 on June 30, 1918, as compared with June 30, 1917. There were registered during the first half of 1918, 1956 new cars. There has been a slight increase in the number of motor trucks in use this year as compared with a year ago. In motorcycles the registration figures show an increase of 185 during the same period. The official figures are:

	First Half Year 1917	First Half Year 1918
New registration cars....	2,556	1,956
New registration commercial vehicles.....	209	214
New Registration motorcycles .....	1,062	1,247
	On June 30, 1917	On June 30, 1918
Total cars in use in N. S. W.....	16,062	18,619
Total motorcycles in use in N. S. W.....	7,526	8,471

### Lexington Line Revised

CONNEERSVILLE, IND., Oct. 7—The Lexington Motors Co. will continue its present model with a number of modifications and improvements in the body. The radiator and cowl have been raised, the top has been redesigned, the seats have been built into the body sides and have deeper upholstery. New prices are: Seven-passenger, \$1,785; 5-passenger tourabout, \$1,685; 5-passenger convertible sedan, \$1,985; 3-passenger coupelet, \$2,450; 4-passenger sedanet, \$2,550; 4-passenger coupe, \$2,650; salon sedan, \$2,750; 5-passenger limousine brougham, \$3,250. The chassis remains unchanged.

### Operate Pending Application Approval

WASHINGTON, Oct. 3—Under the recent Presidential proclamation announced in an earlier issue, concerns engaged in importing, manufacturing, distributing and transporting crude oil, fuel oil, kerosene, gasoline and natural gas were required to secure a license from the United States Fuel Administration before Oct. 1, 1918. In those cases where the application for the license has been promptly made, the applicant can continue his business pending final action upon his application.

### Food Trucks Are Essential

WASHINGTON, Oct. 7—Motor trucks used to relieve railroad congestion by interurban transportation of food and other essential war products will be considered as in essential work and the men employed on them will be regarded as essential by the United States Employment Service.

## Air Service Clubs Organized

Standards and Traditions to Be Established to Promote Efficiency

WASHINGTON, Oct. 3—The Air Service Clubs Association has been organized following a meeting here of 800 officers of the Army Air Service yesterday. The purpose of the association is to establish standards and traditions and promote the efficiency of the Air Service, disseminate professional knowledge and provide means for social activities at all places where members are stationed. The Association will include all of the local air service clubs which have been organized at various flying fields and training stations.

At the meeting yesterday Major General William L. Kenly, Chief of the Division of Military Aeronautics, presided. Following the adoption of the constitution, officers were elected as follows:

Major General Wm. L. Kenly, President; W. C. Potter, 1st vice-president; Col. G. C. Drant, 2nd vice-president; Col. M. F. Davis, 3d vice-president; Major Maxwell Kirby, 4th vice-president; Col. G. C. Edgar, treasurer; Lt. Colonel H. S. Brown, assistant treasurer; Captain John H. Packard, secretary, and 1st Lieutenant Tom Poe, assistant secretary. John D. Ryan, Assistant Secretary of War, was elected chairman of the Board of Control, and the following were elected members of the Board of Control: Col. H. H. Arnold, Col. W. E. Gilmore, Col. C. A. Seonne and A. A. Landan, for one year; Col. Arthur Woods, Col. F. R. Kenney, Col. G. H. Crabtree and C. W. Nash, for two years; and Col. A. L. Fuller, Lt. Col. B. F. Castle, Lt. Col. Milard F. Harman, Jr., and Major Wm. R. Malone, for three years.

It is the purpose of the Air Service Clubs Association to issue a magazine periodically and to organize clubs at all Air Service flying fields and stations.

### Tire Filler Makers Organize

CHICAGO, Oct. 7—An association styled American Tire Filler Industry was formally launched here following a conference of the principal manufacturers of tire filling compounds. The following officers and directors were elected: President, Franc D. Mayer, Essenkay Products, Chicago; first vice-president, Frank A. Hager, Universal Tire Filler Co., Portland, Ore.; second vice-president, Lee W. Lockwood, Dahl Punctureless Filler & Rim Co., Minneapolis; third vice-president, W. W. Major, National Rubber Filler Co., Midlothian, Tex.; secretary, C. P. Umstot, Peerless Tire Filler Co., Chicago; treasurer, L. G. Harris, Wolverine Tire Cushion & Accessory Co., Detroit; directors, J. Wolff, National Synthetic Tire & Rubber Co., New York, and C. G. Schwarz, Panama Rubber & Equipment Co., St. Louis.

## Aircraft Production Contracts

WASHINGTON, Oct. 2—Following is a list of contracts placed by the Bureau of Aircraft Production:

Dayton Engineering Laboratories Co., Dayton, spare ignition parts.  
Champion Ignition Co., Flint, spark plugs.  
Empire Axle Co., Dunkirk, N. Y., engine spares.  
Durke & James, Inc., 240-258 East Ontario Street, Chicago, Ill., cameras.  
Wright-Martin Aircraft Corp., New Brunswick, engine spares.  
Wright-Martin Aircraft Corp., New Brunswick, engine spares.  
Central Dry Plate Co., St. Louis, photographic dry plates.  
English & Mersick & Co., New Haven, radiators and attachments.  
The General Rubber Goods Co., Cleveland, shock absorber cord.  
Ohio Rubber Co., Cleveland, shock absorber cord.  
Baker & Lockwood Manufacturing Co., Kansas City, services coloring airplane hanger tents.  
Eastman Kodak Co., Rochester, aerial cameras.  
Astoria Veneer Mills & Dock Co., New York, lumber.  
English & Mersick Co., New Haven, spares, radiators and attachments.  
Ohio Rubber Co., Cleveland, shock absorber cord.  
Stone Propeller Co., Dayton, propellers.  
Starr Plano Co., Richmond, propellers.  
Giant Furniture Co., High Point, propellers.  
Hallet & Davis Plano Co., Boston, propellers.  
Brewster & Co., Long Island City, propellers.  
Flottorp Manufacturing Co., Chicago, propellers.  
Curtiss Aeroplane & Motor Corp., Buffalo, propellers.  
A. C. Clark & Co., Chicago, oxygen apparatus repairs.  
Claphone Co., Akron, claraphone tubes.  
International Duplex oat Co., New York, furlined suits.  
Brown Instrument Co., Philadelphia, thermometers.  
Eastman Kodak Co. of New Jersey, Rochester, photographic supplies.  
Eastman Kodak Co. of New Jersey, Rochester, cameras, carrying cases and repair kits.  
Positype Co., Cleveland, bromotype paper.  
J. J. O'Connor, Jersey City, steel drums.  
California Burdett Oxygen Co., Oakland, hydrogen gas.  
Berger Mfg. Co., Canton, material for hangars.  
Sayles Finishing Plant, Saylesville, services, inspecting balloon cloth.  
Ideal Veneer Lumber Co., Franklin, lumber.  
Wood-Mosaic Co., New Albany, lumber.  
Standard Aircraft Corporation, Elizabeth, steel tubing.  
John A. Roebling's Sons Co., Trenton, aviator cord.  
Scheuerman Co., Inc., 332 Pearl Street, Buffalo, pilot's safety belts.  
Robbins & Meyers Co., Springfield, electric generators.  
North East Electric Co., Rochester, electric generators.  
Kunhardt & Co., New York, castor beans.  
Commercial Bank of Spanish America, Ltd., New York, castor beans.  
C. L. Van Doren, Gloversville, flying gloves.  
Wright-Martin Aircraft Corp., New Brunswick, engine spares.  
Wright-Martin Aircraft Corp., New Brunswick, engine spares.  
Positype Co., Cleveland, bromotype paper.  
Clifton Mfg. Co., Jamaica Plain, friction tape.  
Burke & James, Chicago, chemicals.  
Pittsburgh Steel Products Co., Pittsburgh, seamless steel tubing.  
Pittsburgh Steel Products Co., Pittsburgh, seamless steel tubing.  
Studebaker Corporation, Detroit, forgings for cam shaft.  
Interstate Machine Products Co., Rochester, intake pipe for engine.

## Contracts

Interstate Machine Products Co., Rochester, intake rocker arms.  
Hess Bright Mfg. Co., Philadelphia, crank case thrust bearings.  
Taylor Instrument Co., Washington, airplane inclinometers.  
Taylor Instrument Co., Washington, compasses.  
Erie Specialty Co., New York City, spares for planes.  
John A. Roebling's Sons Co., Trenton, wire.  
John A. Roebling's Sons Co., Trenton, wire.  
Erie Specialty Co., New York, spares for planes.  
Samuel J. Shimer & Sons, Milton, engine spares.  
Samuel J. Shimer & Sons, Milton, engine spares.  
Wolverine Brass Works, Grand Rapids, gear repairs.

## Engineer Depot Orders

WASHINGTON, Sept. 26—Following is a list of orders placed by the General Engineer Depot of the Army:

Hercules Gas Engine Co., Evansville, Ind., gasoline engines.  
Republic Rubber Co., Washington, red sheet gasket packing.  
Cook Motor Co., Delaware, Ohio, gasoline engines.  
Tucker City Rubber Co., Philadelphia, rubber gaskets.  
Quaker City Rubber Co., Philadelphia, rubber gaskets.  
General Electric Co., Schenectady, parts for searchlights.  
International Motor Co., Washington, steel dump bodies.  
Empire Rubber & Tire Co., Trenton, rubber-lined hose.

## Dealers May Get War Work

WASHINGTON, D. C., Oct. 7—Dealers who have facilities for doing war work may secure war work, according to an official announcement, according to their facilities for manufacturing or assembling, and the facilities of many dealers are mostly bare floor space. The announcement is made by C. A. Otis, chairman of the Committee on Resources and Conversion, War Industries Board, who states that dealers may be able to effect progress in this direction by combining their organizations. As was announced some time ago, this committee was organized with 20 industrial zones, each in charge of a regional adviser, and sub-zones in charge of sub-regional advisers. Dealers who wish to investigate this work are requested to write to Chairman Otis, who will put the dealers in touch with the sub-regional adviser, who will give the dealers all the necessary information.

## Ordnance Department Contracts

WASHINGTON, Oct. 4—The following contracts have been placed by the Ordnance Department of the United States Army:

Maxwell Motor Co., Detroit, and Minneapolis Steel & Machinery Co., Minneapolis, test tools.  
Nash Motors Co., Kenosha, steering knuckles, spindle washers and brake linings.  
Four Wheel Drive Auto Co., Clintonville, miscellaneous truck equipment.  
Holt Mfg. Co., Peoria, gaskets and equalizing rockers.  
Nash Motors Co., Kenosha, truck spare parts.  
Cleveland Twist Drill Co., Cleveland, drilling and countersinking high-speed steel.  
C. A. Shaler Co., Waupun, vulcanizing material.  
Standard Oil Co., New York, wicks.  
North & Judd Mfg. Co., New Britain, and O. B. North & Co., New Haven, roller buckles.  
United Motors Corp., Harrison, steel cores.  
Allen Motor Car Co., Fostoria, recoil spring adjusters.  
Dodge Bros., Detroit, repair tools.  
Taft-Pierce Mfg. Co., Woonsocket, musketry rules.  
Gray & Davis Co., Boston, fuses.  
Federal Pressed Steel Co., Milwaukee, and Pressed Steel Tank Co., Milwaukee, Livens gas shells.  
The Nash Motors Co., Kenosha, motor parts.

## Engineer Depot Orders

WASHINGTON, Oct. 4—The following contracts have been placed by the General Engineer Depot of the Army:

The B. F. Goodrich Rubber Co., Akron, hose.  
Willard Storage Battery Co., Cleveland, batteries.  
The Buda Co., Chicago, track drills.  
Empire Tire & Rubber Corp., Trenton, fire hose.  
Empire Tire & Rubber Corp., Trenton, fire hose, rubber lined.  
The Buda Co., Washington, jacks.  
General Electric Co., Schenectady, lamp switches.  
The Winton Co., Cleveland, parts for generating set.  
Metal & Thermit Corp., New York, thermit and ignition powder.  
Dayton Rubber Mfg. Co., Dayton, Ohio, airless tires.  
Eiseman Magneto Co., Brooklyn, round carbons.  
Studebaker Corp., South Bend, log wagons.  
Ford Motor Co., Detroit, searchlight parts.

## Republic Earns \$300,564 in July

NEW YORK, Oct. 7—During the month of July the Republic Rubber Co., Youngstown, Ohio, earned net profits of \$300,564. During the three months ended July 31, sales amounted to \$7,598,536 and earnings in the same period were \$574,013. August sales amounted to \$1,429,000.

## \$3,000,000 Addition for Holt

PEORIA, Oct. 7—The Holt Mfg. Co. has let contracts for two assembly shops 500 x 80 and three new machine shop units together with additions to its power and heating plant, the whole to amount to about \$3,000,000.

## Calendar

## ENGINEERING

Nov. 14-15 New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

## ASSOCIATIONS

Oct. 7-12—Milwaukee. American Foundrymen's Assn. and 5 allied organizations. Milwaukee Auditorium.

## SHOWS

Oct. 12-19—Atlanta. Tractor demonstrations Eastern

State Fair and Automotive Exhibition.

Oct. 14-27—Dallas, Tex., Seventh Annual Texas Automobile Show. Texas State Fair.

Oct. 16-18—Ottawa, Ont., International Plowing Match.

Tractor and Farm Machinery Demonstration. Experimental Farm.

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration. State Fair.

Nov. 11-16—Phoenix, Ariz. Tractor demonstration. State Fair.



# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

Vol. XXXIX  
Number 16

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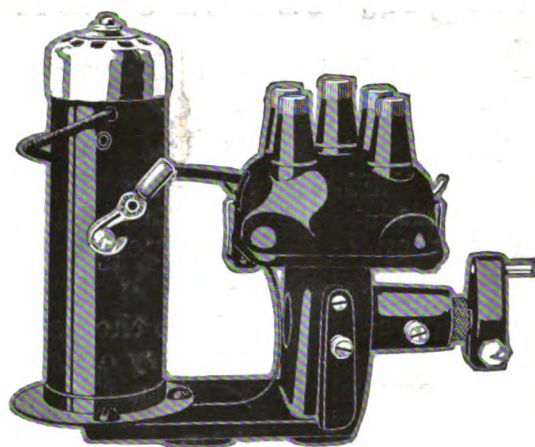
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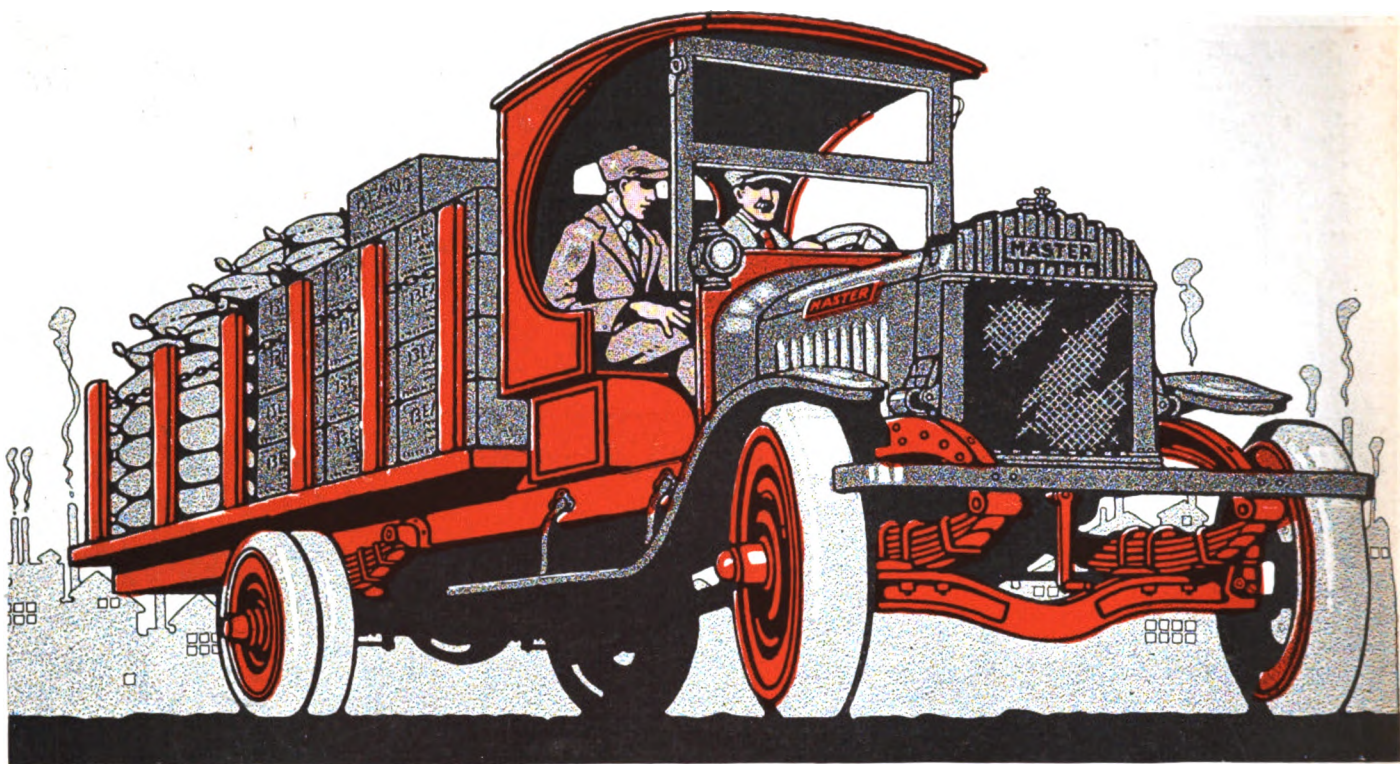
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# AUTOMOTIVE INDUSTRIES

## *The* AUTOMOBILE

VOL. XXXIX

NEW YORK, THURSDAY, OCTOBER 17, 1918—CHICAGO

No. 16

## Tractor Makers Protest Curtailment

**30 Manufacturers Form American Tractor Association and Will  
Lay Their Case Before the War Industries Board—Claim  
25% Restriction Order Jeopardizes Their Business  
and That of Parts Makers as Well**

**C**HICAGO, Oct. 11—The first example of united opposition to a ruling of the War Industries Board because of a curtailment order comes from thirty farm tractor manufacturers who see their business practically wiped out by the 25 per cent reduction ruling of the War Industries Board for 1919. These tractor manufacturers have formed themselves into a new organization known as the American Tractor Association, with the immediate object in view of laying their case before the War Industries Board and presenting to that board an analysis of conditions which these manufacturers think had something to do with the 25 per cent curtailment order.

Some of these thirty tractor manufacturers have been producing tractors in fairly good quantities for the last 2 years, yet notwithstanding this they see their business seriously threatened through the ruling of the Priorities Division of the War Industries Board. Many of these concerns have already obligated themselves with manufacturers of parts for their 1919 production and see in the recent ruling no apparent recognition that such business arrangements have already been entered into and were entered into before the hearing of the War Industries Board on the curtailment subject.

Few, if any, of these tractor manufacturers were invited to the hearing before the War Industries Board on Sept. 17 when the question of tractor curtailment was discussed. The War Industries Board at that time discussed the subject with the War Service Committee, representing the National Implement and Vehicle Association, and while the meeting was only to have been a preliminary one it resulted in the 25 per cent curtailment. There were many tractor firms not members of this association that have built thousands of tractors and who did not even know that such a meeting was taking place, and who had no voice whatever in the curtailment order. There were scores of smaller tractor concerns that have been in the development process for a year or so and were not notified of the meeting and did not directly or indirectly have a chance to protest or express their views on this subject. The whole matter was handled by the War Service Committee, which, before taking the subject up, did not call a meeting of all tractor manufacturers to discuss the subject. It was a plain case of extinction for practically all of these newcomers, who had not got far into production, without an opportunity of even voicing a protest.

The 25 per cent curtailment order has not only



jeopardized the future of these concerns, but its influence has extended to the manufacturers of parts, such as engines, gearsets, ignition, lubrication and all other parts essential for the tractor. It is, therefore, not surprising that all of these parts makers, or a great many of them, have united with the new American Tractor Association and are ready to take up the case with the War Industries Board. These parts manufacturers have large contracts for future delivery with many of these smaller tractor concerns. The great tractor demand of the present year has resulted in programs for factory enlargements, and to meet these increases in production these parts makers have become part and parcel of these newer firms in the tractor field.

### Organization Includes Tractor Pioneers

The list of thirty charter members in the American Tractor Association contains the names of manufacturers of standing, who have been manufacturing tractors for several years. The list also contains the names of parts makers of standing, so that the new organization does not represent a group of mushroom concerns that have sprung up during the past year, but rather firms that have been doing development work for several years and parts makers of long and established standing in the tractor industry. Included are manufacturers of electric apparatus, gearsets, carbureters and radiators who have established businesses, and some of them have been pioneers in the tractor industry.

The formation of the American Tractor Association comes as the result of a settled conviction in the minds of the smaller tractor manufacturers and parts makers that the War Industries Board has been influenced by the membership of the Tractor Division of the Farm Implements Committee of the National Implement and Vehicle Association, which counts in its membership the large and powerful manufacturers of tractors and farm implements and to whose advantage it would be to choke off considerable new development in tractor manufacture. Such has not been publicly stated by the new organization, but this is the sentiment of many comprising it, and it is without doubt the leading spur to organization.

Immediately the ruling of the Priorities Division of the War Industries Board with its 25 per cent restriction on the amount of iron and steel for 1919 was announced by the Farm Implements Committee, the smaller tractor manufacturers and makers of parts sensed disaster to their growing business and at once began to agitate for a modification of the ruling. Believing that they had not been adequately represented at the Washington hearing before the War Industries Board, which resulted in the ruling, and realizing that without organization any protest they might make would be ineffective, the necessary measures to bring about the American Tractor Association were taken.

As a result at the formation meeting held in Chicago Wednesday a representative committee was appointed to go to Washington and present the case of the tractor and parts manufacturers in order to se-

cure a rescinding or modification of the ruling. This committee will demand of the War Industries Board that the weaker interests of the tractor industry be given representation in order that the needs of an essential and growing industry shall receive proper recognition.

It is hinted by many of these newer tractor manufacturers that there is a very large representation of the old-time tractor interests on the War Industries Board and connected with this organization, and that the ruling savors very strongly of being a protection measure to these old-line concerns, which have resented very much in the last 2 years the entrance of new blood into the tractor field and have also strongly resented the entry of the automobile manufacturer, as well as the influence of automobile design on tractor engineering.

The opposition of many of the old-line tractor makers to the Fordson tractor has been very generally construed as not so much an attack against Henry Ford as rather a defensive act of these tractor manufacturers against the invasion of the old tractor circle of makers by the modern automobile and truck industry. It has been rather generously stated by a few of the leading old-time tractor manufacturers that Henry Ford beat them to it in the Fordson tractor, and that if they had thought of it in time they would have done the same thing, but they did not. The opposition to the Fordson started in England as soon as the Government placed tractor contracts. The scene of attack next shifted to Canada and finally to the United States, where it has continued pretty generally ever since. Fortunately there are some of the older interests and also the stronger interests among the old tractor manufacturers who have publicly stated that they will welcome everything that is good in tractor design, no matter whether it comes from the ranks of automobile manufacturers or tractor concerns. They state unequivocally that in these war days the best that comes out must be welcomed and that there must not be opposition to development of design and increase in tractor efficiency.

### Thirty Charter Members in Organization

Charter members of the American Tractor Association to the number of thirty signed the following pledge:

*We, the undersigned, tractor manufacturers and parts makers, and trade press, do subscribe as charter members to a national organization to be known as the American Tractor Association, with central office in Chicago, Ill., and pledge ourselves to the payment of the first annual dues of \$50.*

Erd Motor Co.  
Square Turn Tractor Co.  
Bullock Tractor Co.  
Reed Tractor Co.  
The Star Tractor Co.  
The Evans Mfg. Co.  
Zelle Tractor Co.  
Powell Tractor Co.  
Sumpter Div. Splitdorf Electrical Co.  
Climax Engineering Co.  
Kohl Tractor Co.  
U. S. Tractor & Machinery Co.

Parrett Tractor Co.  
Belt-Rail Tractor Co.  
Foote Bros. Gear & Machine Co.  
Wisconsin Farm Tractor Co.  
Kokomo Electric Co.  
Perfex Radiator Co.  
Brewer Mosel Automobile Co.  
Nilson Tractor Co.  
Wilcox-Bennett Carburetor Co.  
Agrimotor.  
The John Lauson Mfg. Co.  
Illinois Tractor Co.

H. C. Doman Co.  
Turner Mfg. Co.  
Aulson Tractor Co.

Geo. D. Bailey Co.  
Interstate Tractor Co.  
Hooven Radiator Co.

Officers, members of executive committee and committee chairmen of the American Tractor Association were elected as follows:

President, B. F. Sprankle, general manager Illinois Tractor Co., Bloomington, Ill.  
First Vice-President, W. N. Smith, president Monarch Tractor Co., Watertown, Wis.  
Second Vice-President, A. C. Bennett, Wilcox-Bennett Carburer Co., Minneapolis, Minn.  
Treasurer, John B. Foote, president Foote Bros. Gear & Machine Co., Chicago, Ill.  
Secretary, Henry Farrington, Agrimotor, Chicago, Ill.

#### Members of Executive Committee

C. B. Stebbins, president and general manager Climax Engineering Co., Clinton, Iowa.  
J. R. Manning, secretary Coleman Tractor Co., Kansas City, Mo.  
Edward Kohl, president Kohl Tractor Co., Cleveland, Ohio.  
J. C. Westmont, president Wisconsin Farm Tractor Co., Sauk City, Wis.  
Leonard Nilson, engineer Nilson Tractor Co., Minneapolis, Minn.  
R. F. Florian, treasurer Square Turn Tractor Co., Norfolk, Neb.  
Claire L. Barnes, vice-president and general manager Parrett Tractor Co., Chicago, Ill.

#### Chairmen of Committees

*Membership Committee*—W. A. Carrell, vice-president Erd Motor Co., Saginaw, Mich.  
*Constitution and By-laws Committee*—L. M. Turner, vice-president and general manager Turner Mfg. Co., Port Washington, Wis.  
*Investigation and Statistics Committee; Publicity Committee*—Henry Farrington, Agrimotor, Chicago, Ill.

The members of the membership committee will remain in Chicago for the remainder of the week making plans for an aggressive campaign. Already assurances have been received from a number of tractor and parts manufacturers who were not represented at the meeting that it is their intention to join. It is hoped to have the membership pass the hundred mark within thirty days.

Another meeting of the association will be called by the executive committee in the near future.

By the 25 per cent curtailment for 1919 many of the old established tractor makers have practically admitted that they will not to any extent be interfered with in 1919 production because the ruling permits them to make use of the inventory which they have had on hand as of Sept. 30, 1918. In addition to this inventory they are permitted to secure 75 per cent of the steel from Oct. 1, 1918, to Sept. 30, 1919, that they had during the previous year. In many cases the inventory on hand amounts to considerably more than the 25 per cent curtailment, so that these concerns do not face any curtailment at all. In some cases it will be possible for them to increase their numerical production.

On the other hand, the small manufacturer who has been in the development stages is apparently denied any such field of manufacture. The ruling is that if he has not built more than ten machines in the year ending Sept. 30 he cannot build more than ten during the year Oct. 1, 1918, to Sept. 30, 1919, no matter whether he has obligated himself for

the materials and apparently irrespective of any inventory he may have on hand. The ruling to such a group of manufacturers means practically business extinction.

Going a step farther, the ruling provides that those manufacturers that have not manufactured over fifty machines in the past year cannot increase this output. The unfairness of such a ruling lies in the fact that new concerns that have developed tractors and put fifty out have plans laid for manufacturing several hundred next year and have obligated themselves to the parts makers, and in many cases have inventories on hand. At the same time the parts makers have gone ahead with the purchase of materials, as well as the production of parts for these, and the ruling apparently takes no recognition of what the parts maker has done up to the present and provides no modification for these new tractor concerns and their programs.

The committee appeared to go to Washington to try for a modification of the Priorities Division ruling consists of the following members:

B. F. Sprankle,	John B. Foote,	R. K. Schreiber,
C. B. Stebbins,	C. W. Lamson,	G. E. Manning,
Edward Kohl,	C. L. Barnes,	L. M. Turner.

Following is the registration at the meeting:

W. A. Carrell, vice-president Erd Motor Co., Saginaw, Mich.  
W. E. Foster, stockholder Square Turn Tractor Co., Norfolk, Neb.  
O. C. Parker, general manager, Bullock Tractor Co., Chicago, Ill.  
E. L. Rose, sales manager Reed Tractor Co., Kalamazoo, Mich.  
C. W. Pendock, president and general manager Milwaukee Machine Tool Co., Milwaukee, Wis.  
P. D. White, vice-president and manager The Star Tractor Co., Findlay, Ohio.  
H. P. G. Coats, vice-president and manager American Engine & Tractor Co., Charles City, Iowa.  
R. T. Evans, vice-president The Evans Mfg. Co., Hudson, Ohio.  
S. W. Harger, Chicago, representing Graham Bros., Evansville, Ind.  
W. C. Zelle, president Zelle Tractor Co., St. Louis, Mo.  
F. L. Howard, chief engineer Hooven Radiator Co., Chicago, Ill.  
S. A. Witt, sales department Detroit Lubricator Co., Chicago, Ill.  
John Powell, general manager Powell Tractor Co., Elwood, Ind.  
E. P. Gould, sales engineer Sumpter Div. Splitdorf Electrical Co., Chicago, Ill.  
C. B. Stebbins, president and general manager Climax Engineering Co., Clinton, Iowa.  
Edward Kohl, president Kohl Tractor Co., Cleveland, Ohio.  
F. P. Blake, Charles F. W. Nichols Co. Adv. Agency, Chicago, Ill.  
B. F. Sprankle, general manager Illinois Tractor Co., Bloomington, Ill.  
H. D. Lauson, general manager The John Lauson Mfg. Co., New Holstein, Wis.  
E. R. Aulson, president Aulson Tractor Co., Waukegan, Ill.  
G. M. Lamson, president U. S. Tractor & Machinery Co., Chicago, Ill.  
A. X. Merz, secretary Madison-Kipp Lubricator Co., Madison, Wis.  
R. K. Schreiber, president H. C. Doman Co., Oshkosh, Wis.  
L. M. Turner, vice-president and general manager Turner Mfg. Co., Port Washington, Wis.  
H. P. Albaugh, Chicago, Ill., representing the Square Turn Tractor Co.  
W. E. Smith, president Rogers & Smith, Chicago, Ill.

(Continued on page 696)

# What Langley Did for the Science of Aviation

His Early Experiments in Aerodynamics at Allegheny Observatory—How He Worked Out Fundamentals and Developed Basic Principles Before Attempting to Obtain Free Flight

## PART I

**I**N order to appreciate fully the value and extent of the contributions of Samuel Pierpont Langley to the science of aerodynamics and the application of the principles of that science to practical mechanical flight, one must not only know who Langley was, but what he was, measured as a scientist and as a man.

Of all those who in the early days investigated the possibilities of flight with heavier than air machines, Langley was undoubtedly the best equipped by training, experience and natural aptitude. He was a scientist of world renown whose honors and recognition had been won by the accomplishment of things of which the value could be measured in terms of practicality. He was fitted to succeed in his efforts in aviation, and he did succeed, but the demonstration of his success came when it was too late for him to enjoy the unstained satisfaction in a realization of accomplishment which would have been the greatest reward that he, being the manner of man he was, could possibly have desired. That satisfaction was denied him largely through the attitude taken toward his invaluable work by a dim visioned public press, which was largely responsible for the cutting off of the supply of funds which would have made a continuation of his experiments possible. And the disappointment and humiliation which resulted from cruel criticism and ridicule heaped upon him and those who believed in him and supported and encouraged him in his efforts and the sad result which followed made his life the tragedy it was and him a martyr to a cause which, as we see to-day, was destined to become a vital factor in establishing the freedom of mankind.

Samuel Pierpont Langley was the descendant of a long line of substantial and intelligent citizens of New England, among whom were skilled mechanics, business men, clergymen and teachers, including a president of Harvard University. As Andrew D. White said in a memorial address at the Smithsonian Institution, "They were of those who build or enrich states by conscientious work and sane thought."

Langley was born in Roxbury, Mass., on August 2, 1834, and was educated in the schools of Boston. At 23, having been trained in architecture and civil engineering,

he went to St. Louis and Chicago, where he followed his profession for seven years. A natural fondness for astronomy then caused him to give up his profession and devote himself to the making of telescopes, refractors and a reflector. This latter period of about three years was followed by an extended visit to Europe, where he spent most of his time in observatories, scientific institutions and art galleries. Upon his return he was made, first, an assistant in the Harvard Observatory and later professor of mathematics and director of the observatory at Annapolis. At 32 he was made professor of astronomy and physics of the Western University of Pennsylvania and director of the Allegheny Observatory. He remained there for twenty years, and during the latter part of his connection conducted the experiments in aerodynamics which extended over more than three years from 1887, and of which the results are to-day counted among the most valuable contributions to the science.

It was while he was at Western University that, with his ability to

### Langley's Achievements

1—His experiments in aerodynamics conducted at Allegheny Observatory from 1887 to 1891 resulted in the compilation of data never before obtained which provided a firm basis upon which to build the science of aviation. Specifically, as summarized by Octave Chanute, they:

- (a) Established a more reliable coefficient for rectangular pressures than that of Smeaton;
- (b) Proved that upon inclined planes the air pressures were really normal to the surface;
- (c) Disproved the Newtonian law, that the normal pressure varied as the square of the angle of incidence on inclined planes;
- (d) Showed that the empirical formula of Duchemin, proposed in 1836 and ignored for fifty years, was approximately correct;
- (e) That the position of the center of pressure varied with the angle of inclination and that on planes its movements approximately followed the law formulated by Joessel;
- (f) That oblong planes, presented with their longest dimension to the line of motion, were more effective for support than when presented with their narrower side;
- (g) That planes might be superposed without loss of supporting power if spaced apart certain distances which varied with the speed;
- (h) That thin planes consumed less power for support at high speeds than at low speeds.

2—He made a steam propelled model aerodrome in 1896 which repeatedly demonstrated its ability to make long flights.

3—He built the first gasoline engine suitable for the propulsion of a man-carrying aeroplane.

4—He built the first gasoline propelled model aeroplane to make successfully a sustained free flight.

5—He built the first man-carrying aeroplane capable of sustained free flight, the successful demonstration of which remained for others to accomplish after his death.



comprehend the practical, he saw the need for a standardized time system for the operation of the railroads of the country, and not only devised the means for providing it but persuaded the railroads to adopt his plan and the method of carrying it out and to furnish the necessary equipment. He linked astronomy and railroad operation and eventually sent the time twice a day from his clock, set by the sun, to stations on railway lines extending for thousands of miles. More than any other man, he is responsible for the system of standardized time in use to-day.

Langley's investigations of the surface of the sun and his study of sun spots resulted in drawings and records which, though made before the year 1875, are still regarded as the most authoritative data available on the subject. This fact bears eloquent testimony to the infinite care and patience with which he worked and the keen intelligence which guided his efforts.

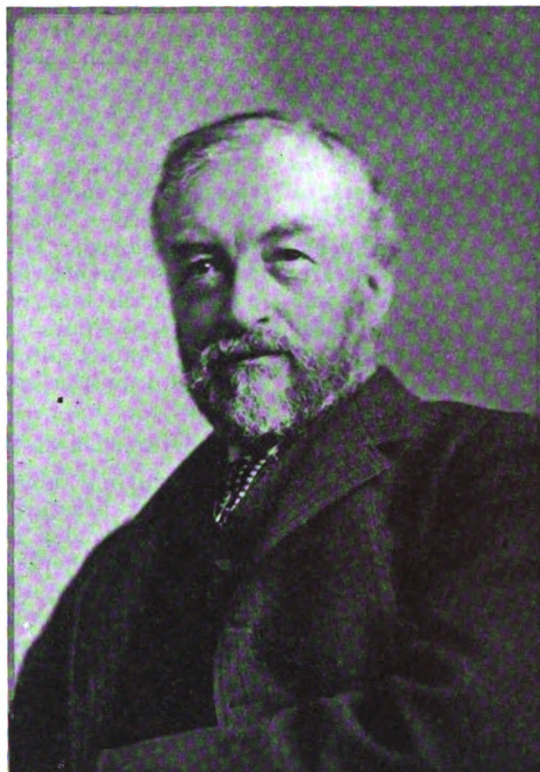
In 1879 and 1880 Langley developed and constructed the bolometer, an instrument of such infinite delicacy and precision that it indicates accurately variations in temperature of less than one-hundred thousandth of a degree centigrade. By means of it he was able to analyze in detail the heat of the moon in a lunar heat spectrum.

In 1886, following a long succession of astronomical investigations of an original and far reaching character, he was invited to become and became assistant secretary of the Smithsonian Institution with the stipulated privilege of continuing his research work at Allegheny Observatory. In August of the following year he was made secretary of the institution and held the position until his death, on February 27, 1906.

Knowing who and what Dr. Langley was gives one, as we have said, a better conception and keener appreciation of the value of his contributions to the science of aeronautics.

#### His Methods Logical and Scientific

Unlike nearly all other investigators in the field of mechanical flight, Langley did not follow the cut-and-try methods of the average experimenter. He engaged first in the most painstaking research to determine fundamentals and to discover and classify the principles involved so that he could successfully employ them later. The process which he followed was logical and scientific. It began in the laboratory and ended in the work shop. By the time that he was ready to begin to construct he knew not only what he was going to build, but how he was going to build it, and why it should be built in that particular way. He attacked the problem of developing a new science and of practically applying the principles involved in much the same manner as a naval architect would to-day lay out plans for a merchant ship, and hav-



SAMUEL PIERPONT LANGLEY

*Langley's experiments in aerodynamics resulted in the compilation of data which provided a firm basis upon which to build the science of aviation*

ing finished them, send them on to the constructors with the knowledge that if the plans laid out were followed the result expected would be accomplished. There was this difference, however, in Langley's case: He was obliged to work out the fundamentals upon which the plans for construction were based.

A close study of the work which Langley did at the Allegheny Observatory in devising instruments and apparatus for making the tests necessary for the development of the principles he sought results in unceasing wonder at and admiration of the thorough and careful manner in which he carried out his experiments even to the smallest detail. It is impressed upon one, in going over the record of these experiments, that no detail was too small to be regarded by Langley as unimportant. He seems to have given thought to everything that could possibly have been considered. He provided and made allowances for all extraneous factors and influences which could have affected the results and have

thus led him from the truth he sought.

The work of Langley in theoretical and applied aerodynamics divides itself naturally into three distinct parts:

1—His experiments in aerodynamics at Allegheny Observatory, where for three years he confined himself exclusively to the making of tests for the determination of principles and the development of data to be used later in constructing models and man-carrying machines.

2—His experiments with rubber-pull and steam-driven models, as a result of which he was able to construct a steam-propelled model which flew for more than three-quarters of a mile.

3—His work with the quarter-size gasoline engine-driven model and the construction, after its successful demonstration, of a full sized man-carrying machine propelled by a gasoline engine.

The fourth part of Langley's work, although it was concluded several years after his death, is the demonstration of the practicability of the machine he unsuccessfully attempted to fly, which was accomplished at the plant of the Curtiss Airplane & Motor Corp. at Hammondsport, N. Y., in the fall of 1914.

This article is the first of a series of four, dealing with the contributions of Dr. Langley to the science of aerodynamics, which will appear in AUTOMOTIVE INDUSTRIES. It deals only with his experiments at the Allegheny Observatory. The three remaining articles will take up the other parts of his work, as outlined above.

Langley was prompted to make his investigations into the possibilities of mechanical flight not so much by the interest which he had felt in the subject for, as he put it, as long as he could remember, as by the conflicting theories which were advanced and the evidently erroneous

explications which were offered even by some supposedly scientific thinkers. There was so much confusion about the whole subject that Langley decided to find for himself by means of laboratory experiments just what the possibilities were.

As was characteristic of him, he gave his entire self over to the undertaking and at the end of something more than three years of the closest kind of work he announced in the introduction to his "Experiments in Aerodynamics," written when the experiments were completed, that his researches had led to the conclusion "that mechanical sustentation of heavy bodies in the air, combined with very great speeds, is not only possible, but within the reach of mechanical means we actually possess, and that while these researches are not meant to demonstrate the art of guiding such heavy bodies in flight, they do show that we now have the power to sustain and propel them." This was written in 1891, many years before the demonstration of the truth of these words was accomplished.

Langley's first three years of work in aerodynamics was, it has been said, down at the Allegheny Observatory, at Allegheny, Pa., to which description of location should be added, if we are to follow the example of thoroughness which Langley set in his own description of what he did there ("lat. 40 deg. 27 min. 41.6 sec.; long. 5h. 20m. 2.93s.; height above sea level, 1145 ft.")

#### His Apparatus

His principal piece of apparatus was a large whirling table with a radius of 30 ft., which consisted of two symmetrical wooden arms revolving in a plane 8 ft. above the ground. It was driven by a gas engine of  $1\frac{1}{2}$  horsepower during the early days of experimenting, but as this was found to be inadequate for the work a steam engine of 10 horsepower was substituted later. A belt from the engine connected with a set of step pulleys providing four different rates of speed. These pulleys in turn drove a horizontal shaft which ran under ground to the axis of the whirling table and drove the latter by means of a pair of bevel gears, having a ratio of 1 to 5. The step pulleys gave 25, 50, 100 and 200 revolutions to the whirling table for 1000 revolutions of the engine.

During the last of his experiments the gear ratio of the bevels was changed to 1 to 4 and a new system of

pulleys was installed so that at 120 revolutions of the engine per minute, 48, 24 and 12 revolutions of the whirling table per minute were secured and these corresponded with 100, 50 and 25 miles per hour at the end of the arms.

It was possible, of course, to secure any intermediate speed by varying the speed of the engine.

Langley did not leave the determination of the actual speed at the end of the arm at any time to a calculation of the speed of the engine at that moment and the gear ratio employed. The precise velocity was obtained by means of an electrical registration on a chronograph placed in the observatory. Four equally spaced contact pieces were secured to the fixed axis of the table and a moving contact piece was secured to a horizontal arm screwed into the axis of the turntable and revolving with it.

#### Advised Erection of Whirling Table Indoors

The whirling table was located in the open air because it was not practical to construct a large building to house it. Langley felt, also, that it was better to conduct his experiments in the open air on calm days, as "in a confined building the rotating arm itself puts all the air in the room into slow movement, besides creating eddies which do not promptly dissipate." It turned out, however, that calm days were not so numerous as had been expected, and in his record of what transpired Langley complained that "from the beginning to the end of the experiments the presence of wind currents continued to be a source of delay beyond all anticipation as well as of frequent failure," and he advised any one making similar experiments to erect his whirling table in a large building.

For use in connection with the whirling table Langley devised and constructed a large number of special instruments, each designed to establish some particular fundamental. Many of these instruments will be described and illustrated later. The care with which the details of this apparatus were worked out is little short of amazing. The results of his long investigations are summarized at the early part of this article and constitute, as is now generally acknowledged, probably the most substantial contributions to the science that any one man has made. *(To be continued)*

## Airplane Altitude Record Now 28,900 Ft.

**C** LIMBING over 5 miles into the air, to an altitude of 28,900 ft., and coming down to a site 200 miles distant from the starting point, were some of the extraordinary experiences of Capt. R. W. Schroeder, Air Service, U. S. A., on Sept. 18. Capt. Schroeder's altitude record has been officially confirmed. He started his flight at Dayton and landed at Canton, Ohio. In the report of the climb, filed with Major General Kenly, Director of Military Aeronautics, he said:

"In order to take an airplane to a higher altitude than any other pilot in the world, I found that it would require more than one or two attempts. I made three attempts. The first one took me to 24,000 ft., the second to 27,000 ft. and the last one to 28,900 ft., but now I feel certain that I can get to 30,000 ft.

"The cold thin air is one's greatest adversary. First of all, one must make a study of the performance of his motor at these high altitudes. I took off at 1.45 p. m. Wednesday, Sept. 18, and made a steady circular climb, passing through clouds at 8000 ft., 12,000 ft. and 16,000 ft.

"At 20,000 ft., while still climbing in large circles, my goggles became frosted, making it very difficult for me to watch my instruments. When I reached 25,000 ft. I noticed the sun growing very dim, I could hardly hear my motor run, and I felt very hungry.

"The trend of my thought was that it must be getting late. That evening must be coming on, but I was still climbing so thought I might as well stick to it a little longer, for I knew I could reach my ceiling pretty soon, then I should go down, and even though it were dark, I could land all right for I had made night landings many times before; and so I went on talking to myself, and this I felt was a good sign to begin taking oxygen, and I did. I was then over 25,000 ft., and as soon as I started to inhale the oxygen the sun grew bright again, my motor began to exhaust so loud that it seemed something must be wrong with it; I was no longer hungry, and the day seemed to be a most beautiful one. I felt like singing with sheer joy as I gazed about through the small portion of my goggles which had no frost, due to a drop of oil which had splashed on them from the motor.

"When I was about 27,000 ft. I had to remove my goggles as I was unable to keep a steady climb. My hands by this time were numb and worried me considerably. The cold, raw air made my eyes water, and I was compelled to fly with my head well down inside the cockpit.

"I kept at it until my oxygen gave out, and at that point I noticed my aneroid indicated very nearly 29,000 ft. The thermometer showed 32 degrees below zero, Centigrade, and the revolutions per minute had dropped from 1600 to 1560."



# Tractor Development in Iowa

## Agricultural State Has Many Concerns—States in Grain Belt Offer Inducements for Tractor Manufacture

By P. M. Heldt\*

**M**INNEAPOLIS, Oct. 14.—It is quite evident that the center of gravity of the tractor industry will be located farther West than that of the automobile industry. Consideration of shipping conditions naturally draws an industry having a market all over the United States to the center of the country, but the fact that the early demand for automobiles was mostly from the big cities tended to draw the automobile industry eastward.

On the contrary, the early demand for farm tractors came from the large farms of the Far West. While Michigan, Ohio and Indiana are the predominating states in the automobile industry, Illinois, Iowa and Minnesota are making a strong bid for the tractor industry. In fact, much of the early work in tractor development was carried on in Iowa and Minnesota, and to-day Minneapolis possesses more individual tractor factories than any other city, though the plants of largest production are located elsewhere.

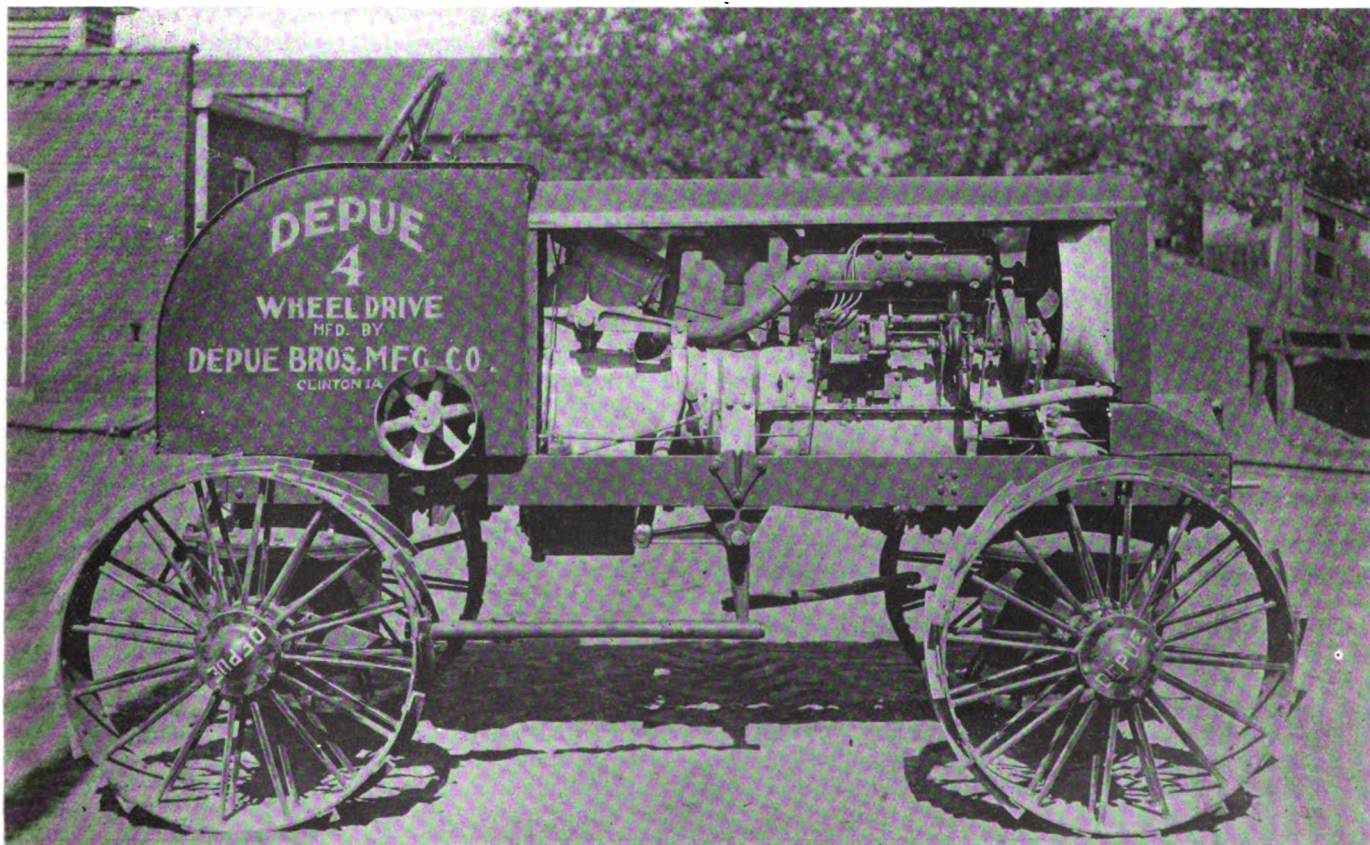
Iowa at present possesses one tractor factory having a very large output, a number of others of moderate output and some concerns still in the development stage or

just getting into production. There are also at least two important parts plants in the state.

At Clinton, on the Mississippi, is located the Climax company, which manufactures engines for farm tractors. Climax succeeded a well-known marine engine concern (Lamb Boat & Engine Co.) and the men who designed and produced the Climax have had 16 years' experience with heavy duty internal combustion engines. Climax engines are used in Square Turn, Wisconsin, Coleman and Illinois tractors among others. This engine, which burns kerosene, is rapidly gaining favor among tractor manufacturers and the company quite recently has had to build a 90 x 280 ft. factory addition, which is now in use. A new power plant containing a 250-hp. boiler, and an engine and a generator to correspond, are in course of erection. About 100 men are employed. C. B. Stebbins is president and general manager of the company, R. D. Upton, vice-president and superintendent, and J. W. Delany, Jr., secretary and treasurer.

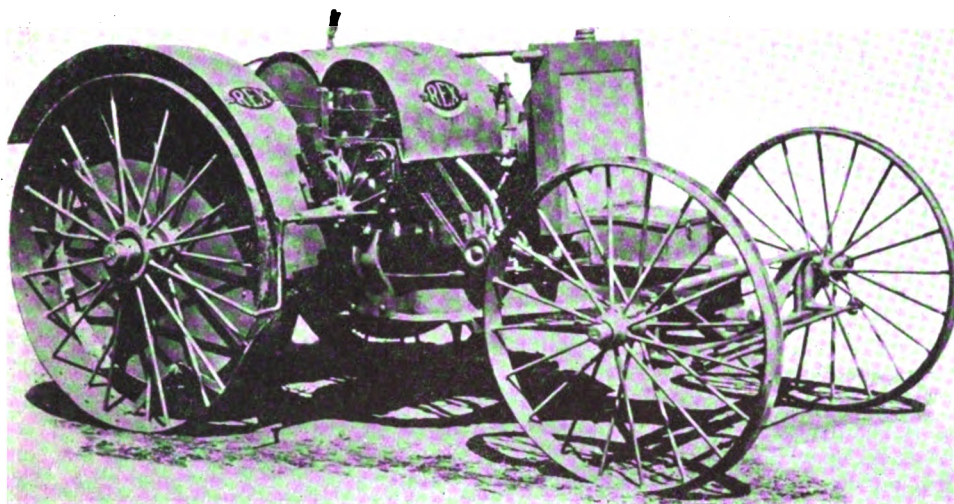
Depue Brothers, who have built a four-wheel drive farm tractor at Clinton, are still in the development stage. The engine and its accessories and the clutch are standard parts, but the frames, axles, steering gear

\*P. M. Heldt has been making an extensive investigation of farm tractor manufacturing conditions throughout the Middle West.



*Depue four-wheel drive and steer tractor*





*Rex three-plow tractor built by the Leader Tractor Mfg. Co.,  
Des Moines, Iowa*

and final drive are of original design. A Buda Model YU engine is used, together with Stromberg carbureter, Bosch magneto, Perfex radiator, and Borg & Beck clutch.

The transmission, which is of the selective sliding type and gives three forward speeds, is bolted to the engine bell housing to form a unit power plant, and the steering gear housing is bolted to the top of the gearbox. There is no direct drive in the transmission, as at all times the drive is from the primary to the secondary shaft. The latter connects through propeller shafts to the front and rear axles, there being two Spicer joints in the forward propeller shaft and one universal of the company's own design in the rear shaft.

The feature of the tractor is the combined driving and steering axle. Both axles are alike, as the tractor is both four wheel driving and four wheel steering. The axle has a cast steel housing of the double banjo type, the differential casing being open at top and bottom. Into the top is set the gear carrier and this takes the weight of the tractor on a 7-in. Timken bearing. Axle and gear carrier can swing around a vertical axis, this motion being allowed for by a kind of fifth wheel arrangement. In the tractor built, the bearing surface of the fifth wheel is rather hard, and to eliminate the friction a row of balls will be inserted between the gear carrier flange and the stationary ring opposite it.

There is a double bevel gear reduction in each axle, the pinion on the propeller shaft meshing with a gear on a vertical axis, and a pinion at the lower end of the shaft carrying this gear meshing with the bevel gear ring on the differential. Each bevel gear set gives a reduction of 4:1, making the total reduction in the axle 16:1. A further reduction is obtained in the gearset and with an engine speed of 700 r.p.m. The tractor speeds are of  $1\frac{3}{4}$ , 3 and 6 m.p.h. The wheelbase is 99 in. and the wheels are 40 x 10 in.

As both axles have to be turned around their vertical center in steering, a very powerful steering gear is required. It comprises a 20-in. hand wheel and a single head worm meshing with a 33-tooth worm wheel. From the arm on the worm wheel shaft a heavy link extends down to an arm on a cross steering shaft under the main frame, and from this there are lever and link connections to the axle housings.

The 8-in. diameter 10-in. face belt pulley is controlled by the drive clutch and by a lever putting the driving bevel gears in and out of mesh. Completely filled, the

tractor weighs 7200 lb. It is rated as a four-plow tractor, this rating referring probably to the lowest speed. The belt speed is 3000 ft. p. m.

Depue occupies the plant of the old Clinton Brewing Co. The company was incorporated about a year ago, and its first machine was built in Kenosha, Wis.

The National Tractor Mfg. Co., Cedar Rapids, is the successor to the Denning Tractor Co. The latter concern was organized in 1910, and during its existence turned out several hundred tractors. Recently the production has been brought up to five a day, though the total produc-

tion for the current year will be only between 200 and 300.

Two models are made, a 9-16 and a 12-22. The National is a friction drive type and employs the Waukesha engine. The flywheel is developed in the form of a friction wheel, and there is a large diameter plate on either side of it which can be forced into frictional contact with it by means of a lever to give forward or reverse drive. From the friction disc shaft is spur gear drive to the differential shaft, this set of gears being located outside the frame and enclosed in a sheet metal housing. From the differential shaft the drive is through double spur gears, fully enclosed and running in oil, to driving sleeves on the rear axle to which the driving wheels are rigidly connected.

The largest manufacturer of gas tractors in the state of Iowa is the Waterloo, which was originally organized to build such machines as far back as 1893. The gas tractor was not a success at that early period, but the company got into the manufacture of stationary engines for farm use. At present it builds six different sizes of farm engines, of  $1\frac{3}{4}$ ,  $2\frac{3}{4}$ ,  $4\frac{1}{2}$ , 6, 8 and 12 hp. Only one size of gas tractor is manufactured, the Waterloo Boy, a kerosene-burning, two-cylinder, 3-plow design.

The company occupies very extensive works, two of the buildings being 1000 feet long each, and the entire plant covering 40 acres. Approximately 25 per cent of the total capacity is devoted to the manufacture of tractors, and the present output is 35 a day. While an effort was made to manufacture gas tractors in 1893, regular production of these tractors was begun about five years ago, and this branch of the business has seen very rapid development, as may be judged from the present output. About 1400 men are employed.

The engine, a two-cylinder horizontal one with opposed cranks, has a bore of  $6\frac{1}{2}$  in. and a stroke of 7 in., and a horsepower rating of 750 r.p.m. of 25 on the brake and 12 on the drawbar. One of the features of the engine is that the forward half of the crankcase can be removed, and the operator can then adjust either the connecting rod or main bearings while standing in a natural position, in which he can apply his strength to the best advantage, and also judge most accurately the character of the adjustment. All valves are located in the cylinder head, which is removable. The engine is set crosswise of the frame and an enclosed transmission is located adjacent to it. The contracting type of clutch is built



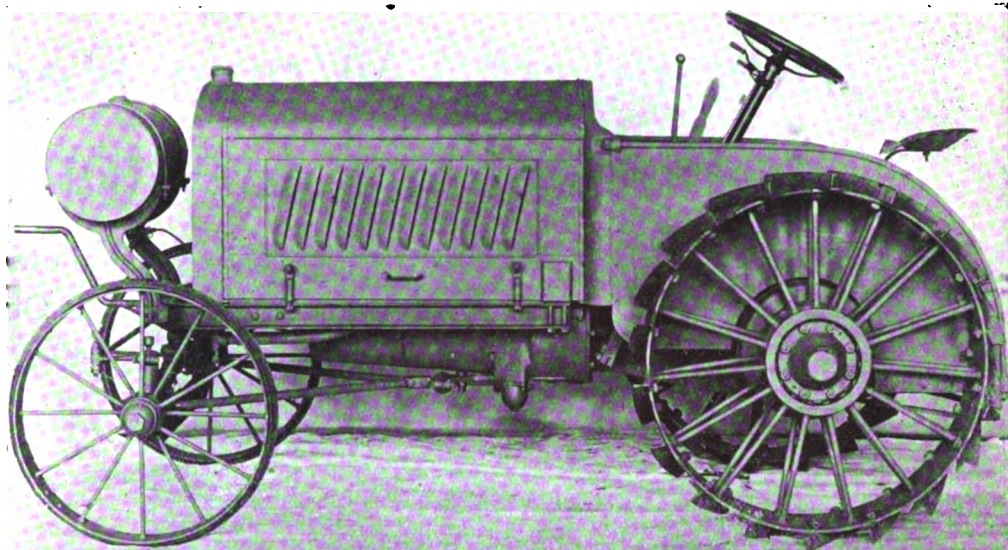
together with the flywheel and the belt pulley is located on the end of the primary shaft of the gearset, directly in line with the crankshaft. Two forward and one reverse speeds are obtained by sliding pinions. Transmission is from the primary shaft to a countershaft and thence to the differential jackshaft. At the end of this shaft are bull pinions which mesh with the internal type bull gears on the driving wheels.

The radiator is set with its face parallel with the longitudinal axis of the tractor, which makes for easy drive of the radiator fan, and also protects the radiator against trash being drawn into it. No air cleaner is fitted, but air is drawn into the cylinders through a stand pipe extending 2 ft. above the engine. The fuel tank is carried on brackets at the front end of the frame.

Steering is by a pivoted front axle and a chain extending from lugs near the ends of the axle and running over a drum operated by the steering gear. This construction will be recognized as similar to that usually employed on steam traction engines.

The Interstate, another Waterloo concern, turns out about 1500 tractors a year. The product consists of two models, one 13-30 and the other 15-30 hp. Two different sized engines are used, and though the belt horsepower of both is rated the same, it is stated that the 15-30 model has much more reserve power. Both use Buda engines, Foote transmissions and Cotta clutches. The company formerly made a small tractor known as the Plowboy. This has now been discontinued and eventually the 13-30 model will be known as the Plowboy, while the 15-30 model is referred to as the Plowman.

This concern has also been working on a new model, the Trojan, which has been demonstrated on various occasions, but which is not yet in production.

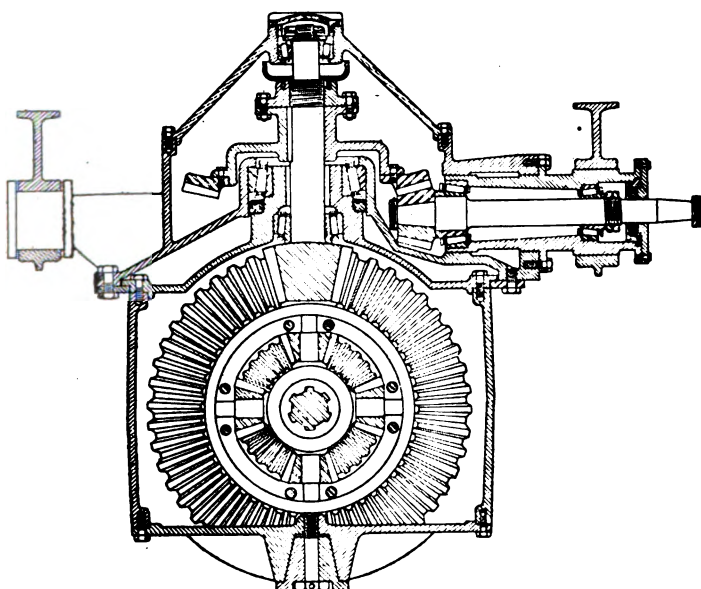


*Worm-drive tractor made by the Galloway company of Waterloo, Iowa.  
It is equipped with a  $4\frac{1}{2} \times 5\frac{1}{2}$  four-cylinder engine*

The 15-30 Plowman, with a  $4\frac{1}{2}$  by 6 in. Buda engine, weighs 4800 pounds, of which 2950 pounds is carried on the rear wheels and 1850 pounds on the front wheels. Its engine and gearset are combined into a unit power plant, from which final drive to the rear wheels is by spur pinions and internally toothed bull gears. The driving wheels are provided with cone lugs. Steering is on the Ackerman principle and the front axle is built up and has the front end of the frame pivoted to it. A Bennett air cleaner and a Bennett carburetor are fitted and kerosene is the fuel used.

Another large concern in the agricultural implement industry in Waterloo, which has been doing some work in the tractor line, is the William Galloway organization, which has been making a chain-driven tractor, and is still furnishing some of these machines; but during the past year it has developed a worm-driven job which will be its principal model in the future. The chain-driven model was first taken up 4 years ago, and possibly 800 of this type have been sold and delivered. First experiments with the worm drive are said to date 3 years back, and in January of this year the company received an order for 1080 tractors of this type from the well-known British firm of Henry Garner, Ltd. W. L. Bodman, whose name will be remembered by many whose experience in the automobile field dates back to the early years as one of the pioneers of the British steam truck industry, came to this country during the summer of 1916, having been sent by the Garner concern to look over the tractor field here and select a number of different types of light tractors which would meet the requirements of British farmers. Mr. Bodman purchased and forwarded to England samples of six different tractor types, both creeper and wheel. All these types were thoroughly tested out during the winter and spring of 1916-17. As a result of these tests orders for 1200 tractors were placed with different American makers during 1917, but owing to various causes only ten of these 1200 were delivered during the first 6 months of 1917. Mr. Bodman then returned to America, and by looking personally after deliveries succeeded in getting 250 across during the last 6 months. During this second trip to America Mr. Bodman got into communication with the Galloway company and as a result of a report which he made on its worm-driven model an order for 1080 machines was placed by Garner. Unfortunately, however, Galloway so

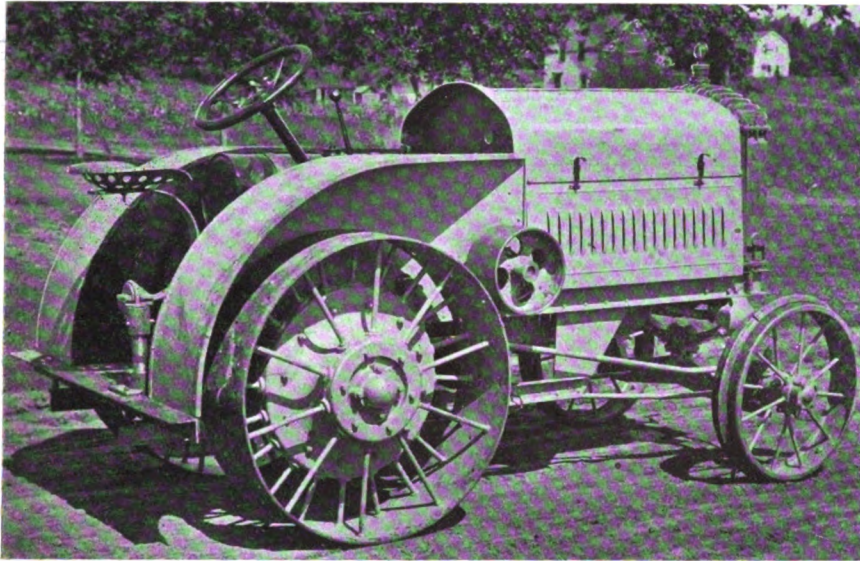
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*Double-bevel gear reduction and differential used in both front and rear axles of the Depue four-wheel drive tractor*



# Internal and Worm Reduction in Dart Tractor



By P. M. Heldt

**A** NEW final drive is the distinguishing feature of the Dart farm tractor. It combines the worm with the internal gear drive and takes account of the fact that a worm drive is most efficient at high speeds, while the internal gear drive is most efficient at low speeds.

The new machine is a three-plow tractor and is equipped with a Buda four cylinder  $4\frac{1}{4} \times 5\frac{1}{2}$  engine. Either a Zenith or Kingston carbureter is fitted, and gasoline is recommended. For regular production Dart will use the new Buda special design of tractor engine, which was not yet available when the model on which this description is based was built.

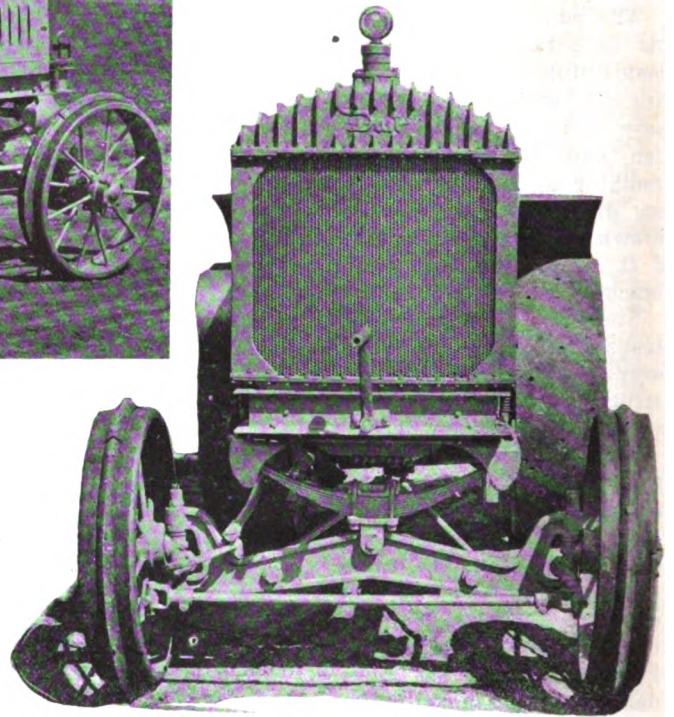
Fuel is carried in a 20-gal. tank arranged lengthwise behind the engine. A Bennett air cleaner is regular equipment. Ignition is by a Dixie magneto with hand control of the spark. The cooling water is circulated through a Modine radiator with cast top and bottom tanks and distance pieces. The fan is 20 in. in diameter and is driven by a 2-in. flat belt. Engine support is of the three-point type.

The engine, with a piston displacement of 312 cu. in., gives the tractor rating of 15 hp. on the drawbar and 30 hp. on the belt, although it is claimed that the horse-powers developed considerably exceed these figures.

A multiple-disk type of clutch is used which consists of hardened steel plates running in oil. The gearset, giving three forward speeds and reverse, is similar in design to an automobile type except that the intermediate speed is the direct drive, the high speed being geared up. The three forward speeds are  $1\frac{3}{4}$ ,  $2\frac{1}{2}$  and 5 m.p.h. Of these the intermediate speed,  $2\frac{1}{2}$  m.p.h., is the plowing speed and corresponds to direct drive.

Power for the belt shaft is obtained from the clutch-shaft through a pair of helical gears located between the clutch and gearbox. The driving member of this gearset is made of hardened steel and the driven one of aluminum

Total Reduction of  $48\frac{1}{3}:1$   
Is Obtained—Rear Wheels  
40-In. Diameter—Weight,  
4500 Lb.

*Side and front views of the Dart three-plow farm tractor*

bronze. A slight reduction of speed is obtained through this pair of gears, the pulley shaft running at five-sixths the speed of the crankshaft. The belt pulley is 12 in. in diameter by 7-in. face and is of the conventional cast-iron type. A positive clutch is incorporated in the pulley drive so that the pulley need not be kept running while the tractor is used for plowing and other field work. This clutch is of the internal and external gear type. The lever for engaging the pulley clutch has a sideward motion.

## Rear Axle Construction

Back of the gearbox a fabric-type universal joint (Thermoid) is incorporated in the propeller shaft. The rear axle construction is similar in lay-out to that of the usual internal gear truck axle, except that the bevel gear reduction at the center of the axle is replaced by a worm gear. The rear axle housing is of cast iron. The worm gear used is the standard 2-ton truck design and gives a reduction of  $9\frac{2}{3}:1$ . It operates a jackshaft on each end of which there is a spur pinion meshing with an internal gear secured to the driving wheel of the tractor. This internal gear or bull gear is completely enclosed. An additional reduction of 5:1 is obtained by this in-



ternal gearset, making the total reduction for the direct drive 48 1/3:1. The worm and worm gear are supported by a gear carrier and the whole gearset can be removed integrally from the axle housing. This set of gears is mounted on Gurney bearings, and the same make of ball bearing is used in the gearbox and in the rear wheels. The differential is a Brown-Lipe four pinion type.

The rear axle housing is an iron casting made with flanges at the ends to which are bolted two circular disks forming the covering for the internal gears. These disks are formed with lateral flanges at their circumference and the flanges are turned with a groove on the inside in which is inserted a felt packing insuring a dust-tight joint with the gear ring. The spur pinions are made of 3 1/2 per cent nickel steel, hardened, and have a face width of 2 1/4 in. Steel axle spindles are pressed into the ends of the axle casting for a distance of 8 to 9 in. and are secured in place by set screws. The front axle is of I-beam section and is also an iron casting. The front wheels are fitted with Timken bearings.

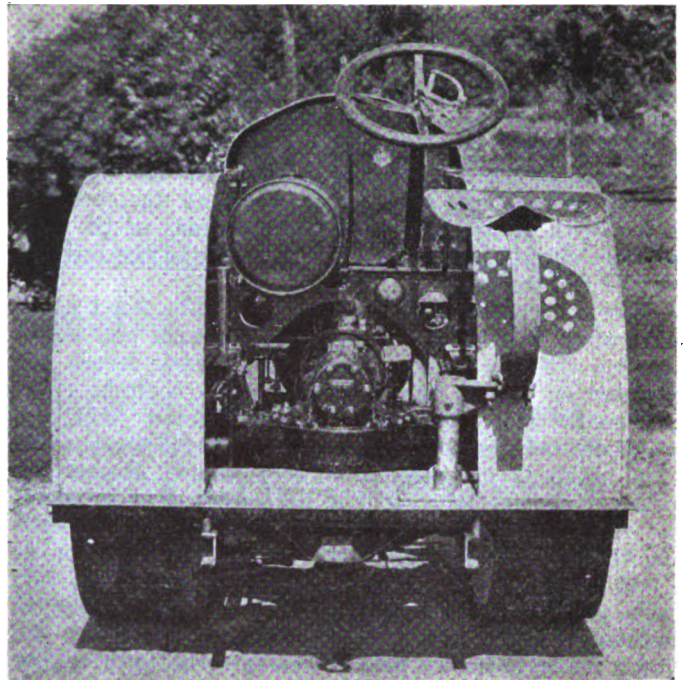
#### Frame Made of 4-In. Channel Steel

The frame is constructed of 4-in. channel steel, the channels having a weight of 6 1/4 lb. per foot. The frame extends some distance forward of the engine and has a cross-member of the same material as the side bars at the extreme front. The forward end of the frame is supported on the front axle through a semi-elliptic spring 24 in. long by 2 in. wide, which is swiveled to the axle at the middle and connects through shackles and enclosed type of spring brackets to the frame at its ends.

In addition to the main frame there is a sub-frame made up of 3-in. 4-lb. channels which are placed with the open side outward. These latter channels extend from the rear end of the tractor to about midway between the front and rear wheels, some 16 in. below the main frame channels, to which their front end is connected by brackets of 3/8-in. rolled steel.

At the bottom of the gearbox there is a lug from which extend two slanting radius rods to near the ends of the front axle and two other radius rods to a bracket secured to the front of the rear axle housing. The forward radius rods at their rear end are hinged to an eye bolt passing through the lug of the transmission housing referred to.

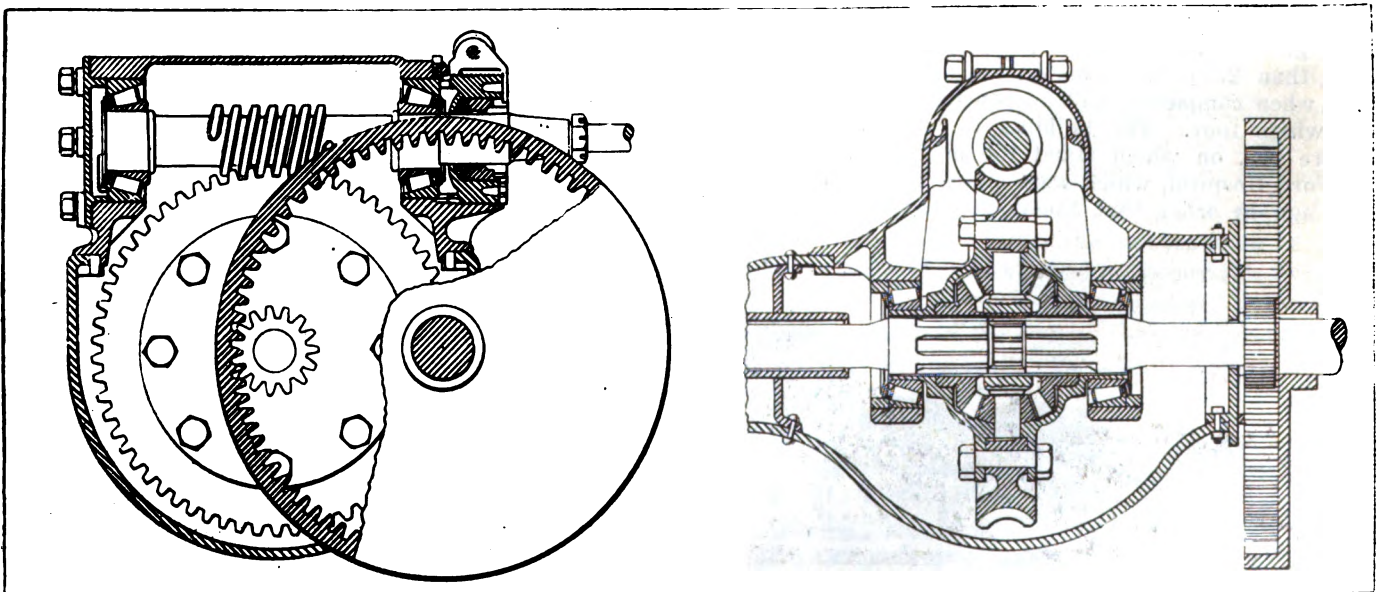
A flexible exhaust pipe leads to the muffler mounted crosswise of the frame close behind the engine. A muffler



*Rear view, showing arrangement and construction of the Dart tractor axle*

cut-out is provided, this being one of the few tractors so fitted. Mr. Johnson, the designer, argues that a farmer appreciates noiseless operation in his tractor as well as in his automobile and has carried out this idea throughout the design, as both the worm drive and the flexible universal joint make for noiselessness.

Most of the weight on the forward wheels is carried on roller bearings mounted at the inward end of the hubs, whereas a bronze bushing is forced into the outer end. The steering knuckles are of conventional design, and hardened bushings and washers are fitted to them. The front wheels, 28 in. in diameter by 5 1/4 in. wide, are of the built up type, having cast hubs, round spokes and rolled steel rims. A cast-iron, slightly hooded dash is bolted to the frame and is formed with a ledge on its forward side upon which the rear end of the engine hood rests, there being a corresponding ledge on the



*Side and end sections of Dart combination worm- and internal-gear double-reduction tractor axle, with worm reduction at center and internal-gear reduction at the ends*

radiator for the forward end of the hood. The hood is hinged at the center. Its sides, which hook under sheet metal angles riveted to the frame and are secured in place by means of spring type hood fasteners, can be readily removed to give access to the engine and its accessories. The fenders and dust guards are made of No. 16 gage sheet steel, reinforced and fastened together with angle steel. The forward ends of the fenders are cut off at an angle, which adds to the appearance of the tractor.

Steering is effected by means of an 18-in. hand wheel with wood rim, operating through a worm and wheel Lavigne steering gear. Spark and throttle levers are mounted on top of the steering wheel. A brake operates on the rim of the fabric type universal joint, the brake drum being  $9\frac{1}{4}$  in. in diameter by  $2\frac{1}{4}$  in. wide. This brake is operated in a very simple manner by means of a long, substantially horizontal lever to which the free end of the brake band is directly connected and the rear end of which is developed in the form of a pad on which the operator steps. In addition to this brake pedal there is a clutch pedal, the clutch operating mechanism being of the type used on automobiles, the clutch being normally held in engagement by a spring and disengaged by pressing on the pedal.

The rear wheels are 40 in. in diameter with 12 rims to which spade lugs are secured. At the rear of the tractor there is an angle steel cross bar which is bolted to the extreme ends of the frame side members and the fenders are secured to this cross bar. The cast-iron floor, with a pyramid non-slipping surface, is bolted to

both side members and the cross member of the frame.

The drawbar is of the spring type and is joined to the frame in such a way that there can be no rearing when turning corners in plowing. There are two diagonal channel steel members which are bolted to the sub-frame and which join together in the longitudinal axis of the tractor some distance ahead of the rear axle. It is at this point that the drawbar is attached.

#### Driver's Seat Mounted on C Spring

A pressed steel driver's seat is mounted on a C spring and can be swung around its supporting axis in order to enable the driver to get easily into the seat and out, and also to swing it out of the way when he wants to stand up while driving the machine. There is an arch-shaped tank support of cast iron almost directly above the rear axle. This carries the fuel tank, the magneto switch and the carburetor control.

The Dart Blue J tractor has a wheelbase of 78 in. and a tread of 52 in. measured from outside to outside of wheels. The tractor complete, but empty, weighs 4500 lb. Overall dimensions of the tractor are: Length, 125 in.; width, 56 in.; height, 65 in. The standard equipment includes a motometer, spade lugs or angle cleats and a full set of tools. Lighting and starting equipment can be furnished at an extra charge.

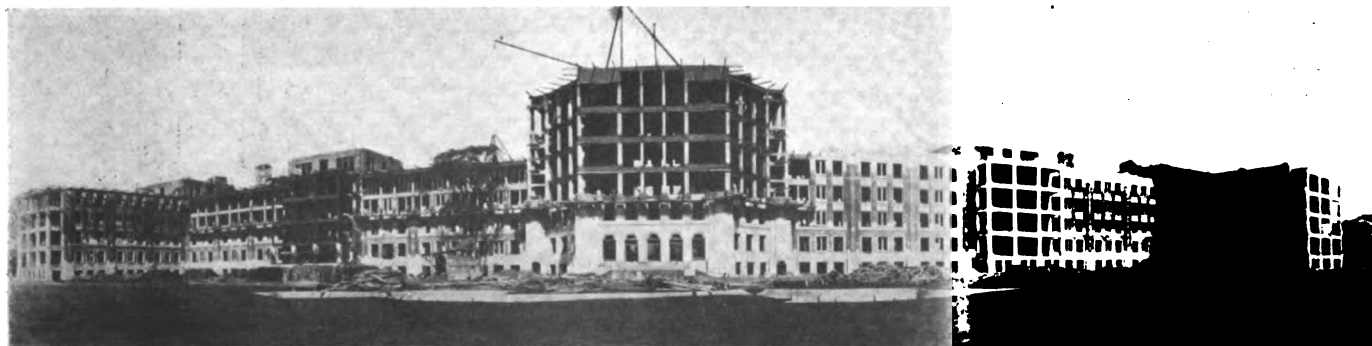
As in plowing the engine acts directly on the worm gear, the tooth pressures in it are no greater than in a motor truck having the same engine power and size of worm gear. All parts of the transmission are enclosed and run in oil, hence operate efficiently and noiselessly.

## Government Takes Ford Hospital

DETROIT, Oct. 14.—The Government has recently taken over the new Ford Hospital which is in process of construction, and which, with its capacity for 2000 men, will be equipped to meet all requirements, the same as a base hospital in France. It is hoped that this hospital will be open for patients Jan. 5, 1919, when it will be given over almost entirely to surgical cases. The building, 750 ft. long, is built in units, and is so designed as to give maximum light; in fact, no person can get more than  $22\frac{1}{2}$  ft. from window space. The middle unit, when completed, will be six stories high, and the two wings four. The building is being erected on a 20-acre plot on which stand the original buildings of the Ford Hospital, which were closed to the public some time ago in order that the doctors and nurses might

engage in more useful work for the Government, either in France or in cantonments in this country.

It is planned to use the new hospital as a remaking one, in which maimed will be sent to have their disabled limbs made useful. Instead of being divided into over 400 private rooms, with baths, as was the original intention, it will be divided into thirty wards, each 40 x 75 ft., and accommodating 50 men. This will permit the men to enjoy the comradeship of each other, which is desirable with such cases. When the hospital was started it was not the intention to turn it over to the Government, but now that this course has been decided upon all elaborate finishing will be neglected and no painting done. Ornamental plastering and decorating will be done when the war is over.



*Partly constructed Ford hospital, which when completed will have a capacity for 2000 men. It is expected the building will be opened for patients Jan. 5. There will be 30 wards, each 40 x 75 ft. and accommodating 50 men*

# "Which Side Are You On?"

## Employers Asking This Question Let Slip Good Opportunities

"Conditions of labor are still fluid and there is still opportunity for great advancement; we are in a most advantageous position to institute a change, to make it possible for the workman in the individual factory to take his responsibility and incentive from that factory and to secure his individual strength and his confidence from that organization, instead of the occupational labor organization, which is his only means, at present, of obtaining these things."

By Harry Tipper

**T**HE other day, in talking with a member of a state manufacturers' association, the subject turned upon labor, as it must when manufacturing problems are uppermost. This manufacturer, who is broadminded in his business attitude, said: "I note you are writing upon labor. WHICH SIDE ARE YOU ON?"

That statement explains better than half-a-book the fundamental trouble with the whole attitude upon labor questions: the assumption that an analysis cannot be made, that there must be conflict and that it is necessary to take sides. The consequences of this are seen in the constant misunderstanding on both sides as to the reasons for the adoption of policies and practical demands, and the assumption of a belligerent attitude at every turn of events.

*The object of this series of articles is to analyze the conditions and the resulting tendencies, without regard to the particular merits of any one conflict, or the particular prejudices as they exist on either side. Such conclusions as are drawn will be drawn from the analysis and will be supported by evidence that appears to be sufficient, in the writer's examination of the matter, to warrant the findings.*

No discussion of this kind can proceed very far without taking some time to consider the history and the present conditions of the labor movements in this and other countries. Unless this is done the conclusions which are arrived at will be without the qualifying statements which the traditions and precedents of such history and development demand.

The labor union is a British development, and there it has been carried much farther than in any other country. Labor movements are strong in one or two of the other European countries, but the character of the movements in these countries is different on account of the fact that they have not developed

purely as industrial movements but have been colored by socialistic aspirations from early stages in their progress.

Furthermore, the history of labor organization is the history of the British labor union, the first portion of that history having occurred before other countries had acquired any large manufacturing interests. It is for these reasons that Great Britain offers the best example of the direction and the immediate extent of the practical ideals which are behind the labor organization.

These ideals do not vary greatly, but the practice varies in degree in this country, so that the problem is not so acute and there is a greater opportunity for intelligent compromise. The direction is the same, however, and Great Britain, having traveled a good deal further on this same road, can point out to us some of the things we may expect if the labor question is left to its usual and time-honored course.

*Just as we can determine the tendencies of extreme socialistic—collectivist—government from an examination of the results of the two most far-reaching attempts at this method—the German system of complete collectivism controlled by a vigorous autocracy and the Russian Bolshevik system carried without that control—so we can from an examination of the British conditions gain some idea of the direction in which we are moving in this country.*

The conditions in Great Britain vary from those in the United States in important particulars, not only as to the progress of labor influence and organization, but as to the conditions surrounding the workers and the general attitude toward labor union endeavors.

At present the British nation, as a whole, has accepted the labor organization and has admitted the necessity for it.



In the reports of the British Commissions, which have examined into war-time industrial conditions, the necessity for strong, well-organized labor unions is frequently insisted upon. From time to time recommendations are made for the strengthening of weak labor organizations and commendations given to the stronger bodies for their value in facilitating the work. In general the hours of labor in British industrial plants are longer, the conditions of lighting, heating, and sanitation not so good as in this country. The splendid arrangements for canteen, rest, hospital, general welfare, club and other activities found in many industrial plants in this country far surpass anything at the command of the average worker over there. The opportunities for advancement are not nearly so great and the industrial system has been in action for so many years that the worker has had time to settle into a distinct class. Further, the tendency of the worker to stay in his home section and the homogeneity of the people have given this class great solidarity.

Many of the detailed reports of conditions and changes as to health measures, hours, overtime, eating, sanitation and similar matters would not apply directly to the problems as they exist with us; but even in these cases the care with which the matters have been approached and analyzed leads to some general conclusions which are of great importance, apart from the detailed figures, to every large industrial operator.

The broad position of labor in the industrial and political life of Great Britain suggests many things in the acceptance and practice which may foreshadow the things we shall be called upon to meet.

### Most Trades Strongest

In the most important trades, the railroad, iron and steel, machinery, textile, mining and maritime, the labor organizations are much stronger than they are in this country in all respects. They count among the members of the labor unions a much larger proportion of the workers, in many cases a large majority. They have had long years of unbroken development and they are well managed. They possess an influence over the industrial life of that country which is almost a definite control. With these important trades so thoroughly entrenched in unionism, the organization of the thousand and one subsidiary trades has gone ahead at a rapid pace in the last decade or so.

It is now about 20 years since these labor organizations began to secure representation in Parliament and the fact that labor members have been holding cabinet positions since the outbreak of the war is significant of the importance and influence of labor in politics. It is true that we do not have any labor party in this country, or any appearance of one, but the influence of labor organizations on politics is indicated by a number of things which have happened and this influence has not lessened any during the war—so that, even though we may never have a labor party, we must regard it as certain that labor influence in politics, once felt, will grow here as it has in Great Britain, perhaps with more rapidity.

In the important trades mentioned previously, the shop procedure as to hours, overtime, restriction of output, holidays, settlement of disputes, etc., is governed thoroughly by labor union decision and practice in Great Britain. In this country, the influence of labor has not been felt to the same extent, but again, such influence as has been exerted has concerned itself with hours, overtime, holidays, production and the same general ideas as indicated in the labor action on the other side. As this influence extends in this country, the direction of its extension is plainly marked by the conditions exhibited in the older country.

Not only is it true that in the most important trades all these questions are handled through the labor union and under labor union rules, but it was necessary for the British Government, in order to get the necessary war-time production, to agree that all changes in the practice as to hours, overtime, limitation of output, etc., should cease as soon as the war was over and the pre-war practices be considered as governing the working conditions again.

### Shop Steward's Work

One of the special features of skilled labor and recently of unskilled labor organization practice in British manufacturing is the shop steward. This is a member of the union who is selected for the purpose and whose time is paid by the other workmen of the trade in the shop. The job of this steward is to see that all the workmen live up to the union rules and to see that the foreman does likewise. All disputes between the individual workman and the foreman go through this shop steward and to him come all complaints of the management. He has no relation to the labor organization, except that he is a logical outcome of the intense interference of the labor organization with the details of shop practice, the official who must see that this mass of detailed by-law on practices is observed both by workmen and employers.

A diligent reading of the reports which have been gotten together on the industrial necessities during the war will indicate the thoroughness with which labor has interfered in the formation of every detail of manufacturing practice. The most significant part of the matter is the acceptance of the labor union's right to do these things and the necessity for the consultation of the organization upon all these matters.

*Perhaps this recognition of the right of labor to have a voice in all that concerns its conditions of work is the most valuable part of the whole matter. That question seems to have been laid away in Great Britain. The manner of its demise may involve the industrial future of the country as seriously as the question itself, but that fact can be stated as genuine progress in industrial relations.*

But there are many things which have come out of the strength and development of the labor movement in Great Britain which are so questionable in their desirability and so doubtful in their efficacy

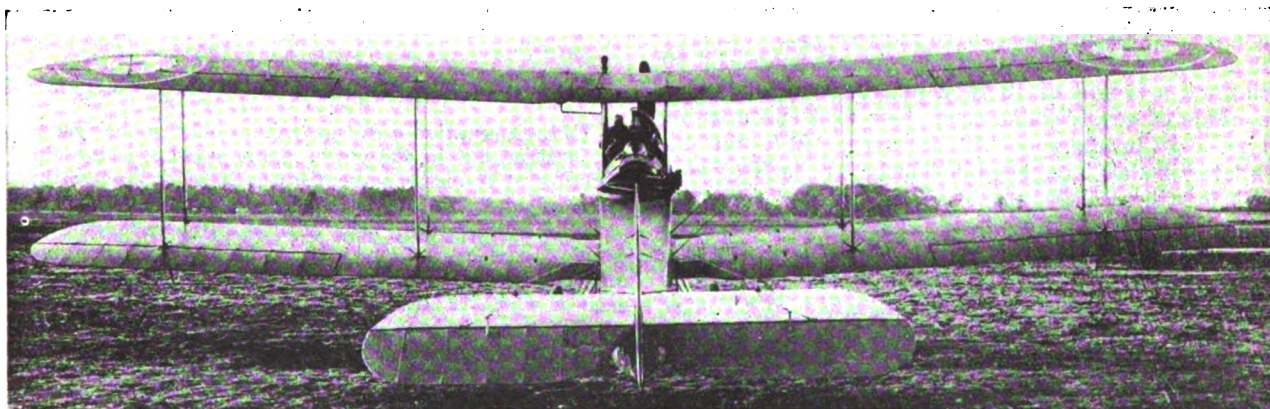
that we would better escape them if we can. The solution to the problem of satisfied labor has not been found in their more completely unionized industries, for they are still burdened with strikes and other marks of economic warfare. More complete unionizing has handed a much larger measure of control to the worker, but does not seem to have increased the good feeling between employer and employee and does not appear to have made for a greater organization esprit de corps.

*Evidently we should be better advised to attempt other ways of solving the matter. If we leave the labor question to develop through the warfare between labor organization and manufacturers' organization, we must expect that labor organization will grow by virtue of the necessities of that warfare.*

In that case we must expect that it will gain a larger control as it has in Great Britain, that its political influence will be greater along the lines of its present development and that we shall be involved in a more serious stage of the warfare, with

less profit in it, with less chance of avoiding complete defeat and with less probability of the success of any other scheme. The longer the organized bodies continue to fight for control of these matters the harder will it be to come to peace instead of armistice.

BECAUSE OF THE FACT THAT THE MOVEMENT IN THIS COUNTRY HAS NOT YET ATTAINED THE STRENGTH WHICH IT HAS DEVELOPED IN THE OLDER COUNTRY, BECAUSE THE CONDITIONS OF LABOR ARE STILL FLUID AND THERE IS STILL GREAT OPPORTUNITY FOR ADVANCEMENT, WE ARE IN A MOST ADVANTAGEOUS POSITION TO INSTITUTE A CHANGE, TO MAKE IT POSSIBLE FOR THE WORKMAN IN THE INDIVIDUAL FACTORY TO TAKE HIS RESPONSIBILITY AND INCENTIVE FROM THAT FACTORY AND TO SECURE HIS INDIVIDUAL STRENGTH AND HIS CONFIDENCE FROM THAT ORGANIZATION, INSTEAD OF THE OCCUPATIONAL LABOR ORGANIZATION, WHICH IS HIS ONLY MEANS, AT PRESENT, OF OBTAINING THESE THINGS.



*Rear view of the latest model De Haviland 4, showing the rear cockpit for the observer*

## Features of the De Haviland 4

**Has Been Fitted with Engine of from 200 to 400 Hp.—Fitted with Two Machine Guns, One Firing Through Propeller, the Other Mounted on a Ring Surrounding the Observer's Cockpit**

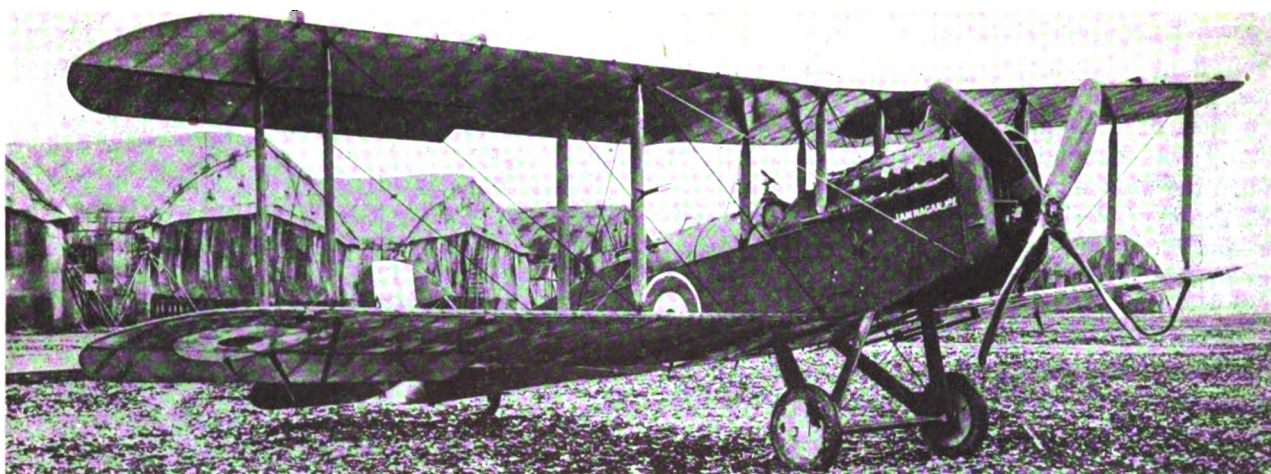
**A**N important place in the American air program has been assigned to the De Haviland 4, a machine of British origin, to which frequent reference was made in a recent discussion in connection with the aircraft investigation. We have already printed a technical description of this machine, and are now in position to show a number of photographs, which will make its form more familiar to the reader.

The De Haviland 4, which was designed by Geoffrey De Haviland, chief engineer of the Aircraft Mfg. Co., is a tractor biplane, serving for reconnaissance and bombing. The machine has been fitted with a variety of engines, including a 200 hp. B. H. P., a 270-hp. Rolls Royce, a 260-hp. Fiat and a 375-hp. Eagle Rolls Royce,

and those being built in America are, of course, being fitted with the Liberty engine. The plane seats two persons, the pilot and the observer, and its armament consists of one Vickers machine gun, operated synchronously from the engine through a Constantinesco interrupter gear, and a Lewis gun. For the Vickers 600 rounds of ammunition are carried, and for the Lewis 10 drums. The total weight is 2945 lb., and the load carrying capacity for bombs amounts to 400 lb.

We have been furnished with some figures regarding the performance of the machine, but in this connection it is not stated with what engine these performances were accomplished. It is, of course, obvious that with a 375-hp. Eagle Rolls Royce the speed and climbing ability





*Three-quarter front view of the De Haviland 4. Most of these are fitted with four-blade propellers with the machine gun synchronized to fire through the blades*

will be much greater than with a 200-hp. engine. Presumably the figures apply to a plane equipped with the largest of the engines mentioned, the 375-hp. Rolls Royce. It is stated that at an altitude of 10,000 ft. the machine has an endurance of  $4\frac{1}{2}$  hours. Its ceiling is 17,000 ft. At ground level it has a speed of 117 m.p.h., and at an altitude of 10,000 ft. a speed of 113 m.p.h. An altitude of 10,000 ft. can be attained in 16 min. 18 sec.

With a span of 42 ft.  $4\frac{1}{2}$  in., an overall length of 30 ft. 2 in., and a height of 10 ft. 2 in., the De Haviland 4 is a machine of considerable size. The first specimen of this type was brought out in January, 1917, and although later models have been developed by De Haviland, the DH4 is still in active use. As will be seen from the side view, the upper wing has a considerable forward stagger, which amounts to  $6\frac{1}{2}$  in. There is no sweep-back, but both sets of wings have a dihedral angle of 174 degrees. The upper wings are attached to a center section 2 ft.  $3\frac{1}{2}$  in. wide, while the lower planes connect directly to the body or fuselage. The notable feature of construction is the slight camber of the wing ribs. The webs of the wing ribs consist of three-ply wood, and are secured to the flanges by means of brass tacks.

In the construction of the body, considerable use is made of ply wood. The forward part of the body up to a point behind the gunner's cockpit, is made without the use of diagonal bracing, and is covered by ply wood. The

formers, as well as the support for the controls and machine guns, are made of ply wood, some of which is as much as 1 in. thick. The longerons are of spruce, and the engine bearers of ash.

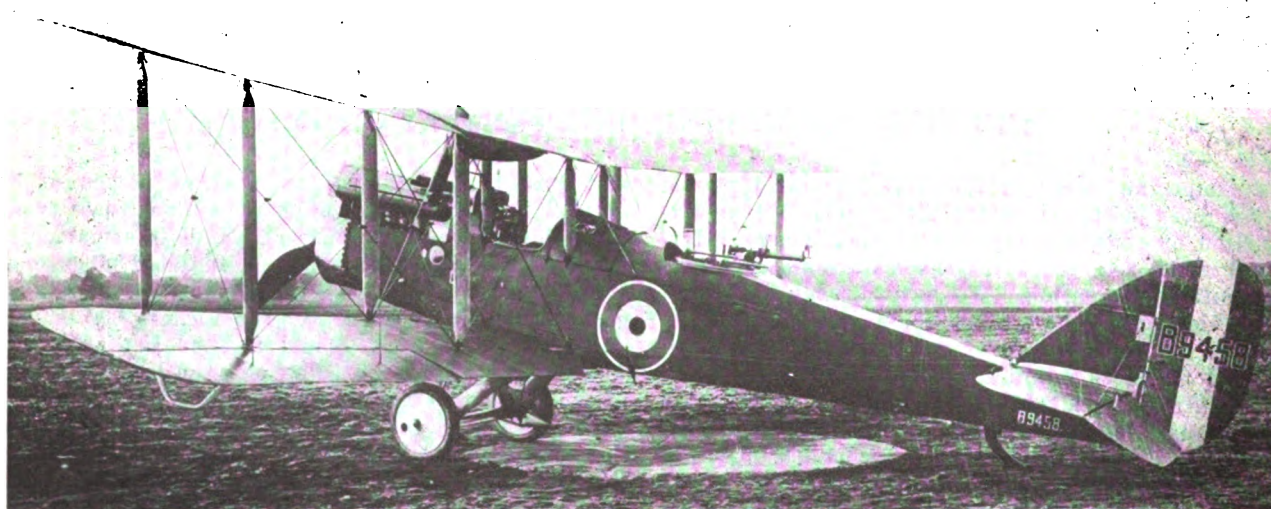
Most of the De Havilands are fitted with four-blade propellers, but some of them have been fitted with two-blade propellers.

### The Peterson-Culp "Super Steamer"

THE elimination of all gears, not only in the transmission system, but in the power plant as well, is the chief feature of interest in the "Super Steamer," which has been brought out by the Peterson-Culp Gearless Steam Auto Company of Price, Utah. The designs provide for the use of a double steam engine, or rather a pair of steam engines built together with a common crankcase but separate crankshafts, each of which is directly connected to one of the rear driving wheels. By this construction, it will be seen, no differential gear is necessary. Each of the two engines has two cylinders of the double acting type with a bore of  $3\frac{1}{4}$  and a stroke of 5 in. The crankshafts run on ball bearings.

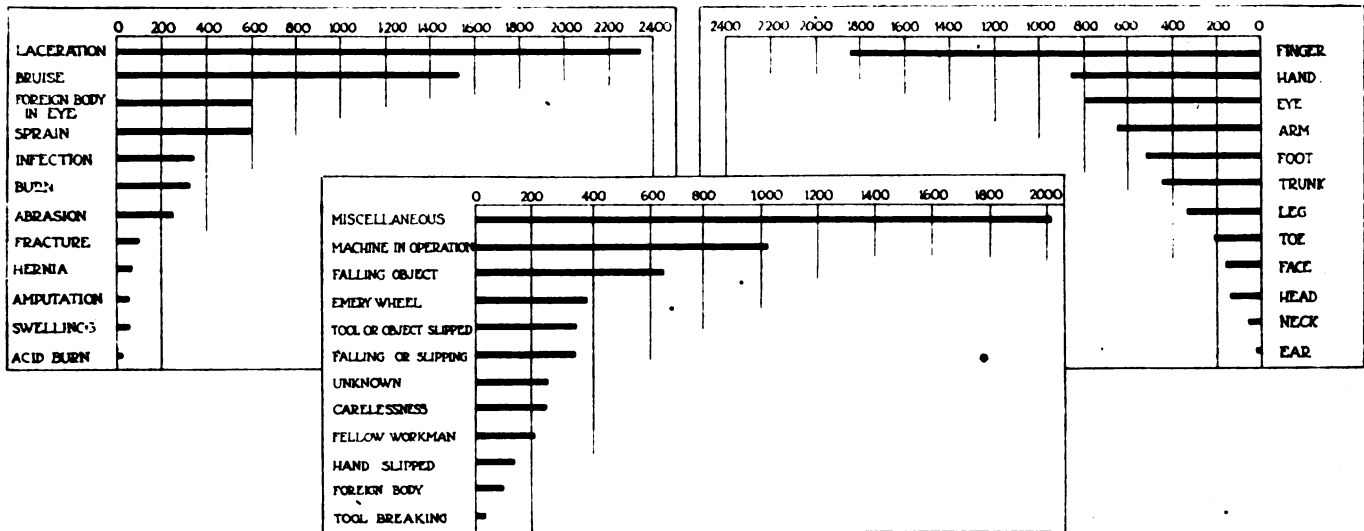
The boiler is of the fire tube type, 23 in. in diameter with more than 100 sq. ft. of heating surface. Kerosene is used for fuel and the tank has a capacity of 25 gal. It is attached at the rear of the chassis.

A honeycomb type condenser makes it possible, it is said, to run 200 miles on one filling of the 30-gal. water tank.



*In this view the swivel mounting of the observer's machine gun is plainly shown*





*These charts show the various kinds of accidents sustained by employees in Cadillac plants. Through a careful analysis of such charts, together with the application of the proper remedial and protective measures, the number of accidents has been very greatly reduced*

## Accidents in Cadillac Plants Lessened

Statistics Show That Young Men Suffer Accidents More Frequently Than the Older Ones and Married Men More Frequently Than Single Ones—Classification of Accidents and Their Causes—Rendering Sandblasting Less Injurious

A VERY interesting compilation has been made by the Safety Department of the Cadillac Motor Car Co., Detroit. One of the diagrams shows the comparative number of accidents for men of different ages. Young men suffer most from accidents. This can be taken to mean that older men are more careful. The largest number of accidents recorded at any one time among men between the ages of 20 and 30 is 148, while that among men over 40 years of age was only 127. The largest number of men between 30 and 40 years of age who sustained injury through accidents during the same 5-year period was 45. All these accidents occurred during the year 1913, since which time a general decrease has been noted.

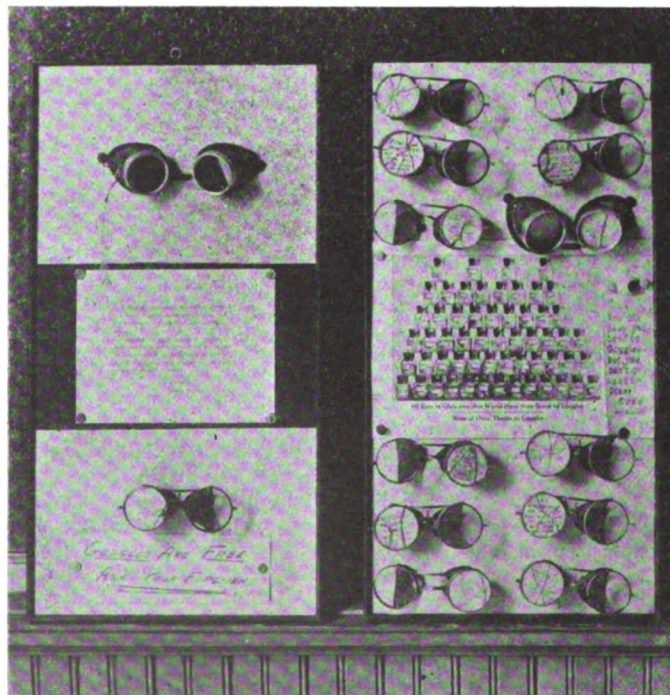
One of the other diagrams reveals the fact that accidents are more frequent among married men, although the line representing accidents to single men is not widely separated from the other. A chart giving the nationalities of the victims of accidents is rather misleading. As the biggest proportion of the employees at the plants are American it is to be expected that the

greatest number of accidents will befall them, but the conclusion should not be drawn that the proportion of accidents to the number of workers is greatest among Americans. In other words, this chart must not be considered from a percentage standpoint.

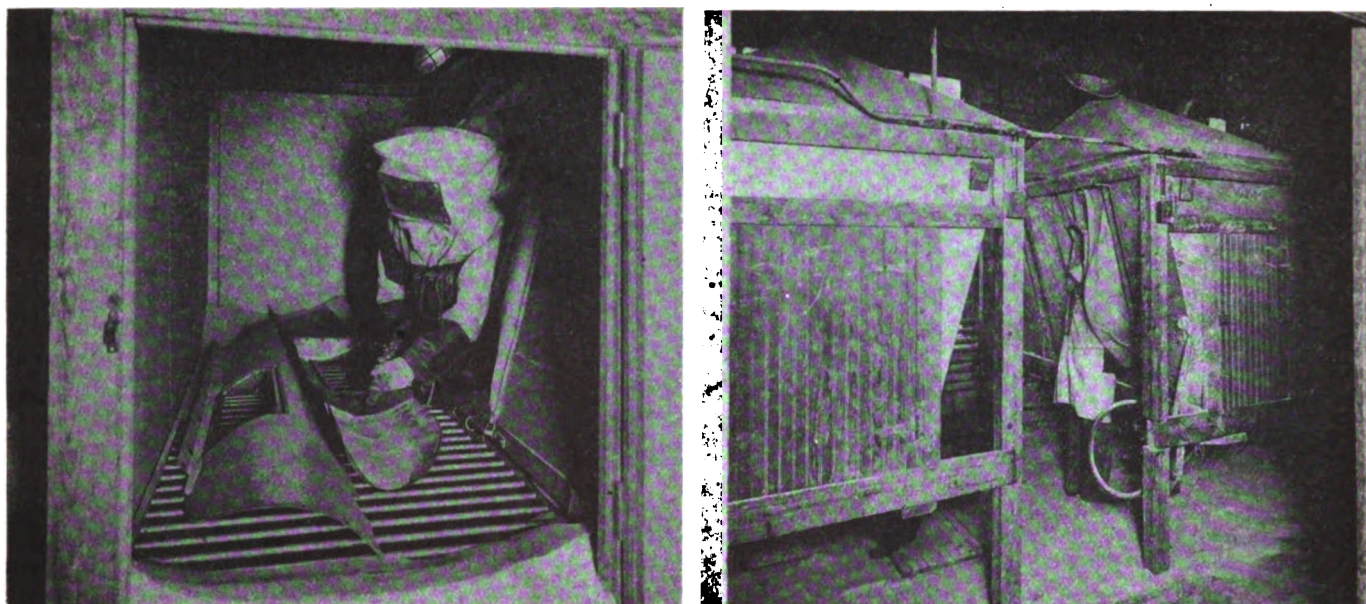
During the 5-yr. period 1913 to 1918 the greatest number of injuries reported were cases of laceration. A total of 2350 are reported on the chart. Bruises were sustained by 1530 persons. Sprains and cases of foreign bodies in the eyes total about equally—600.

About 1064 accidents occurred on machines which were in operation; 630 persons were hurt by falling objects; 273 workmen suffered injury by fellow workmen, while about 285 accidents resulted through carelessness and could have been avoided. Cases of tools breaking were the smallest in number, only thirty being recorded during the 5-year period above mentioned.

Of all injuries, those sustained to fingers were highest in number, totaling more than double those which the hand suffered during the same period. Nearly 860 accidents to



*An exhibition of broken goggles which tells a mute tale of eyes that have been saved. Bulletin boards similar to these are hung in various places throughout the plant*



*Sandblasting is done in individual enclosures, and each operator is thoroughly protected from dust. At the left is shown the inside of such a compartment, and at the right is shown the external appearance*

the hand were reported, while injuries to the fingers totaled 1820. Injuries to other parts of the body were less in number. Only 10 cases of ear accidents were reported.

Through the aid of the safety department, which has introduced safeguards throughout the various plants wherever necessary, accidents have been greatly reduced. The company offers the following figures showing the percentages by which accidents of various kinds were reduced during the period 1912 to 1916:

Nature of Injuries.	Percentage of Reduction
Grinding .....	40%
Tool slipping.....	55%
Bad practices.....	31%
Hand slipping .....	67%
Carelessness .....	78%
Machines in operation.....	48%
Fellow workmen.....	71%

One of the most unhealthful occupations was that in the sand-blast room. Breathing the sand-filled air was very injurious to the workers' lungs and the men would stay away from work several days at a time. It was necessary to have a staff of fourteen men for

this job in order to maintain a working force of twelve men. Production in this department was very uncertain, the foreman never knowing how many men he would have from one day to the next.

It was, therefore, necessary to devise some scheme which would prove more satisfactory to both the workers and the company. The men worked in a large room which was partitioned off in stalls, with one man in each stall. The partitions extended only about 7 ft. in height and offered the sand an opportunity to fill the room to such a degree that men breathed large quantities of sand, which soon affected their health.

Now individual booths are provided for the men, and all sand is confined within the walls. The men work entirely outside of the booths. After inserting his work into the booth, the worker steps before an apron and slips his arms through sleeves which permit him to handle the work on the inside. His head fits in a helmet arrangement with a glass opening permitting him to inspect his work.

## Increased Production of Artificial Abrasives

**A** MARKED increase in the output of artificial abrasives in the first half of 1918, as compared with the first half of 1917, is shown by figures compiled by Frank J. Katz, of the United States Geological Survey, Department of the Interior, and obtained in co-operation with the Mines Branch of the Canadian Department of Mines. There was little change in the output of corundum and a decrease in the output of emery in the United States.

During the first half of 1918 emery ore was produced by seven operators in the Peekskill district, in New York, and by one in southern Virginia. Corundum is produced from one mine in Macon County, N. C., and by one company operating in Renfrew County, Ontario.

The combined mine output of emery and corundum in the United States and Canada from January 1 to June 30, 1918, was 5455 short tons. During the same period the producers sold, shipped, or used in the manufacture of abrasive articles approximately 4500 short tons, and the stock on hand at the mines June 30 was about 1500 short tons.

As compared with the same period in 1917, there was a large decrease in the quantity of emery mined, and the output from January to June, 1918, inclusive, was considerably less than half of the mine output of emery for the entire year

1917. During the first half of 1918 corundum was produced at about the same rate as in 1917.

Artificial carbide abrasives, including carborundum, crysolon and carbolon, were produced during the first half of the year 1918 by two companies in the United States, operating plants at Niagara Falls, N. Y., and at Blasdel, N. Y., and by three in Canada, operating plants at Shawinigan Falls, Quebec, and at Chippewa and Thorold, Ontario.

The plant output of crude carbide abrasives was 6583 short tons. During the same period the producers sold or used in the manufacture of abrasive materials 5633 tons, and on June 30 there remained in their hands as stocks 2840 tons.

Aluminum oxide abrasives, including alundum, aloxite, exolon, lionite and natite, were manufactured in the United States by four companies, three of which operated plants at Niagara Falls, N. Y., and one at Blasdel, N. Y., and in Canada by five companies, which operated plants at Niagara Falls, Chippewa and Thorold, and two at Hamilton, Ontario.

The combined output of these plants in the first half of 1918 was 28,341 short tons. During the same period the producers sold or used in the manufacture of abrasive materials 28,161 short tons, and on June 30 there remained in their hands 26,221 short tons.



# Electric Dynamometers for Aircraft Engine Tests

Sprague 300 and 450 Hp. Dynamometers Capable of Handling Heavy Torque—Larger Type Particularly Suitable for Testing Liberty Engines

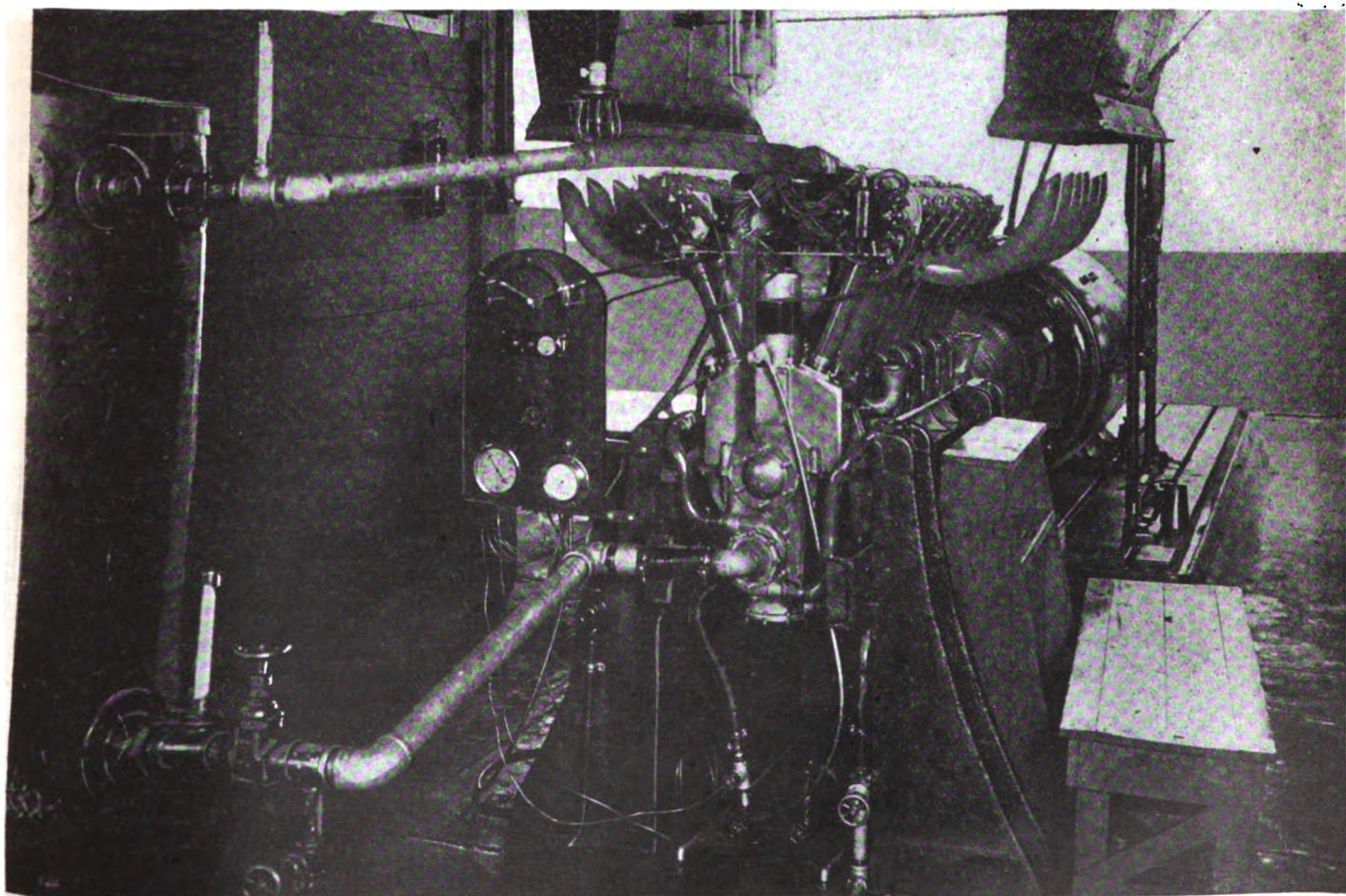
**T**ESTING the Liberty engine and other big aircraft power plants has necessitated the development of electric dynamometers of much greater capacity than those in use up to a year ago. The club test, as the fan dynamometer test is often called, has not proved to be reliable, and as a result of this there has been a strong demand for airplane dynamometers. The Sprague Electric Works are putting out two sizes for this work. The larger size has a nominal rating of 300 hp. at 1325 r.p.m. and a maximum rating of 450 hp. at 1700 r.p.m. The safe permissible maximum speed is between 2500 and 3000 r.p.m. This size is particularly adapted for testing the Liberty engine.

The smaller machine is ideal for testing the engines for advanced training planes and speed scouts. It has a nominal rating of 200 hp. at 1300 r.p.m. and a maximum rating of 300 hp. at 1650 r.p.m. The maximum free run-

ning speed is between 2500 and 3000 r.p.m. Combinations are frequently made of two of the smaller machines for testing up to 500 hp. and of two of the larger machines for testing up to 800 hp. For such tandem combinations the electrical control and torque measuring system has been worked out so that the torque is read on a single scale and the load is controlled by a single handle, just as in a single-unit machine.

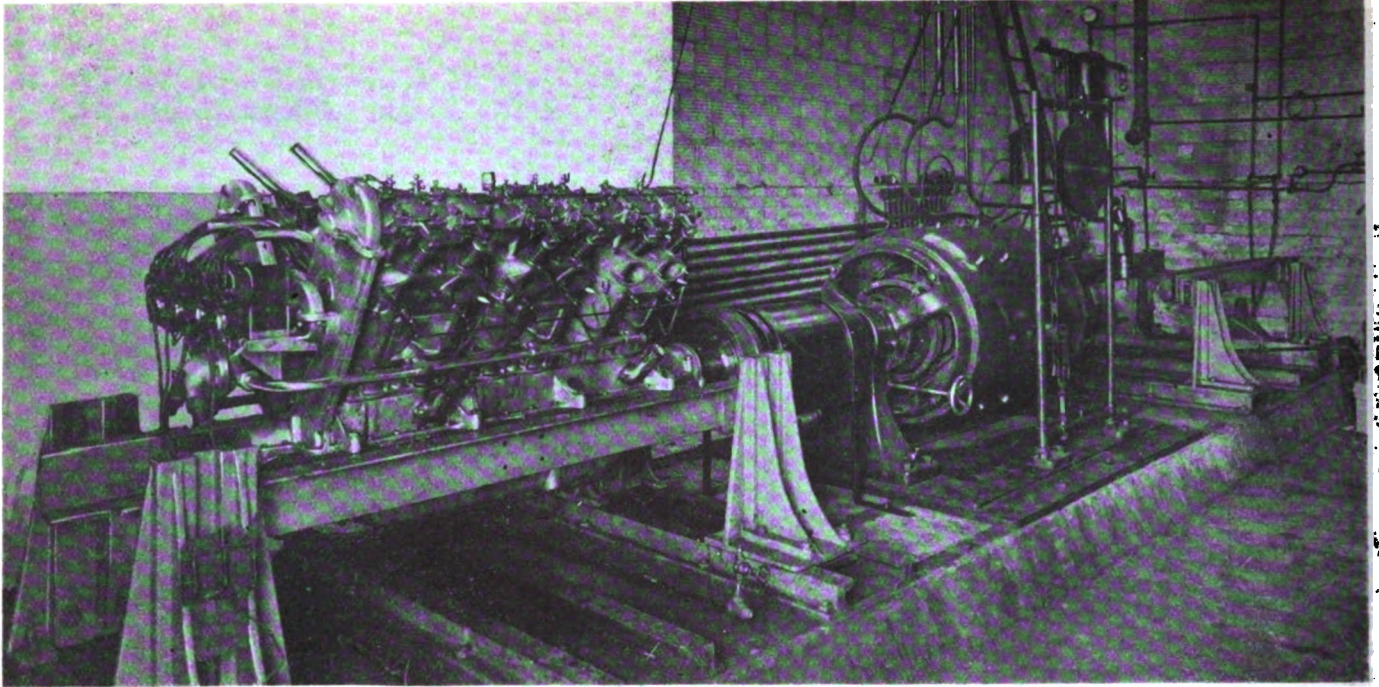
These dynamometers are fitted with shaft extensions at each end, so that one engine can be set up and gotten ready for test while the other is being run. The shaft extensions are tapered to facilitate the fitting and removal of the necessary couplings.

Torque measurements are usually taken on heavily constructed beam scales, as built by the Chatillon Co., and fitted with a spring balance in series for quick indications. The Toledo Scale Co. has developed an automatic control

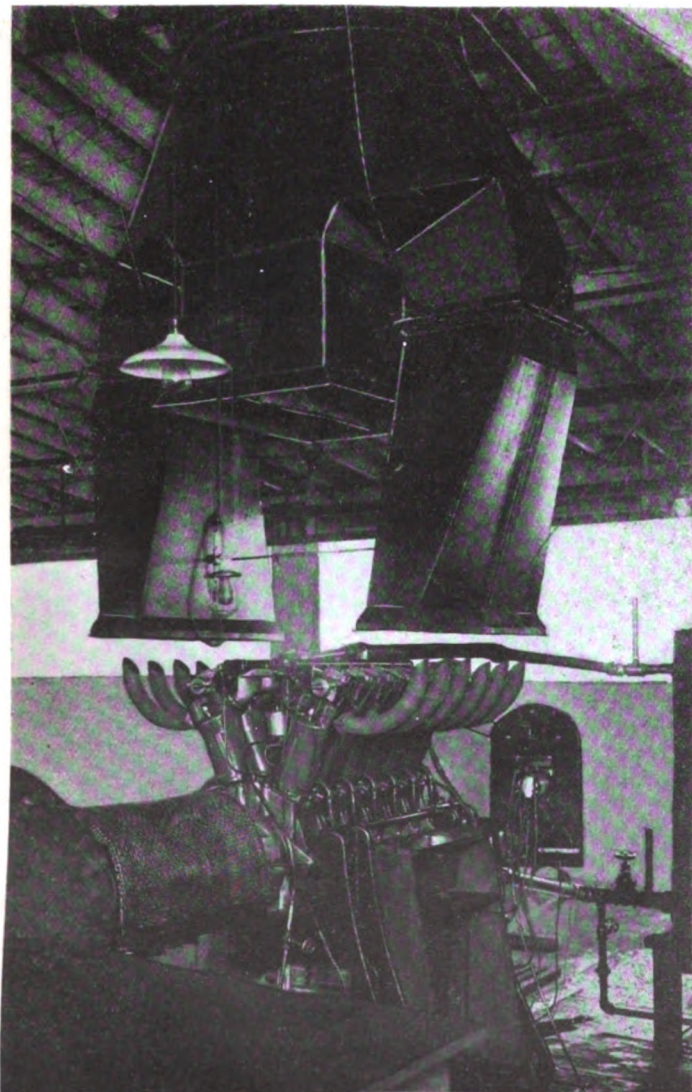


*A 12-cylinder Liberty engine on a Sprague dynamometer testing stand at the Trego plant. The photograph shows a part of the exhaust hoods and the complete water system for cooling the engine*





*Wisconsin 200-hp. airplane engine connected to 300-hp. Sprague dynamometer*



*Showing the exhaust hood used in testing the Liberty engine at the Trego plant*

indicating dynamometer scale which is very well adapted for this work, and installations of this scale are being made in a large number of plants.

#### Use Individual Rooms

Where a number of dynamometers are installed for production testing, they are mounted in individual rooms, and in each room provision is made for carrying off the exhaust gases, to eliminate any fouling of the intake air. The Ford and Lincoln companies have large numbers of these rooms for testing 100 or more Liberty engines at one time.

The engine on test is mounted on four cast-iron stands, carrying wooden engine bearers similar to those used in the plane. Rigid supports are essential to prevent vibration.

The coupling usually used is a double-flange coupling with transmitting members of Thermoid discs 15 in. or more in diameter. It is essential that the coupling be strong enough for the load and at the same time sufficiently flexible to take up slight differences in alignment. The coupling is balanced throughout and is built with a considerable flywheel effect, which is essential in testing airplane engines, even of the twelve-cylinder type.

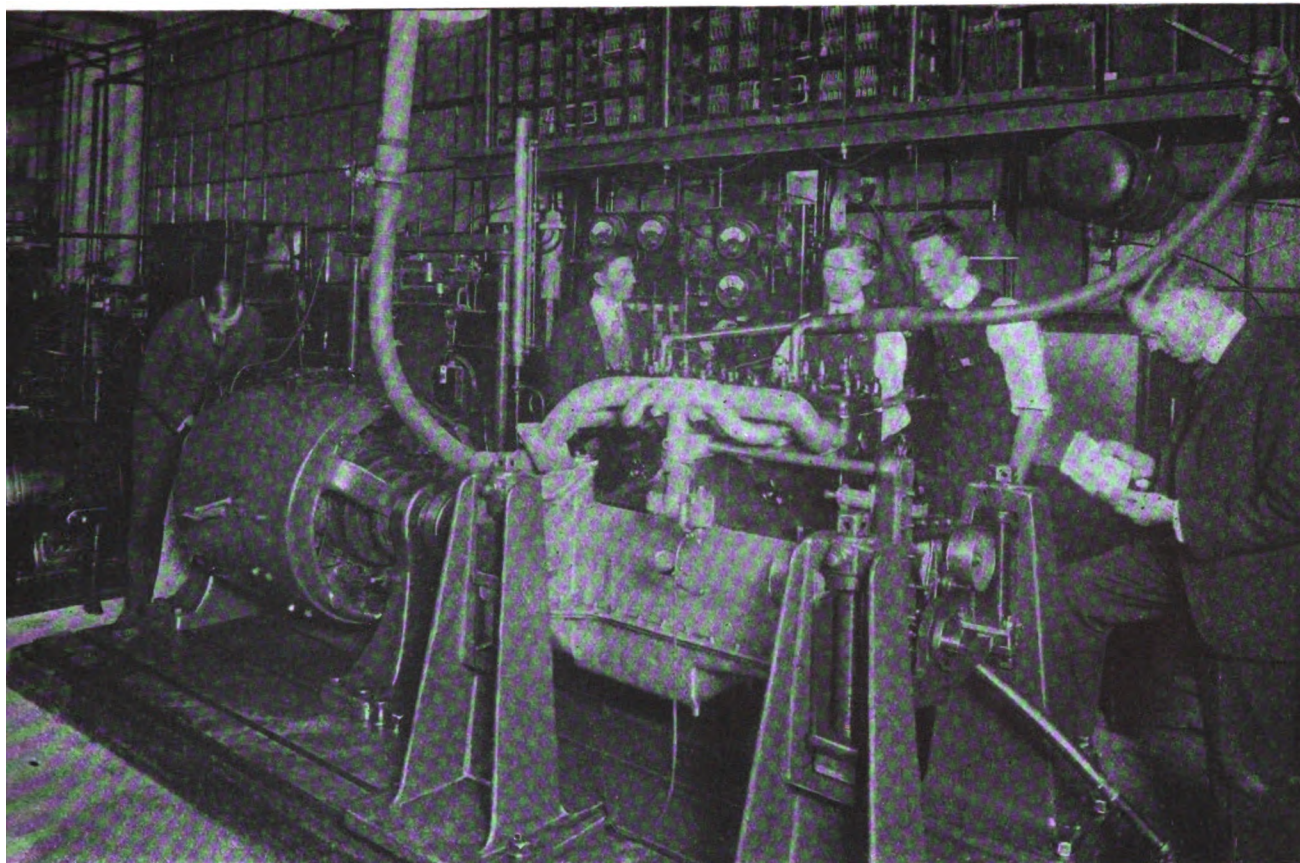
In the earlier days of electric-dynamometer testing some engine failures were attributed to the rigidity of support and the heavy weight of the testing machine, but later investigations have demonstrated that a properly installed dynamometer equipment produces no ill effects whatever upon the engine, and an engine that is properly built for service in flight will show up well on dynamometer test.

#### Follow Cube Law

In conducting dynamometer tests it is important that the loads at different speeds follow approximately the speed-horsepower curve of the propeller that would be used with the engine. This follows the cube law. For example, if the load were 400 hp. at 1700 r.p.m., the engine should only be loaded in routine test to about 90 hp. at 1000 r.p.m.

It is claimed that results obtained on torque stands





*Engine for Class B government military truck on dynamometer testing stand in the experimental room of the Continental Motors Corp.*

clubs or propellers frequently vary as much as 10 or 20 per cent from the true horsepower output, and that calibrated clubs or rigid stands the variations have been known to be even greater. With electric dynamometers much greater accuracy is secured.

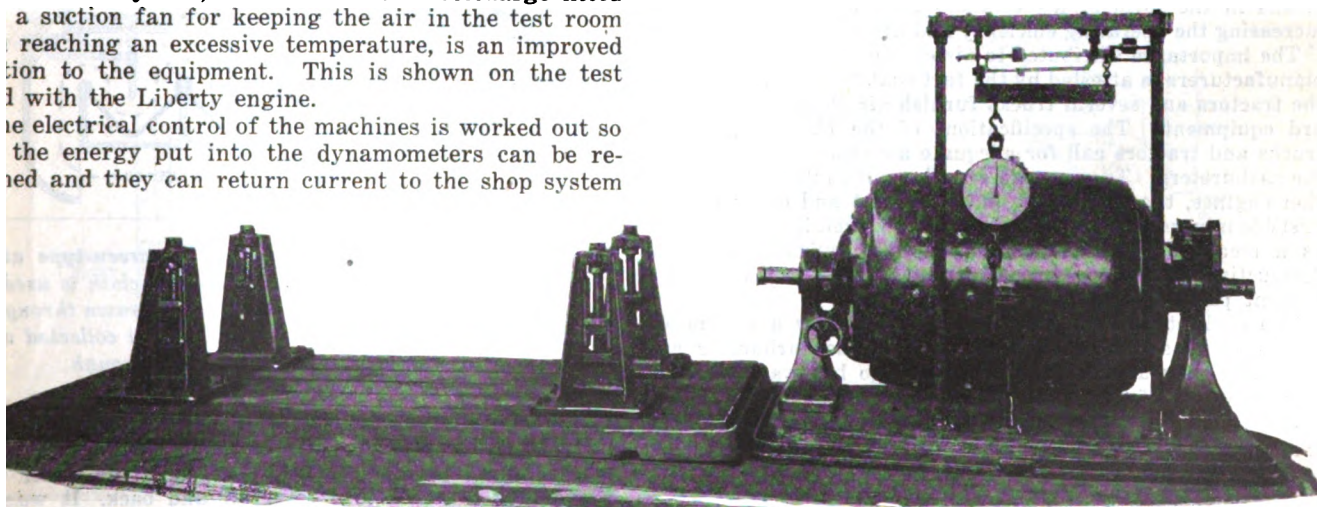
With modern types of aviation engine no difficulty is experienced in keeping the engine cool during the dynamometer test. Water is circulated through an external radiator which is kept overflowing with cold water, so that intake temperatures are maintained the same as in actual service. In the larger engines it is the practice to pump oil through an external radiator, and the intake and outlet oil temperatures can be maintained at the same as in actual service.

The blower system, with an overhead discharge fitted with a suction fan for keeping the air in the test room from reaching an excessive temperature, is an improvement to the equipment. This is shown on the test stand with the Liberty engine.

The electrical control of the machines is worked out so that the energy put into the dynamometers can be returned and they can return current to the shop system

through a fairly wide range of speed, usually from 1300 to 1700 r.p.m. For that part of the test which is conducted below 1300 r.p.m. the current is diverted into a resistor. The resistor, however, has sufficient capacity to take the entire load of the machine under conditions where it is impracticable to pump back. The control is worked out so that the adjustment of load and speed can be accomplished entirely by means of a field rheostat handle. There is one main rheostat handle and concentric weight and small handle operating an auxiliary rheostat of low resistance which gives fine adjustments of speed and load between the steps of the main rheostat. Automatic means are provided for short-circuiting the mag-

*(Continued on page 696)*



*Sprague 300-hp. dynamometer set suitable for testing airplane engines*

# Air Cleaners

## Analyzed and Compared

Four Types of Cleaners Are:

- |                        |                    |
|------------------------|--------------------|
| 1—Cloth or Screen Type | 2—Inertia Type     |
| 3—Liquid Type          | 4—Centrifugal Type |

Efficiency of Liquid and Gravity Types Approximately the Same—Liquid Types Because Water Aids in Carburation

By W. G. Clark, M.E.\*

**T**HE trend of engine design in the tractor and automobile field during the past few years has been more along the lines of increased efficiency of prevailing types rather than toward the development of new types of engines.

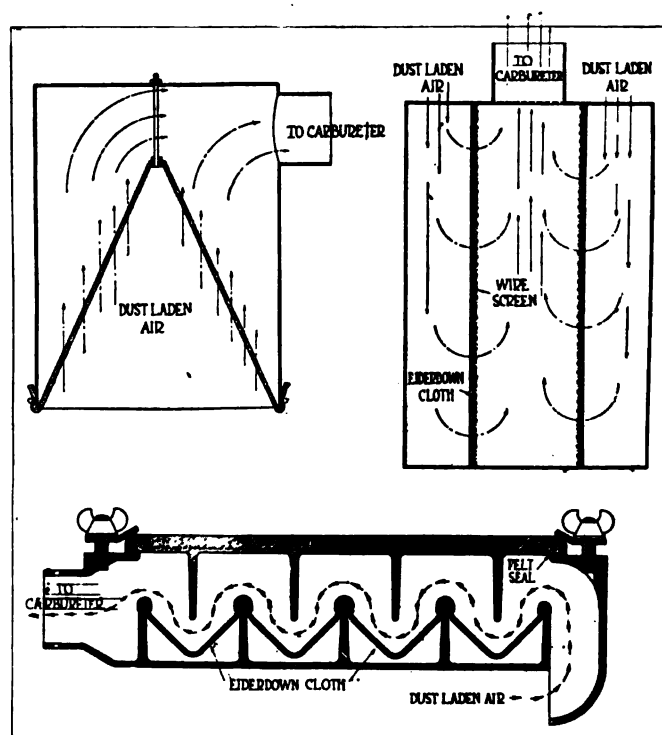
That is but a natural stage in the development of a mechanism so young as the internal combustion engine, although the demand for better efficiency has perhaps been hastened and rendered more necessary by the war. The demand for more efficiency naturally fell first on the accessory making people, especially the makers of magnetos, carbureters, bearings, etc.; and the fact that it required some time to make any appreciable progress was due to too much of the burden being shifted to the accessory firms. It is gratifying to note the rapid progress being made since the motor designers are co-operating with us and taking over their share of the work.

One of the most important single factors making for better efficiency and service in automotive work was the early recognition of the fact that dirt and carbon are the worst enemies of the internal combustion engine. Changes in design along protective lines and the application of external preventive means in the form of air cleaners have done much toward increasing the operating efficiency and life of our field engines.

The importance attributed to air cleaners by engineers and manufacturers is attested by the fact that fully 80 per cent of the tractors and several trucks furnish air cleaners as standard equipment. The specifications of the U. S. Army for trucks and tractors call for adequate air cleaning devices for the carbureters. To everyone familiar with internal combustion engines, the destructive power of dirt and other incombustible mineral matter in the cylinders is well known, so that as a means of preventing access to the cylinders of such destructive agents, the air cleaner now ranks as a most important part of field equipment.

The earliest form of air cleaner was merely a fine mesh screen of considerable area attached to the carbureter air intake. This was used several years ago but was not very efficient or satisfactory for obvious reasons.

Another of the earlier forms of cleaners was called the rain type, of which the modern air washer or water cleaner is a development. It was a modified form of the washers and



*Figs. 1, 2 and 3—Three forms of screen-type air cleaners in which flannel or eiderdown cloth is used. In the upper ones the dust laden air is drawn through the cloth. In the lower one the dust is collected on the surface without passing through*

humidifier used for cleaning and moistening air in public buildings. The cleaning was accomplished by drawing the carbureter air through a fine film or sheet of water which flowed over a screen to a reservoir and back. It was very cumbersome and impractical for field use, although if well made it was quite effective.

\*Engineer of the Wilcox-Bennett Carbureter Co. The paper published here was read at the recent meeting of the Minneapolis Section of the S. A. E.



There are several types of cleaners now in use on tractors and trucks:

No. 1—Cleaners employing cloths or screens or both to catch the dust.

No. 2—Inertia cleaners.

No. 3—That class in which water or some other liquid is used to wash the air.

No. 4—Centrifugal or gravity cleaners.

#### Screen Type Cleaners

No. 1 type, those which depend upon a cloth or screen, are practically obsolete, and rightly so, as they are troublesome, ineffective and bulky. In order to clean efficiently the cloth or screen area must be very large in order to cut down the air velocity and also to provide any considerable capacity. A cloth or screen soon clogs and restricts the flow of air to the carburetor, thus enriching the mixture. This creates carbon, causes overheating and other kindred troubles. There have been numerous forms of this type cleaner.

Fig. 1 is a type with just a cylindrical drum closed at one end and connected to the carburetor, and covered at the other end by an eiderdown cloth held in the shape of a cone by a wire at the top. The air is drawn upward through the cone of eiderdown and thence into the carburetor. In dusty field work with this cleaner the operator would have to clean the cloth very frequently or else carry a bale of clean cloths for the many changes necessary in a day's run. The type shown in Fig. 2 also employs an eiderdown or flannel cloth, but has an additional feature over Fig. 1, in that the air is forced to reverse its direction several times in passing around baffle plates. These baffle plates are intended to direct the dust-laden air into contact with the cloth.

Fig. 3 shows a cleaner employing both cloth and screen, although I rather think the screen is meant only as a means of holding the cloth in place. No provision is made for taking it apart for cleaning, which possibly is one reason we don't see many of these cleaners in use.

The second class of air cleaners I have called inertia clean-

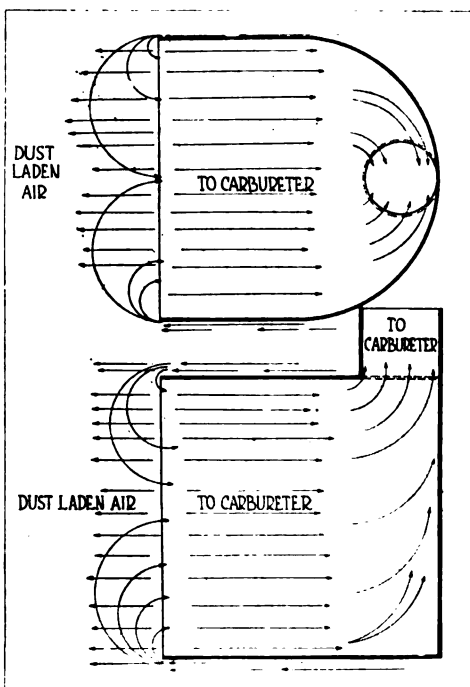


Fig. 4—Simple form of inertia air cleaner, the open end of which is placed on the outside of the radiator. The principle of this cleaner is that the suction of air through the radiator entrains dust particles

ers, because their action depends on the inertia of the dust in the air to carry it out of the air stream when the air flow is suddenly reversed or changed before passing to the carburetor.

One form of this type of cleaner of which there are now several varieties is shown in Fig. 4. It consists of a metal casing with one side open and of rectangular shape, with a connection from the closed side to the carburetor. The open side of the casing is placed against the outside of the radiator core facing in the direction of air flow through the radiator, so that the carburetor air is drawn out of the air stream in the reverse direction. The inertia of the dust in the air being drawn through the radiator is supposed to carry it beyond the open end of the cleaner and through the radiator instead of being deflected from its path by the suction of the carburetor.

The actual efficiency of this cleaner is rather problematical, as it is very difficult to determine it since the dust cannot be measured or caught in any way. Practically the only way to test it would be to try it on an engine in the field and judge its efficiency by the condition of the cylinders.

In another form of inertia cleaner, in many respects similar to this one, the cleaner is placed behind the fan—instead of in front of the radiator so that the air is forced through the cleaner instead of being drawn through. Its efficiency, however, is dependent upon the maintenance of a certain air velocity for a given proportioning of the cleaner openings, so that a variation of fan speed interferes seriously with its effectiveness. I have no data available on these forms of inertia cleaners, but I believe that there must be a considerable volumetric loss with their use due to the fact that the carburetor air must be drawn in a reverse direction from that of the fan air stream, which possesses the kinetic energy and inertia of its velocity and direction of flow.

The third type of air cleaners comprises those cleaners or washers in which a liquid such as water or kerosene is em-

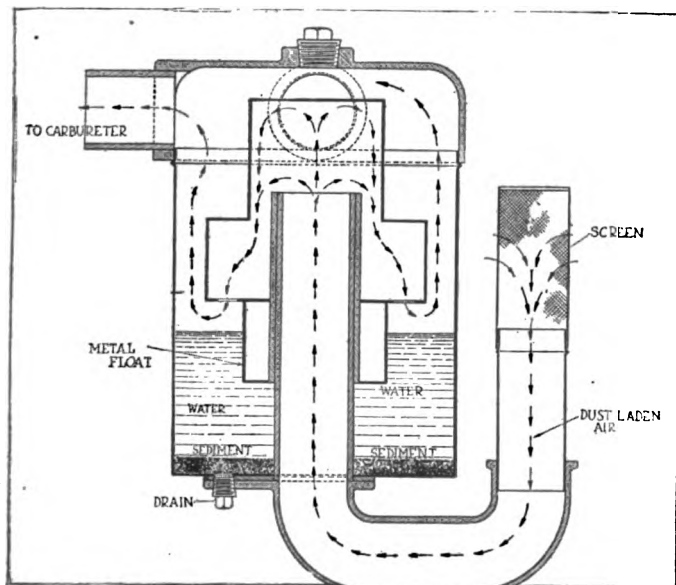


Fig. 5—Liquid air cleaner in which the dust-laden air is made to strike the surface of water before passing through the carburetor

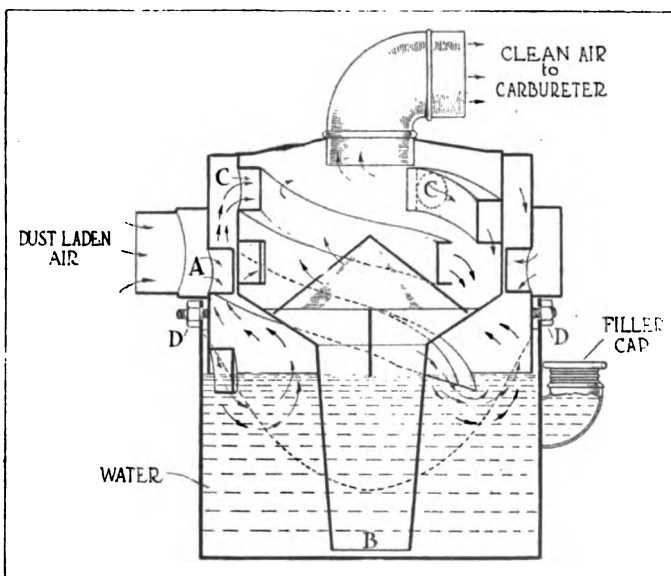
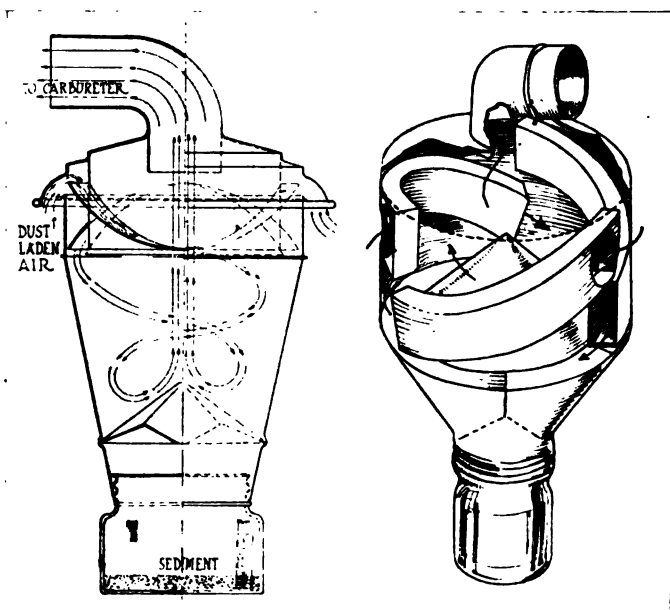


Fig. 6—Wilcox-Bennett air cleaner, in which the air is directed to rapidly whirling water in the lower compartment through spiral passages



*Figs. 7 and 8—Two types of air cleaner in which the dust particles are thrown out by centrifugal force and collect in a container at the bottom of the device*

ployed to trap the dust. The demand for an air washer or wet type cleaner was created primarily by engine operators and owners of tractors in exceptionally dusty territories, who felt that other types of cleaners were not efficient enough for adequate engine protection. However, judging from data on most of the best air washers and dry type cleaners, I do not believe that the slight advantage of the wet type over the best dry types is sufficient to compensate for the extra troubles and difficulties encountered in the use and care of a wet type cleaner.

The best dry type cleaners will catch from 95 to 100 per cent of the dust passing into them, the efficiency varying with the fineness, weight and volume of the dust.

Under the most adverse conditions for the dry type, the best air washers will show not more than 2 or 3 per cent better efficiency. Such conditions are most frequently encountered in some of our Western States where the dust is largely composed of volcanic ash, or lava dust. This dust is very light and fine, which makes it hard to stop. It also contains considerable vegetable matter, so that of the small percentage of it which escapes the dry type cleaners, the major portion is combustible vegetable matter that will burn in the cylinders without deposit.

Many have been misled as to the efficiency of the air washer by comparing them to building air washers and humidifiers; while the action is somewhat similar, they differ in a very important respect. The ordinary building air washer deals with air at low velocities through which finely divided water particles are passed. The carburetor air washers deal with air at high velocities which must be pulled through a quantity of water.

In one case the surface of a large number of water particles comes in contact with a slowly moving volume of air affording ample time, when properly designed, to thoroughly wash all the air. On the other hand a volume of air is forced through the water at high speed. This forms air bubbles while passing through the water, which trap within themselves particles of dust. These dust particles never get in contact with the water and are carried through into the carburetor. The best carburetor air washers are those in which these air bubbles are broken up and reduced to a minimum. The presence of these air bubbles accounts for the fact that even the best air washers are not always 100 per cent efficient, especially in the extreme conditions of which I have spoken.

I know of two carburetor air washers which are not so efficient as some dry type cleaners because of this defect. Under ordinary field conditions the difference in efficiency between the wet and dry type cleaners is very slight. I think that if the truth were known the majority of tractors now

using the wet type cleaner do so on account of the moisture which they furnish to the intake air, rather than on account of any real appreciable better operation over the dry type cleaner. For some motors which do not cool any too well, especially when using kerosene, the heavily moistened and cool air from a water cleaner is almost as much a necessity as its freedom from dust. This heavy moisture content which some air washers impart causes a large water consumption, the amount varying with the temperature.

One well known air washer is said to use up 30 quarts of water in a day's work under ordinary summer temperatures. Not all of the air washers are as bad as that, but when they have to be refilled a couple of times a day, it becomes somewhat of a chore and often an inconvenience. This fact and the susceptibility to freezing in cold weather form two of the main objections of an air washer.

Figs. 5 and 6 are two forms of air washer now in use. No. 5 has the objection besides those already mentioned, that it employs a floating member with a large bearing surface exposed to the wearing action of the dust entering the cleaner. This surface is in the direct path of the dust which must effect some wear if not actual clogging of the bearing.

No. 6 is a water cleaner which the Wilcox-Bennett Carburetor Co. brought out over a year ago to satisfy certain demands for a wet type cleaner. It contains several novel features designed to eliminate as far as possible some of the objectionable properties of the wet type cleaner. It consists essentially of a centrifugal air cleaner suspended within a cylindrical casing containing a quantity of water. The water is made to revolve within the container by the whirling action of the air drawn into it from the suction of the carburetor. The water rotates because the air is drawn into it tangentially through two spiral tubes in the inner circumference of the casing.

Referring to Fig. 6, the dust-laden air enters at the side as shown and passes into the water compartment through openings in the spirals at A. The rapidly whirling air causes the whole mass of water to revolve so that it piles up against the sides in approximately the position shown by the dotted line. This completely submerges the lower ends of the spirals in a heavy spray so that all the air must pass through the water spray before escaping upward into the openings C of the inner air cleaner.

#### Effect of Centrifugal Action

The air cleaner has three spirals on its inner circumference through which the air and entrained moisture pass. The centrifugal action set up in the inner cleaner breaks up any air bubbles, completes the cleaning of the air and also throws down any drops of water that have been picked up in the air. These water drops are thrown downward and back into the water container through the open end of tube B. This reduces the humidity of the washed air and also prevents excessive water consumption. The clean air after passing out of the spirals in the inner cleaner escapes upward and out through the elbow at top to the carburetor air intake.

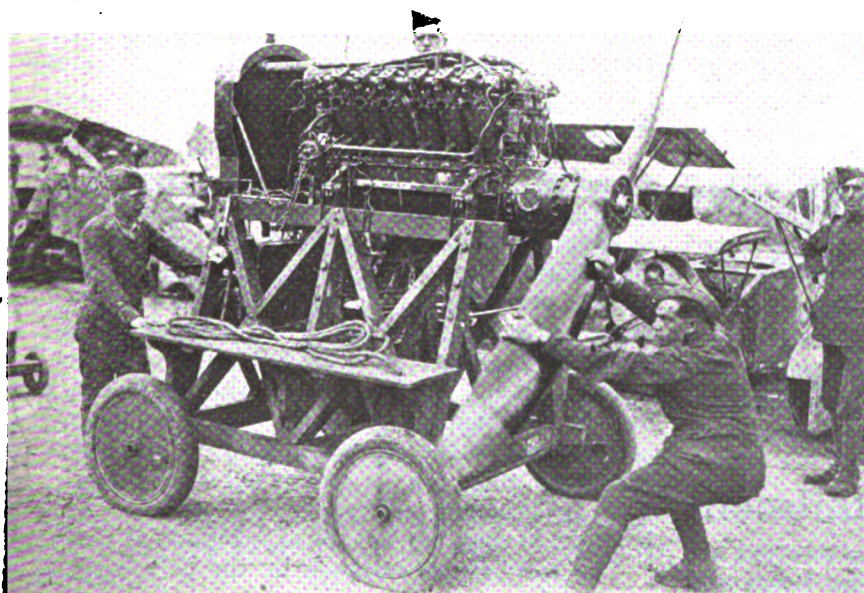
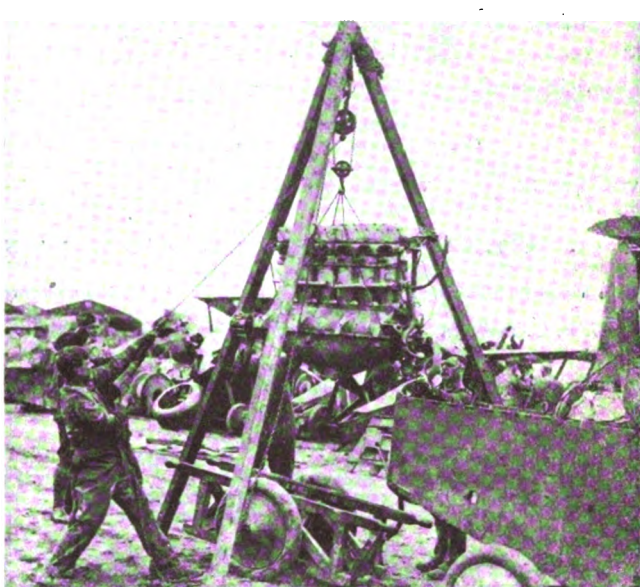
As long as there is any water in the container, the whirling of the water keeps the end of tube B, which is very close to the bottom of the container, sufficiently open for the thrown-down water to re-enter the reservoir. However, if the water supply is allowed to totally evaporate, enough mud and dirt will settle under the open end of B to seal it, so that even if the container runs dry, the inner air cleaner will collect the dust as a dry air cleaner. If the water container is dry and also clean, no such cleaning action is possible unless opening B is closed. Under normal summer temperatures one filling of water should last a full day's run with a tractor in the field.

The reservoir holds about 1 gal., which is a very low water consumption. The air contains so little moisture that it does not interfere with the carburetor action on gasoline as is the case with some other water cleaners. The whirling action of the water in the reservoir creates a heavy spray over the openings of the spirals so that all the air must pass through the water spray instead of bubbling through a volume of water. This practically eliminates the formation of bubbles, thereby increasing the efficiency. Furthermore, any particles

(Continued on page 696)



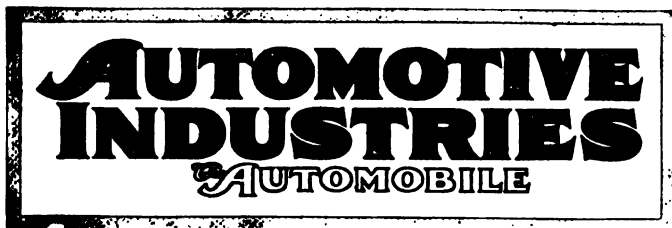
## Salvaging Damaged Planes in France



***T**HESE illustrations show one of the many airplane hospitals that have been placed in operation in France. Here, planes that have been damaged in combat and in training are virtually rebuilt, the engines overhauled and the whole machine put in condition for another go at the Huns.*







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## Effects of Tractor Curtailment

THE views of the small tractor manufacturers are quite at variance with those of the large and long-established makers with regard to the War Industries Board curtailment of 25 per cent on the amount of steel and pig iron for 1919 production. Most of the large makers were pretty well stocked up with inventory on Oct. 1, 1918, which they will be permitted to use during 1919, and so the curtailment order does not affect them seriously. The small maker has not been so fortunate.

The situation of many of the smaller and newer concerns in the industry is a difficult one. Take, for instance, the case of a concern that has been preparing to place an assembled or partly assembled tractor on the market and has just reached the point where production is about to begin; it may have a large erecting plant, but, being equipped with only few machine tools, the latter is not suited for any kind of munitions work. If no material for regular production were delivered to such a concern before

Oct. 1, 1918, it seems that under the curtailment ruling it will not get any, because, as one manufacturer puts it, "75 per cent of nothing is nothing." Apparently the only thing for such a concern to do is to shut up shop and wait for better times.

In spite of such hardships in individual cases the steel curtailment may prove a partial blessing in disguise to the tractor industry, and some large tractor makers admit this. For some time past there has been a headlong rush into the tractor industry. One reason for this is that during the past year there has been a very pressing demand for farm tractors, and, besides, since the division of industries into an essential and an unessential class, the field for the company promoter has been greatly restricted.

## Production Might Have Outstripped Demand

Not only have many new companies been formed during the past year to manufacture tractors, but existing companies in many cases have enormously increased their production facilities. Under these conditions, if the development had been allowed to proceed unchecked, it is a question whether production would not soon have outstripped the demand and a serious slump set in. It is true enough that we are only beginning to introduce tractors on the farm, and that whatever number might have been turned out next year without any Government restriction would have been a small figure compared with the number that will be sold annually 10 years hence.

But it must also be remembered that the farm tractor is still in a relatively early stage of its engineering development. There are a certain number of farmers who, on account of mechanical intuition, enthusiasm for power farming, and perhaps the urgent necessity of doing their work with fewer men, will make a success of the average present-day tractor. However, it does not require a very long conversation with farmers on the subject to bring out the fact that many of them harbor a deep-rooted antagonism to the tractor. Before these more conservative ones can be converted and brought into line as tractor purchasers the tractor must be brought to a higher degree of mechanical perfection.

The restrictions imposed by the Government will give engineers and inventors opportunity to further improve their designs, and at the same time will prevent flooding the market with tractors of immature design. Commercial and engineering development must go hand in hand.

## Use American Designs

WITHOUT exception, whenever we have tried to use a foreign design of tractor, airplane engine or what-not we have run into difficulties in the shop. The Sunbeam engine, the Gnome engine, various types of tractors that can not be mentioned for military reasons, are not the only examples of this.

The difficulty starts in the engineering department, where it is necessary for American draftsmen to remake European drawings so that they can

be interpreted by American workmen accustomed to American practice.

The same trouble is encountered in the tool design department, where it is necessary to adapt American tools to foreign practice, and lastly in the shop, where the dimensions given in inches and decimals, as interpreted from the metric system, hit in his tenderest spot the workman who is used to the inch and fraction system.

Why has the Liberty engine been put into production faster than any other type since this country started to build airplane engines? Simply because it has been designed from the ground up as an American product, adapted to American machinery, and made from drawings which can be interpreted by American workmen.

After all the bitter experiences which our fac-

tories have had with work of this nature, it is folly not to read the lesson clearly.

We can make use of the knowledge incorporated in foreign designs by adapting ideas instead of dimensions. By doing this we can carry practice further in advance than is possible by a slavish copy of a foreign design which is bound to be a makeshift in the end, if it ever has the good fortune to reach the production stage.

We have had to throw up our hands on foreign designs before and we are struggling with others now on which we should have been in production if we had started at the beginning with a design adapted to our national manufacturing peculiarities.

We are fully able to stand on our own feet from a design standpoint. We have shown this in the past and it should be our policy in the future.

## Establishing An Airplane Industry

**T**HESE are days to lay deep the foundation for the American airplane industry rather than to constantly keep that group of factories now making planes on the rack for lack of contracts and the entire plane industry at 40 per cent of capacity when it should be working at 100 per cent capacity.

There is no question regarding the future of the airplane industry. It is going to be as essential as the motor truck or the farm tractor or the automobile.

To-day our policy regarding building planes and the attitude of certain governmental organizations toward our factories would not indicate that we should be laying strong and permanent foundation stones for a future great industry.

European belligerents have for some months taken definite steps in surveying the future possibilities of the airplane industry and have laid down certain basic plans for its practical working.

Already plans embrace the use of dirigibles for express service between Europe and the Americas, as well as for service to Asia and Africa. Plans also include using the large bombing types of planes for mail service.

### Mail and Express Airplanes Necessary

The value of such mail and express service lies largely in the measure of usefulness of mail and express in foreign trade business and in the necessity for such service in inter-colonial trade with such a nation as Great Britain.

Herein lies one of the strong cornerstones of the airplane industry as an essential in the peace and industrial program of a nation. Those people who look upon the bombing plane and the dirigible as only vehicles of war have failed in the comprehensive grasp of the constantly changing conditions which the hour demands.

The day is past when a round-trip mail service with Argentina covering over 6 weeks will serve to maintain necessary trade relationships. The airplane mail of one-third to one-quarter that time

must come. It is just as much a certainty as the end of the war.

The point of view of foreign trade by thousands of American manufacturers must be corrected. Those who look upon foreign trade as a business convenience by which a surplus of merchandise can be disposed of when supply exceeds the domestic demand must bury that idea with the Hohenzollern dynasty.

*Foreign trade stands as a prime essential of national greatness and national permanency.*

We must have foreign trade to secure our necessary share of the raw materials of the world that are not found on this continent.

Our gold is not sufficient surety to obtain such supplies. They can only be obtained through our foreign trade. Foreign trade at once takes on that stature which many leading European nations have attributed to it, and hand in hand with it must come air transportation.

### Foreign Trade Requires Air Transportation

Because of this, the foundation and the permanency of our airplane program becomes one of upmost importance and it seems unfortunate that at present the industry is being stifled rather than developed as it merits. The 40 per cent production stage should cease. A 100 per cent production régime should come in.

We must establish ourselves in the heavy plane industry—that is planes capable of carrying loads of 2 tons or more. That is the big future of the industry. The single-man chasse types of to-day will be of little value in commerce. The two-man planes of to-day will be of little value, but the big bombers and the bigger bombers yet to be, will be the ones that will work for national greatness.

They are the types that will accomplish most in ending the war and the ones that when peace comes will have an immediate commercial value and will admit of quick conversion from a vehicle of war into a necessary vehicle of commerce.

# □ Latest News of the

## Implement Dealers Losing Tractor Sales National Federation of Implement Dealers Takes Up Future of Farm Tractor Business—Tractor Is Not an "Implement" —Must Be Sold and Handled as Automobiles

CHICAGO, Oct. 11—"What will the National Federation, which represents the old line implement dealers, do to induce retail implement dealers to maintain themselves in the implement trade by dominating the tractor and power machinery business?"

This subject was the major one up for consideration at the joint meeting here to-day of the sales managers of the old line implement manufacturers and the National Federation of Implement Dealers' Association, representing 16,000 implement dealers who are supposed to sell 75 per cent of the tractors and farm machinery in the agricultural area. It is only once a year that these two organizations meet in joint session, and generally the subject of greatest importance is selected for discussion, and speakers representing both the manufacturers and the dealers are chosen.

This subject was selected this year because of the great number of automobile distributors and dealers who are selling farm tractors and who are also selling power machinery, by which is meant plows and other farm machinery, especially designed to go with tractors as opposed to corresponding machinery designed to be drawn by horses. The meeting was especially significant because many of the old implement dealers who have not taken on automobile lines have been losing that portion of their implement trade which goes with the farm tractor.

The sentiment was general that unless the implement dealer dominates in the selling of tractors and power machinery he will be wiped out. This view was expressed by P. B. Laurie, sales manager of the John Deere Plow Co., who was selected to present the viewpoint of the manufacturers of farm equipment. Mr. Laurie said:

Unless the National Federation finds a way to induce the retail implement dealers of the country to take on tractors and power farm machinery and to handle them in the right way, then the retail implement dealers who sell only horse-drawn equipment are doomed to extinction. Many retail implement dealers all over the country will not go into the tractor business, and thus the selling of tractors and power farm equipment is getting into other hands.

The dealer who sells tractors will sell also a large proportion of the power equipment as well. With tractors and power equipment in the hands of motor car dealers and others so much of the good and profitable trade will have been taken away from the

horse-drawn equipment dealer that he will be forced out of business.

It may be interesting in this connection to know the results of a recent investigation undertaken by my company—the John Deere Plow Co.—among our dealers. We found that 60 per cent of our implement dealers' agents in the States of Iowa, Illinois and Wisconsin do not handle tractors.

Furthermore, of the 40 per cent who do handle tractors only a portion ordinarily stock tractors and handle them properly. It is interesting to know, too, that of the total number of Deere dealers in these three States only 4 per cent sell the Ford car.

*As manufacturers of farm equipment we call upon the National Federation to do something to stimulate the dealers belonging to the constituent associations to get busy in the tractor business if they do not want to see it go into the hands of motor car dealers. The decision is squarely up to them.*

It is necessary and absolutely vital for the retail implement dealer, if he wants to continue in the trade, to add tractors and power equipment to his present horse-drawn lines. *Also the implement dealer must add the service which goes with the tractor business, and this, gentlemen, will take A-1 dealers. Now what are you going to do?*

The occasion was dramatic and the blunt declaration of Laurie created a sensation. It was the first public and official recognition given to the fact that motor car interests *promise to dominate in the tractor field and precipitate a new alignment in the implement business.*

Coming from the manufacturers of farm operative equipment, with the prominence of the men selected to present the subject, the incident was pregnant significant.

The viewpoint of the implement dealer was expressed by R. L. Stebbins, a Minnesota member of the dealers' organization, who contended that the tractor business belonged to the implement dealer because he was the logical man to handle it, without giving any very definite reasons for such a stand. His main thought is that the implement dealer knew how to set a plow, how to operate a silo filler, run a threshing machine, or manage a corn sheller. He contended that these were qualifications that made him the proper person to sell a tractor.

The contrary view regarding the qualifications of the implement dealer to handle the tractor was expressed by Mr. Laurie, who declared that the tractor is more like an automobile than an agricultural implement, and that it must be sold and handled as automobiles and motor trucks are. At this point one of

the implement agents interjected with "If you want us implement men to handle them," to which Mr. Laurie replied, "Make an agricultural implement out of the tractor, if you will, but if you do, then take hold of it and handle it right."

The meeting was an open recognition on the part of tractor manufacturers that the automotive dealer has demonstrated his ability to handle the tractor, and also care for the service which goes with the tractor and also with farm machinery used with it. The dealer has demonstrated his ability to give that service which keeps the tractor working as a farmer must have it.

The meeting developed the fact that several tractor makers who were also manufacturers of farm machinery have in the past years discovered that the factory cannot give the service, even through its branch house organization, which is necessary, and that it is imperative on the dealer to give this service. The experience of the year has been that the automobile dealer is not only qualified but has the capacity for such a task. It has been admitted by not a few tractor makers that it will require more than two years for the old implement dealer who has not been in the automobile trade to organize himself to give that service which is needed.

Tractor manufacturers have also discovered that the automobile dealer buys tractors in large numbers and stocks them, whereas the implement dealer does not. The automobile dealer also has been in the habit of selling for cash, whereas the implement dealer has favored long credit periods, which has been a serious handicap on his business for many years.

The National Federation of Retail Implement Dealers' Associations in turn is the supreme body in the organized implement retail world. It corresponds to a grand lodge. It is a delegate body meeting but once a year. It is composed of regularly accredited representatives from all the State associations of retail implement dealers throughout the country. The numerical aggregate of retail implement dealers represented by the State associations, and by delegates in the National Federation, is about 16,000, more than half of the recognized retail implement dealers in the United States.

It is claimed, furthermore, that these 16,000 represented dealers sell better than 75 per cent of all the agricultural implements sold in the country. This assertion is based upon the fact that the National Federation represents State associations which are located for the most part in the vast agricultural country lying between the Rocky and the Allegheny mountains. This is the territory which absorbs most of the farm equipment which is made.

These two important and representative bodies, the Sales Managers' Division and the National Federation, meet contemporaneously

(Continued on page 696)



# Automotive Industries □

## New Anderson Head Elected

**W. C. Anderson Resigns Presidency But Retains Interest—Succeeded by Townsen**

DETROIT, Oct. 16—William C. Anderson, for more than 30 years actively engaged in the carriage and electric vehicle industries in Detroit, has retired from the presidency of the Anderson Electric Car Co., which produces the Detroit electric. He will retain his interest with the company and remain in an advisory capacity as chairman of the Board of Directors. He is succeeded as president by M. S. Townsen, who has been head of the Elwell-Parker Co., Cleveland, which produces electric industrial trucks and is closely affiliated with the Anderson company.

Mr. Anderson was the organizer and head of the original Anderson Mfg. Co., which started to produce carriages in Port Huron, Mich., in 1895. Shortly thereafter the company was removed to Detroit and continued as a manufacturer of carriages and electric vehicles. In 1911 the name of the company was changed to Anderson Electric Car Co.

Coincident with the retirement of Mr. Anderson, a number of other changes have been made in the personnel of the company. G. D. Fairgrieve has been elected vice-president and general manager; W. M. Locke, treasurer; W. P. McFarlane, secretary; Wilson Critzer, assistant secretary; George M. Bacon, electrical engineer.

The Board of Directors includes these men with W. C. Anderson as chairman and J. B. Book, William H. Murphy and F. E. Price. Mr. Price, who was formerly advertising manager, hereafter will devote his entire time to the development of the sales division of the industrial truck department in Detroit and vicinities.

The company's two plants in Detroit and Cleveland have been enlarged with increased capacity for passenger cars, trucks and industrial tractors.

### Rural Express Sells Trucks

New York, Oct. 17—During the past 3½ months, 500 trucks have been sold as a result of the activities of the Highways Transport Committee in pushing Rural Express and Return Loads Bureaus propaganda, according to S. W. Fenn of the N. A. C. C., who told of the work of this organization before the Metropolitan section of the S. A. E. Geo. W. Pride, Regional Director of the committee, was

the principal speaker, and he reviewed the work and progress of the body. On Nov. 2 the Metropolitan section will make an inspection trip through the plant of the Wright-Martin Co. at New Brunswick, N. J.

### Two Dozen Companies Get Orders for 25,000 "B" Trucks

WASHINGTON, Oct. 11—Orders have been placed with twenty-four companies for 25,000 class B 3-ton Army trucks as follows:

United Motors Co.	Grand Rapids
Signal Motor Truck Co.	Detroit
Vim Motor Truck Co.	Philadelphia
Winther Motor Truck Co.	Winthrop Harbor, Ill.
Brockway Motor Truck Co.	Cortland, N. Y.
Denby Motor Truck Co.	Detroit
Lewis Hall Iron Works	Detroit
Republic Motor Truck Co.	Detroit
Bethlehem Motor Truck Co.	Allentown
Diamond-T Motor Truck Co.	Chicago
Rowe Motors Mfg. Co.	Lancaster
J. C. Wilson Co.	Detroit
Sterling Motor Truck Co.	Millwaukee
Indiana Truck Corp.	Marion
Clyde Cars Co.	Clyde
Maccar Co.	Sterling
United States Motor Truck Co.	Cincinnati
Gramm-Bernstein Motor Truck Co.	Lima
Service Motor Truck Co.	Waubash
Standard Motor Truck Co.	Detroit
Atterbury Motor Car Co.	Buffalo
Midland Motor Truck Co.	Oklahoma City
Velle Motor Truck Co.	Moline
Selden Motor Truck Co.	Rochester

### Ford's Pulley Attachment Out in November

DEARBORN, MICH., Oct. 12—Henry Ford & Son are getting ready to start production on the new pulley attachment for the Fordson tractor and deliveries will begin the second week in November. The pulley is going to be marketed without the governor attachment; the demand for the pulley being so great, the company has been induced to get the pulley on the market as early as possible and after exhaustive experiments has found that the pulley will work just as well without the governor.

The total production of tractors to date is 24,000; last week's production was 1028 and the average daily production is 170.

### Stinson Buys Stillwater Plant

MINNEAPOLIS, Oct. 15—The Stinson Tractor Co., yesterday purchased the equipment of the Stillwater Steel & Machinery Co.'s plant at Stillwater, Minn. A factory building in which to place this equipment is now being looked for. The Stillwater concern formerly manufactured the Stinson tractor on contract, but its building was requisitioned by the government.

## Seek First Bids on Militors

**Motor Vehicle Section of Quartermaster Corps Wants 20,000—Other Contracts**

WASHINGTON, Oct. 16—The Motor Vehicle Section of the Quartermaster Department has requested bids for 20,000 Militor trucks, and it is understood that orders have been placed for some 17,500 other vehicles in addition, these being Nash Quads, F-W-D, Riker, Pierce-Arrow and Garford.

The request for bids for Militors represents the placing of the first order for this new truck. This is a standardized four-wheel-drive vehicle which was first revealed at the recent meeting of the S. A. E. in Dayton. While the order is a large one, it is but natural that contracts should continue to be placed for older types of trucks to stop the gap until Militors can be delivered.

Following are the companies reported to have received contracts from the Motor Vehicle Section:

Nash	7000 Quads
Four-Wheel-Drive	4000 F-W-D
Premier	1000 F-W-D
Mitchel	1000 F-W-D
Kissel	1000 F-W-D
Locomobile	500 3-ton Riker
Pierce-Arrow	2000 1-ton
Garford	1000 2-ton

It is also stated that an order was given the Packard Motor Car Co. for Packard trucks, but the quantity has not been made public.

### Detroit Exports Establish Record

DETROIT, Oct. 14—The biggest month in Detroit's export trade was established during August, when the total exports from this district reached \$38,668,564. Of this amount, \$24,593,493 represents foodstuffs. The second largest item on the list of exported articles is iron and steel, which totaled \$4,371,905. Exports of automobiles and parts amounted to \$1,232,887.

### John D. Aitken Influenza Victim

INDIANAPOLIS, Oct. 16—John D. Aitken, who established a record as a racing driver first on National and later on Peugeot cars, died here yesterday of Spanish influenza. He was 32 years old and up to recently had been prominent as a racing driver since the days of the old Vanderbilt cup races. From 1904 till quite recently he was connected with the National company and lately had been doing special work for James Allison and Carl Fisher.

## Make Monthly Labor Surveys

### Local Community Labor Boards to Report at Request of the War Industries Board

WASHINGTON, Oct. 14—The Community Labor Boards of the Department of Labor, established in each industrial district of the country, will make monthly reports of surveys of the labor conditions in certain industries. These surveys are being undertaken at the request of the War Industries Board for the use of that board and the various branches of the Department of Labor. They include investigations of what are considered the most important and the least important industries of the country.

The United States Employment Service will co-operate with the Community Labor Boards in making these surveys. Following is the list of the manufacturing and mining industries of which the complete surveys will be made monthly:

**AGRICULTURAL IMPLEMENTS.**  
**AIRCRAFT.**—Aircraft or aircraft supplies and equipment.  
**AMMUNITION.**  
**AUTOMOTIVE.**—Including automobiles, trucks, motorcycles and accessories.  
**AWNINGS, TENTS AND SAILS.**  
**BAGS.**—Hemp, jute and cotton.  
**BARRELS.**  
**BICYCLES.**  
**BLAST FURNACES.**—Producing pig iron.  
**BOILERS.**—Stationary and locomotive.  
**BOOTS AND SHOES.**  
**BOXES.**—Wooden and paper.  
**BRASS AND COPPER.**—Rolling and drawing copper, brass, and other copper alloys in the form of sheets, rods, wire and tubes.  
**BREWERIES.**  
**CALCULATING AND ADDING MACHINES.**  
**CARRIAGES AND SLEDS.**—Children's.  
**CARRIAGES AND WAGONS.**  
**CARPETS AND RUGS.**  
**CARS.**—Rolling stock of every description.  
**CASH REGISTERS.**  
**CHINAWARE AND POTTERY.**  
**CHAIN.**—Iron and steel.  
**CHEMICALS.**—Not mines.  
**CHEMICALS.**—Mines. Sulphur, pyrites and other non-metals.  
**CIGARS AND TOBACCO.**  
**CLOCKS.**  
**CLOTHING.**—All kinds, men's and women's.  
**COAL MINES.**—Excluding anthracite.  
**COKE.**—Including by-products.  
**CONFECTIONERY.**  
**CORDAGE AND TWINE.**—Hemp and jute goods.  
**COTTON.**—Compression of cotton.  
**CRANES.**  
**DRUGS.**—Medicines and medical and surgical supplies.  
**ELECTRICAL EQUIPMENT.**—Plants engaged principally in manufacturing same.  
**ENGINES.**—Steam, gas and water.  
**FEED.**—For live stock and poultry.  
**FERROALLOYS.**  
**FIREARMS.**—Exclusive of United States Government arsenals.  
**FOODS.**—Plants engaged principally in producing food and kindred products for human consumption.  
**FOUNDRIES.**—Manufacture of gray iron and malleable iron castings.  
**GAS APPLIANCES.**  
**GLASS.**—Building, pressed and blown. Bottles and jars.  
**GLOVES AND MITTENS.**  
**GUNS.**—Exclusive of United States arsenals.  
**HARDWARE.**  
**HATS.**  
**HOUSE FURNISHING, GOODS.**  
**JEWELRY.**  
**LAWN MOWERS.**  
**LEATHER GOODS.**—Trunks, bags, etc.  
**LUMBER.**  
**MACHINE TOOLS.**  
**MATCHES.**  
**MATTRESSES.**

**METALS AND MINERALS (ferro-alloy).**—Including mines, smelters, mills and refineries.  
**MILLS.**—Saw and planing, including interior finish.  
**MINES.**—Sulphur, pyrites and other non-metals.  
**MINING TOOLS AND EQUIPMENT.**  
**NONALCOHOLIC DRINKS.**  
**OIL AND GAS.**—Producing and transporting oil or natural gas for fuel.  
**OIL AND GAS.**—Equipment for producing, refining, or transporting oil or gas.  
**PAINTS AND VARNISHES.**  
**PAPER AND PULP.**  
**PENCILS AND PENS.**  
**PIANOS.**  
**PHOTOGRAPHIC APPARATUS AND SUPPLIES.**  
**PLUMBING SUPPLIES.**  
**POWER AND LIGHTING COMPANIES.**  
**RAILWAYS.**—Not operated by United States Railroad Administration.  
**ROOFING MATERIALS.**  
**SAFES AND VAULTS.**  
**SHIPS.**—Not including those built for United States Government, its allies, or United States Shipping Board.  
**SILVERWARE.**  
**SOAP.**  
**SPORTING GOODS.**  
**STREET RAILWAYS.**  
**STEEL.**—Furnaces or mills.  
**STOVES.**—For domestic purposes.  
**TANNERS.**—Plants engaged principally in tanning leather.  
**TALKING MACHINES.**  
**TEXTILES.**—Cotton, woolen and silk.  
**TEXTILE MACHINERY.**  
**TIN PLATES.**  
**TOOLS.**—Small or hand tools for working wood or metal.  
**TYPEWRITERS.**  
**WATCHES.**  
**WIRE ROPE AND CABLES.**

Below is the form which will be used by the Community Labor Board in making out the monthly labor report.

#### Urge Abandonment of Meetings

WASHINGTON, Oct. 15—The War Industries Board has requested that because of the Spanish influenza epidemic all meetings scheduled for after Wednesday, Oct. 16, be abandoned. This does not include regular office and inter-departmental meetings, though it is urged that these be held down to as few as possible.

## Open Central School for Labor

### Chicago Manufacturers Establish Headquarters for Training Unskilled Workers

CHICAGO, Oct. 14—A central school for training unskilled labor has been established in Chicago and will be running within the next week. Local industry is watching the new training school with a great deal of interest because upon its success probably will depend the establishment of a number of others along similar lines. The skilled labor market in Chicago, which for a long time has been a difficult problem, has been made even more serious by the call for highly trained operators in other cities.

In its endeavor to find the exact reasons for the present difficulty in obtaining skilled labor for machine tool work, the Hill Pump Valve Co., manufacturing motor car accessories, conducted an investigation which showed that the labor turnover is exceptionally high, due to the competition among Chicago plants against each other for labor, by which employees were taken from one concern by offers of higher wages from other concerns, both in this city and in other cities.

This investigation showed that in many instances labor was traveling in circles, that many of the workers would jump from factory to factory at the constantly increasing offers of higher wages, and in some cases even coming back within a few years to the original factory, which had weaned them away from their last job.

The idea of a central training school

#### FORM TO BE USED IN MONTHLY LABOR REPORTS

Industry.....	Name of company.....	State.....	City.....
Classification of employees			
Principal product .....	Male		Female
	White	Colored	Total
Last pay day*.....		Male	Female
Date.....		Male	Female
8 months prior to above date.....		Male	Female
Date.....		Male	Female
Number of women at last pay day doing work done by men 8 months prior?.....			
How many of the employees are common laborers?..... Male?..... Female?.....			
What percentage of production is on war contracts?***.....			
At what percentage of total maximum capacity is plant now operating?***.....			
If production is not maximum capacity, state principal cause.....			
Remarks.....			
Date.....	Name.....	Address.....	

\*Take last pay day nearest end of last calendar month.

\*\*The percentage of output on direct Government contracts or subcontracts, or direct contracts or subcontracts with an ally of the United States.

\*\*\*This should be estimated on the normal operation of the plant, assuming all conditions are favorable for production.

Mail the above report to the BUREAU OF LABOR STATISTICS, 1712 G Street, Washington, D. C.

was placed before the different manufacturing and trade organizations of the city, and also before Chairman Miles of the Section on Industrial Training for the War Emergency Advisory Commission, Council of National Defense, and the co-operation of the Chicago Board of Education was enlisted. Through Assistant Superintendent of Schools Roberts, one of the city's school buildings in the manufacturing district has been designated as a central training school, and Chairman Miles has sent a man from his office to take charge of the school at a salary of \$6,000 a year. The Board of Education voted to spend \$10,000 for teachers, in addition to donating a school.

Several manufacturers are donating machine tools, such as automatic screw machines, drill presses, etc., duplicates of the machines that they are using in their plants, and upon which employees sent from their factories will perform the same operation that they are to perform when they have finished the course and go back to the factory.

Certain requirements are made of the factories which take advantage of the school. They must, first, furnish certain equipment, that is, machines; second, they must send a certain amount of their green help for training, and third, they must permit their foremen and other skilled workers to give some time to the school as instructors of their help.

It is the understanding that the unskilled workers who are sent from a plant must return to the plant after their course is completed. Night classes are to be established, so that those who are working in the factory in the daytime may take the school course after hours, and thus increase their efficiency and earning capacity. Unskilled help may attend the school without coming from any factory, and it is presumed that such students, if so they may be called, will be free to choose the plant that they will become allied with after the completion of the course.

#### Only Salesmen Hit by "Work or Fight" Order

ST. LOUIS, Oct. 14.—No employee of an automobile dealer with the exception of floor salesmen is subject to removal from his or her job under the work or fight order, according to a report filed with President Vesper of the N. A. D. A. by Executive Secretary E. E. Peake. This report was made after Peake and two directors had visited Washington with a view of clearing up the muddled situation as to automobile employees. His report is based upon information obtained from the Provost Marshal's office, whence comes the work or fight order.

#### Missouri Has 184,862 Cars

ST. LOUIS, Oct. 14.—The Oct. 1 announcement by the Secretary of State shows that Missouri has 184,862 cars licenses to owners. Other figures in the report are: 1648 dealers' licenses, 2340 dealers' duplicate plates, 3692 motorcycle plates, 21,087 chauffeur badges, 8500 registrations and 1485 duplicate plates.

## Women Suitable for Foundry Work

### Rest Periods and 8-Hour Day Needed—Semi-Steel Shells Asked For

MILWAUKEE, WIS., Oct. 12.—Two hundred firms connected with the American Foundrymen's Association and other metal industries contributed to the display of manufacturers' products in connection with the annual convention of that association held here this week. The attendance was the largest in the history of the association, which was largely due to the war work being done by the members of the organization. In addition to the American Foundrymen's Association the metals division of the American Institute of Mining Engineers, the American Malleable Castings Association and the iron and steel section of the American Institute of Mining Engineers also met during the convention.

#### Stress Laid on Gas Shells

Greatest stress was laid upon the manufacture of semi-steel gas and smoke shells, already undertaken in France, and about to be adopted by American manufacturers as a much less expensive but equally efficient product to be furnished the Allied armies. Members of the French technical commission were present to give information concerning the processes used in France, and a report prepared by the committee of American foundry experts acting in an advisory capacity to the Ordnance Department was presented. In this manner the entire foundry industry of America was given the first comprehensive and authoritative instruction with respect to the production of semi-steel shells, which probably will be purchased in enormous quantities by the Government within a short time.

France makes 25,000 of these shells a day. They are not so good as steel shells but are manufactured to keep the factories at a maximum point of operation, as enough steel cannot be used to keep them at maximum on steel shells. France does not want America to cut down her production of steel shells, but if possible to manufacture in addition quantities of semi-steel shells.

#### 33,000,000 Semi-Steel Shells Needed

This country and the Allies are in immediate need of 33,000,000 cast semi-steel shells, and the gray iron and malleable iron foundries of the United States and Canada must become proficient in this work immediately. All sizes of shells will be required. At first the shells will be used as gas shells.

J. A. Galligan of Chicago was of the opinion that there was enough coke to supply western manufacturers for the coming winter, but that the coal supply was doubtful. To-day 52 per cent of the railroad equipment is being used in hauling coal. Approximately 100,000,000

tons more coal will be needed this year than last.

C. E. Knoepfel of New York in an address on employment of women in foundries asserted that more women will have to be secured if the country is to put forth its maximum war effort. In many respects women are more efficient than men in foundry work and can be used for practically every purpose except heavy work. Women should be given the same wages as men. An 8-hr. day should be provided with rest periods. There should be separate entrances for the women, and as far as possible they should be segregated from the men.

#### Michigan Labor Shortage Still Critical

DETROIT, Oct. 14.—According to a report made by the United States Employment Service the state of Michigan is short 30,000 skilled and unskilled men. Camp Custer is short 2100 unskilled men and 1200 carpenters; Grand Rapids, where a large government picric acid plant is being erected, needs 1200 unskilled men and 400 carpenters; Northern peninsula requires 5000 miners, trammers and laborers and 1500 carpenters. Exclusive of this the state is reported to have a shortage of 20,000 to 25,000 unskilled men and 4000 skilled men. The office reports that the city of Detroit alone needs 1700 unskilled men, 1000 machinists and metal workers, and 1700 other kinds of skilled workers.

During the month of September the office had received calls for 21,707 men and 14,760 were sent to jobs. Of this number 6981 calls were for common labor and 4172 were sent to report for work. Records show that 75 per cent of all the men sent out on jobs are placed. It is difficult to state what becomes of the remainder. It is believed that many of the men and employers fail to send back to the Employment Office the card which is given the applicant to acknowledge the acceptance of the work.

#### Ford Employees Raise \$20,000 Worth of Foodstuffs

DETROIT, Oct. 14.—As a result of a movement started by the Ford Motor Co. employees were successful in raising more than \$20,000 worth of foodstuffs on the land which the company offered for this purpose. The land adjoins the plant buildings and has remained unutilized. The area was divided into 401 sections and each employee received 3000 sq. ft. to work.

#### Drill Chucks on Export Conservation List

WASHINGTON, Oct. 14.—Drill chucks and electrolytic cells have been added to the export conservation list by the War Trade Board, and will require individual licenses for exportation. The restrictions upon the importation of grindstones have been modified by the War Trade Board, which will now allow the importation of grindstones from Europe and Mediterranean Africa when coming as a return cargo, shipped from convenient ports, and when loading can be done without delay.



## All Pilots to Carry Oxygen

Aviators in Battle, Reconnaissance and Bombing Planes Hereafter to Have Tanks

WASHINGTON, Oct. 10—Every pilot in the American Army who goes aloft over the German lines in combat or bombing planes will carry oxygen tanks made in the U. S. A., with sufficient oxygen for from 6 to 8 hr. breathing. Pilots and observers in reconnaissance planes on photographic work will also carry them on clear days when such work is carried on at 15,000 ft. or over.

The normal atmosphere near the surface of the earth contains about 21 per cent oxygen and 79 per cent nitrogen. As the pilot ascends, the density of the atmosphere becomes less and the supply of oxygen grows relatively smaller as higher altitudes are reached. At 19,000 ft. the density of the air has diminished to the extent that each cubic foot contains only one-half the amount of oxygen as at sea level.

Pilots who are able to continue for any length of time beyond 10,000 or 12,000 ft. have a sense of "lack of air" and open their mouths in breathing to get more air. The breathing becomes quicker and deeper; the heart beats faster. They obtain the requisite amount of oxygen by increasing the amount of air breathed in a given time and by exposing a greater amount of blood to the oxygen in the air cells of their lungs.

While breathing under this pressure and really in distress, many pilots do not feel any marked inconvenience for a short period before this emergency method of getting air which nature provides gives out. He may feel perfectly fit and well but he is not as efficient as when near the ground. His reaction becomes slower; he uses longer time to judge distance; to aim his guns, to fire, and to manoeuvre his plane, although he is not conscious of this impairment. Here disaster lurks, for the pilot with swaying senses is no longer the captain of his plane. He will lose his judgment and if he attempts to stay at these altitudes will gradually pass into a condition of semi and sometimes total unconsciousness. A crash follows.

By the new process oxygen from the tanks carried by pilots flows in such a manner as to in no way impair the comfort or movements of the airman. The apparatus is simple and entirely automatic. While the airplane stands on the ground no oxygen is given off, but when it takes the air the increasing deficiency in the oxygen as the plane arises is automatically made up for by the flow of oxygen without attention from the airman.

The device which does this consists of a small tank, or tanks according to the amount of oxygen carried, the pressure apparatus, and the face mask covering the mouth and nose, and the tube con-

nected with the reservoir. This mask has combined with it the interphone whereby the pilot and observer can talk to each other with ease while in the air.

## British Air Ministry Praises Liberty Engine

WASHINGTON, Oct. 12—The British Air Ministry has officially gone on record in praise of the Liberty airplane engine and the American made De Haviland 9 and De Haviland 10 airplanes. W. C. Potter, Acting Director of Aircraft Production, received a cablegram from the British Air Ministry sent through the British Air Mission in Washington as follows:

"After 100 hours flying, one engine (Liberty) was stripped and found to be in very good condition. Tests have been made in the air in the De Haviland 9-A and De Haviland 10 machines. Engines have performed uniformly satisfactorily in these tests. Information officially expressed 4 months ago to effect that engine would prove satisfactory in service fully confirmed."

## National Aeronautic Committee Meets

WASHINGTON, Oct. 11—The National Advisory Committee for Aeronautics held its annual meeting yesterday at which reports of progress in the scientific study of flight were submitted. These reports were ordered published in the Fourth Annual Report, which will be submitted to Congress in December. The committee reviewed the present aeronautic conditions and situations, and at the same time adopted estimates for continuing further experimental and research work for the following fiscal year. Immediately following the meeting of the full committee, the Executive Committee met and elected Dr. C. D. Walcott chairman of the Executive Committee and Dr. S. W. Stratton secretary of the Executive Committee.

## Four Deaths at Aviation Fields

WASHINGTON, Oct. 12—During the week ending Oct. 5, 1918, there were four fatalities at flying fields in this country due to accidents in training. Each fatality represented 971 hours of flying or 77,680 miles in the air. Following is the summary:

Tallaferro Field, Hicks, Texas.....	3
Taylor Field, Montgomery, Ala.....	1
Total .....	4

There were no deaths reported due to flying training at any of the other 25 fields.

## Oakland Gets Bugatti Cylinder Order

PONTIAC, MICH., Oct. 15—The Oakland Motor Car Co. has been asked to supply the United States Government with cylinders for the Italian Bugatti 16-cylinder engine. Production on this contract is to start next week in the former Northway motor plant.

## Living Conditions to Be Examined

Government Commission to Look Into Situation As Means of Increasing Production

WASHINGTON, Oct. 15—The United States Government, through several of its departments, is rapidly becoming a great landlord to tenants occupying buildings erected by Government departments for the use of labor directly engaged in war work. The United States Shipping Board already has 21 housing projects under way, and the Ordnance Department has another 21 in operation. The latter project is operated on a cost plus basis by employers as agents of the Government. All told the Housing Bureau has some 60 projects of various sizes, managed by trained men.

Latterly, conditions outside the plants under which the workers of many of the war industries are living have reached the point where the production program is being seriously interfered with. In consequence the War Labor Policies Board made certain investigations and has recommended the creation of a Commission on Living Conditions of War Workers. This organization will be a branch of the Bureau of Industrial Housing and Transportation.

Its principal purpose will be to eliminate circumstances which in many cases have caused a very large rate of labor turnover with a constant retardation in production. The commission is to investigate living conditions and advise governmental agencies concerning methods conducive to maximum production. The commission will have on its staff specialists in recreation, education, public utilities, safety and sanitation.

## Motorcycle Production Restricted

WASHINGTON, Oct. 16—The manufacture of motorcycles and bicycles has been restricted during the last 4 months of 1918 to 75 per cent of production in the same period during 1917. Such ruling has been made by the Priorities Division of the War Industries Board, which states in Priority Circular No. 37 that makers must reduce their consumption of materials to three-fourths of four-twelfths of the quantity used last year in the same period. Production is not curtailed numerically by specific order. Both the Hendee Mfg. Co., Springfield, and the Harley-Davidson Co., Milwaukee, the two largest manufacturers, are engaged largely on Government work.

## Watson Heads Hispano-Suiza Section

WASHINGTON, Oct. 14—John W. Watson, president of the American Bronze Corp., Berwyn, Pa., has been appointed assistant chief of the Hispano-Suiza engine section of the Aircraft Production Board, of which B. D. Gray is chief. Mr. Watson will make his headquarters in New York.

## Imports Into South Africa

863 Cars in Last Six Months  
—Two-Thirds Less Than  
Year Ago

JOHANNESBURG, SOUTH AFRICA, Aug. 14—In the first 6 months of 1918 there were imported into South Africa 863 automobiles as compared with a corresponding 6 months of 1917, when 2529 automobiles were imported. This dropping off of imports was entirely due to lack of shipping facilities. The 863 automobiles imported the first 6 months of this year were valued at \$615,155, an average of \$712.

The importation of trucks showed a falling off also. In the first 6 months of 1918 there were only fourteen trucks imported as compared with eighteen in the first 6 months a year ago. The fourteen imported this year had a total value of \$41,765, or an average of \$3,000 each.

The importation of tires during the first 6 months of this year showed a small falling off as compared with a year ago. The tire imports this year totaled \$865,640, as compared with \$992,415 a year ago.

The value of automobile parts imported for the first 6 months of this year was \$452,685, as compared with \$524,875 in the corresponding 6 months of a year ago.

Although the importation of automobiles showed a heavy falling off in the first 6 months, the custom authorities say that a large number were imported in July, although figures have not yet been given out. One ship has just come to hand with 300 Maxwells, and it may be these belated July shipments will considerably improve the import figures covering the first 6 months of the year.

At present there are four main ports into which automobiles are imported, and of these Port Elizabeth stands first, with Durban second, Cape Town third and East London fourth. The figures showing the number of cars imported at these ports are as follows:

Port	Cars	Trucks
Port Elizabeth .....	359	3
Durban .....	257	0
Cape Town .....	122	2
E. London .....	112	9
Other Ports .....	13	0

Car prices increase with every few shipments. It was mentioned in error in a previous article published in AUTOMOTIVE INDUSTRIES that the Ford price was \$1,575. It is only \$1,250 for the regular model.

A few years ago Cape Town was the port for inland automobile traffic. Now most of the cars pass through Durban and Port Elizabeth. Durban is 500 miles from Johannesburg, Cape Town 1000 and Port Elizabeth 750. But it is found that upward of 10 days are saved by off-loading at Port Elizabeth.

This is chiefly because Durban is fast becoming the general port for the Union,

and the railroads and docks are not up to the traffic. So wise dealers get their cars off at Port Elizabeth. Also at Port Elizabeth ships are not off-loaded by the South African railways and harbors—the Government Service—but by a company contract, and they seem to get through the off-loading better.

Durban is now the port for the interior and a fast rising city.

## Liberty Engine Production Totals 10,151 to Oct. 10

DETROIT, Oct. 15—The total production of Liberty engines on Oct. 10, including all makers, was 10,151, these being distributed among the various makers as follows:

Lincoln .....	2,824
Packard .....	3,965
Ford .....	2,010
General Motors .....	1,144
Nordyke & Marmon .....	208
Total .....	10,151

The number of engines shipped by these various companies is slightly lower than the total production figures. This is due to the fact that a certain proportion of engines may be practically 99 per cent assembled but held up for some minor detail. Such details may be completed on a large number of engines in one day, thus pushing daily shipments considerably higher. Following are the numbers of engines shipped from the various plants:

Packard .....	3,696
Lincoln .....	2,601
Ford .....	1,766
General Motors .....	961
Nordyke & Marmon .....	139

## Russell Profits \$628,581

TORONTO, ONT., Oct. 15—During the fiscal year ending July 31 the Russell Motor Car Co. made net profits of \$628,581.55, and though this is approximately \$15,000 less than for the previous year, it includes allowances for war profits tax and other contingencies. The balance carried forward shows a marked increase from a year ago, the amount being \$536,162.22 as compared with \$47,580.67. Following is the balance sheet:

Assets	
Cash on hand and in bank .....	\$175,461.55
Accounts and bills receivable .....	313,830.19
Investments in other companies .....	3,793,387.47
Dominion of Canada War Loan .....	321,947.25
Stock on hand, manufactured and in process, raw materials and supplies .....	137,084.91
Insurance, fuel, etc. ....	7,881.55
Real estate and buildings .....	54,583.25
Machinery, tools, patterns, furniture, etc. ....	192,666.61
Less depreciation .....	25,699.24
Total .....	\$4,871,143.54
Liabilities	
Bankers' advances .....	\$325,000.00
Accounts and bills payable (including war tax) .....	1,014,600.93
Dividends declared and unpaid .....	77,000.00
Contingent account .....	216,075.50
Plant investment and insurance reserve .....	802,304.89
Capital stock (preferred, \$1,200,000; common, \$800,000) .....	2,000,000.00
Profit and Loss account .....	536,162.22
Total .....	\$4,871,143.54

## Clear Convoy Routes of Snow

Highways Transport Committee Prepares Plan to Keep Roads Open

WASHINGTON, Oct. 12—The Highways Transport Committee, Council of National Defense, of which Roy D. Chapin is chairman, is preparing plans for the removal of snow from motor convoy routes extending from the north and middle western states to the seaboard during the coming winter.

The committee, which was effective in this work last winter, will use its complete organization, comprising the regional directors and the State Highways Transport Committees, in co-operation with the Motor Transport Corps under General C. B. Drake, in this work.

The State Highway officials of Pennsylvania, New York, Ohio, Illinois, Indiana, Michigan, New Jersey, Massachusetts, Connecticut, Delaware and Maryland, which co-operated with the committee and the War Department most effectively last winter, will be called upon again to arrange plans for the snow removal program which is now contemplated.

The New York Legislature has provided Highways Commissioner Edward Duffy of that state with a fund of \$50,000 to be used in keeping the roads traveled by Government trucks clear of snow. Arrangements have been made with Prof. Charles F. Marvin, Chief of the Weather Bureau, by the committee, to have forecasts made from different observation points in the territory to be covered by motor truck routes at least three days in advance of the starting of the trains. In this way it is expected that the organization will be able to anticipate coming snowfalls and guard against them.

Lieut.-Col. W. D. Uhler of the Motor Transport Corps, in co-operation with the committee, is outlining his plan of motor transportation over three main truck routes, one starting from Chicago, one from Detroit and one from Buffalo, and all converging at Baltimore.

Colonel Uhler is also making plans through the use of the army for removal of snow in co-operation with the committee and as soon as his plans are completed they will be announced. General Drake, in a letter to the Highways Transport Committee asking for its co-operation in the removal of snow from truck routes, suggested that the route from Chicago to Baltimore be as direct as possible, the one from Alma, Michigan, via Detroit to Baltimore and that from Buffalo via Albany to Baltimore.

The moving of motor trucks under their own power from factory to seaboard has grown until now there are as many as 500 traveling over the highways in a single day in separate convoys, and by the time the winter snows fall these numbers will have increased considerably.

# Trade Reconstruction Policies of European Belligerents

## U. S. A. Government Report Gives Comprehensive Analysis

WASHINGTON, Oct. 14—The Government has issued its first report on reconstruction work following the war which has been issued through the Bureau of Foreign and Industrial Commerce which contains an analysis of the main tendencies toward reconstruction in the different belligerent countries of Europe. The reconstruction programs in England, France, Italy, Germany and Austria are outlined and an analysis of each given.

This monograph together with the fact that there are certain Washington representatives in Europe studying reconstruction problems suggests that at last Washington has gotten under way its reconstruction program.

In all of these European reconstruction programs the control of raw materials assumes a major place, and already Great Britain and some of the other countries have entered into agreements with their colonies regarding raw materials.

There is a general sentiment as deduced from an analysis of European reconstruction work that the Government control of an essential product may be converted into a valuable political asset and that political contingencies may make it necessary to keep such a product out of the influence of free economic laws.

Among the high spots brought out in the analysis is the suggestion that there seems to be a general fear that the middle man may be eliminated from the economic structures of some countries after the war.

Germany seems to favor a monopoly on the importation of raw materials as a means of mobilizing the purchasing capacity of the country to counteract economic discrimination.

France holds favorably toward monopolies, a policy which she has stood by in the past.

### Co-operation in Britain

In Great Britain and Germany two parallel movements in the work for after-war conditions are seen. In each country the government is creating new instruments or overhauling the old in order to be ready to meet the new conditions created by the war, and private organizations in commerce, industry and finance are getting closer together and co-ordinating their efforts so as to present a solid front to the anticipated onslaught of their old rivals.

While the different countries are preparing for post-war conditions Great Britain, which has been a leader in this

### Some Conclusions

- A—Government Control of Industries Will Increase.*
- B—Government Control of Raw Materials to Follow.*
- C—Middleman May Be Eliminated in Some Countries.*
- D—France Is Favorable to Certain Monopolies.*
- E—Germany Plans Monopolies on Raw Materials.*
- F—Business Concerns Uniting for Trade After War.*
- G—European Plan to Reorganize Consular Service.*
- H—Great Britain Reorganizing System of Technical Education.*
- I—Three-Year Control of Exports After Peace by England.*
- J—Working Clause in Patents and Trade Marks Urged.*
- K—Banking Amalgamation Started in Germany.*

movement, is not at present attempting to lay down any complete or binding policies regarding the future, but looks upon such as a waste of effort. Her work at present consists in assembling of facts and taking basic steps to improve educational research and promote organizations so as to contribute to clear thinking on the questions involved.

Such expedients as a Webb-Pomerene Bill, authorizing the combination of exporters for foreign trade purposes, the Federal Reserve Board and national banking system with their wide leeway in foreign trade banking matters, the Federal Board for Vocational Education developing the fundamentals of reconstruction by consideration of general vocational training, and the collections of statistical data and research investigations by the Department of Labor, Department of Agriculture, Bureau of Mines and the Geological Survey of the Department of Interior, the Bureau of Standards and the Bureau of Foreign and Domestic Commerce of the Department of Commerce, the United States Shipping Board, War Trade Board, War Industries Board, the State Department and the United States Tariff Commission, are all a considerable amount of quiet and effective work that will be found decidedly constructive in the formulation of the policies of the United States for after-the-war business. With the co-ordination of the efforts of all these departments under one Government office much will be done toward safeguarding the economic future of this country.

These views expressed in a bulletin on economic reconstruction prepared by the

Bureau of Foreign and Domestic Commerce of the Department of Commerce embody the opinions of official Washington on a subject which is receiving not only consideration but considerable action among both our Allies and the Central Powers. In fact, steps are now under way in this country for an enlarged program of economic reconstruction. Walter S. Gifford, Director of the Council of National Defense, is at present investigating and consulting on the subject with British and French authorities in London and Paris. Plans are being considered for the conversion of the Council of National Defense into a vehicle suitable for handling these matters, for making it into a body possibly similar to the Reconstruction Committee of the British Ministry of Munitions.

### Many Plans Adopted

Although the tendency to consider economic factors for after the war as retaliatory weapons is now far less pronounced, states the bulletin of the Department of Commerce, than it was during the period of the Paris Economic Conference, every belligerent country of commercial or industrial importance is considering the economic problems that will arise after the conclusion of peace. Many ambitious schemes have been adopted, but these will of course be modified in accordance with the duration and outcome of the war. But there are certain well defined tendencies and some parts of the program of the more important countries which have received official sanction or been adopted by legislation. These should be considered by the United States because although



many of them are unsuitable or unnecessary for this country they may prejudice its interest in foreign fields.

#### Government Control to Increase

There seems to be a unanimous opinion that Government control of and participation in trade and industry in all of the belligerent countries will increase. Admissions of the inevitability of this have been made by even the strongest opponents of the governmental control policy. The chief reason and probably the factor which no opposition can combat lies in the fact that the ordinary sources of revenue of each nation will be insufficient to bear the enormous fiscal burdens and **THE GOVERNMENTS WILL HAVE TO GO INTO BUSINESS TO PAY FOR THE COST OF THE WAR.**

In addition to this important factor are two others developed as a result of the war and which will undoubtedly influence government control seriously. These are:

##### Economic self-sufficiency.

National control of raw materials and essential products.

Economic self-sufficiency has developed with the war which has proven it a political necessity. Governments must be self-sustaining. National control of raw materials and essential products is another factor developed by the war and is closely related to the problem of self-sustenance. Both Great Britain and Germany are giving much attention to these ideas—England because of the great extent of the natural wealth of its empire and Germany because of the lack of such wealth in its boundaries. The war has developed the fact that control of essential products by a country may convert it into a valuable government asset, and that it must be kept free from the influence of general economic laws of supply and demand and price fluctuation. If such control is found necessary after the war it is almost certain that it will be a government control; and if the control produces increased profit, opinions, according to the Department of Commerce, are that the Government should receive at least a good share of such profits to be applied to the obligations created by the war and for the promotion of the many plans for social betterment.

The entry of the United States into the war and the Russian revolution are considered as disturbing elements in the original plans for economic pact of retaliation on the part of the Allies and the economic alliance of the Central Powers. An economic union between Germany and Austria-Hungary, however, is regarded as a certainty by economists in both countries, although considerable opposition has developed on the part of commercial interests in the Baltic ports and Hamburg as well as by the Agrarians in Bavaria.

#### Governments Enter Commerce

Both Germany and Great Britain have established new departments of commerce, the Ministry of Reconstruction in

Great Britain and a similar department in Germany, which forecast ambitious plans for after-war world trade. Plans for the reorganization of the consular service and technical education in Great Britain, waterways extension in France, Germany and Austria-Hungary, reorganization of credit institutions in Great Britain and France and the restoration of the merchant marine are movements that forecast these schemes.

German economic life has probably changed more than that of any other country. This is due to the great government control exercised during the war, the intensive paternalism developed by the war and the economic pressure caused by the blockade of that country's boundaries. As a result the German problem resolves itself into two phases:

a—Government control during the emergency period, primarily for economic reasons.

b—Permanent government control, primarily for fiscal reasons.

Germany cannot transform itself suddenly from the present extensive scheme of government control and paternalism into a normal competitive regime without creating serious economic and social complications, particularly in the problems of exchange, shipping and raw materials supplies. Even the commercial interests which have complained bitterly against the German war policy that has eliminated the middlemen admit the need of retaining the present economic organizations in charge of raw materials and foodstuffs for some time after the conclusion of peace, although they urge the abolition of these organizations as soon as possible to allow the restoration of those economic forces which created Germany's economic progress in the past. At present the German economic scheme includes, importantly:

- 1—Imperial control of cargo space.
- 2—Imperial control of import rationing and prohibition.
- 3—Imperial control of foreign credits.
- 4—Imperial supervision of exports of raw materials and manufactures.
- 5—Imperial control of the distribution of imports to equalize industrial reconstruction.

In a recent statement before the Reichstag the Secretary of State for Economics stated that so long as the supply of raw materials after the war will be inadequate, the government will have to retain control for the protection of the weaker interests. He stated also that he was taking the threat of an economic boycott on the part of the Allies seriously and making preparations to meet such an emergency. Later in the spring of 1918 the German Government stated that while it does not intend to regulate all commerce and industry it will interfere in the supplies of rubber, oils, leather and hides and such commodities as may be inadequate to meet the demands. In other commodities where there will be a considerable surplus the state will interfere to prevent excessive imports. Present plans include the creation of a number of economic offices to co-operate with the present war

companies which will be reorganized on a peace basis. Various trades and industries will be represented by individuals to be nominated by the industrial, commercial and labor organizations subject to the approval of the Secretary of State for Economics. For some time after the war it is expected that German tonnage will be reserved principally for essential imports which will be controlled by an expert commissioner from the Ministry of Economics. Plans also call for government control of freight rates.

#### Britain to Control Exports

British activities indicating government control for after the war include the introduction of an Imports and Exports Bill providing temporary control for 3 years after the conclusion of peace and a recently adopted Non-ferrous Metal Industry Act giving the Board of Trade control of the business in non-ferrous metals and ores. This last measure is intended primarily to eliminate enemy interests, but is also considered a movement toward government control. At the last meeting of the British Associated Chamber of Commerce it was stated by Sir Albert Stanley that at the close of the war practically all trade and industry of the country will be controlled directly or indirectly, and that it will be the function of the government to immediately abandon these controls as soon as it will be compatible with the national interests. He does not believe, however, that it will be possible for the government to give up its interests in the railways and canals and allow them to revert to their pre-war state.

Continuation for at least 12 months of the existing prohibitions against enemy imports and for government control of exports of essential raw materials is advocated by the Committee on Commercial and Industrial Policy After the War. The London Chamber of Commerce has on several occasions warned against "perpetuation of those methods of expediency justified by the war for after the war." There is a fear that the middleman will be eliminated from the economic structure of the country, a possibility that has considerable opposition.

Organized labor in Great Britain favors government control, a natural attitude in view of the results to labor. At a recent meeting the Labor Party demanded immediate nationalization of railways, mines, production of electrical power and a continuation of the existing government control of commerce and industry for after the war.

#### Germany to Have Monopolies

The establishment of monopolies as the best practical method of exercising government control is advocated by economists in each of the different countries. Some economists prefer monopolies as against capital levies. There is a German tendency toward monopoly of the import of raw materials as a method of mobilizing the purchasing power of the country to counteract economic discrimination and also as a means of increasing the revenue by depressing the

purchase price abroad and raising the selling price at home. It is also claimed that this form of monopoly would only affect import trade and leave the internal trade undisturbed.

Monopolies in France are established government institutions. This country has long had monopolies of manufacture and sale of some commodities. A monopoly of petroleum is now being suggested embodying the taking over of the existing highly concentrated import trade and refining industry. The British monopoly of petroleum is also being considered in connection with a possible exploitation of the Persian oil fields.

#### Britain to Control Resources

To secure economic self-sufficiency and national control of essential products the Dominions Royal Commission of Great Britain is investigating the development of the resources of the empire and the prevention of foreign control of such resources. Some sort of department will be established to secure the information of the requirements of the empire in essential products and their actual and potential outputs. An example of the plans of the British Government for the control of national resources is displayed by the recent agreement with the Australian Government by which the output of zinc concentrates will be controlled for the period of the war and 10 years following. The British Government takes the stock of zinc concentrates on hand Dec. 31, 1917, leaving a specified percentage reserve and 250,000 tons yearly for the duration of the war and one year following, and 300,000 tons annually for the succeeding 9 years. It also retains an option on the balance of production, subject to reservations such as the requirements of the Australian zinc refining works and the fulfillment of existing contracts. There is also a tendency in Great Britain for at least a temporary protective policy over certain industries, calculated to shut off imports of specific German products such as magnetos.

France will be busy for years after the war with the restoration of the invaded districts, and realizes that it will not be able to engage in comprehensive plans of economic reconstruction. Consideration is being given to the development of water power resources, coal and colonial activities, and it is likely that agriculture will be stimulated.

#### Great Britain's Policies

Briefly summarized the British Government in order to meet the problems following the conclusion of peace has developed the reorganization of the War Trade Board corresponding to the Department of Commerce of the United States; the British Ministry of Reconstruction to continue for 2 years after the war, designed to co-ordinate all the departments bearing on reconstruction and which is divided into branches dealing with commerce, production, material supplies, finance, shipping, labor, rural development, health, education, housing and internal transportation; patent and trade-mark legislation; technical educa-

## Rubber Imports Still Decline

### Total for 9 Months Below That of Last Year—All Free Rubber Now Received

NEW YORK, Oct. 11—Imports of crude rubber continue to decline. The total to date from the first of the year is less than for the same period in 1917. During the first 9 months of 1917 the total importations touched 136,325 tons, whereas during the first nine months of 1918 the total was 131,132 tons, which is a loss of 5193 tons.

Imports during September were less than half those for August, 5151 tons coming in during September as compared with 10,421 tons in August; this is a drop of 5270 tons. Imports during September, 1918, were considerably less than one-third the tonnage that came in during September, 1917, a comparison of these two months showing a loss of 8513 tons.

Practically the entire amount of September importations is allocated rubber, substantially all of the free rubber shipped prior to May 8, 1918, having reached this country. According to the rulings of the War Industries Board, importations of rubber have been restricted to 25,000 tons during the last quarter of the year, which means that the monthly allowance is approximately 8300 tons. September, of course, dropped considerably below this figure, so that the difference between the actual imports and the allowance will be permitted to come in during October. It is understood that there is quite a quantity of rubber on the seas and that imports will practically equal the quantity permitted to come in.

Following are the statistics as compiled by the Rubber Association of America:

Month	1917, Tons	1918, Tons
January .....	12,788	16,084
February .....	10,162	13,108
March .....	18,624	17,161
April .....	13,000	12,703
May .....	18,411	16,288
June .....	15,096	24,124
July .....	17,290	16,092
August .....	17,290	10,421
September .....	13,664	5,151
Totals .....	136,325	131,132

tion and the Registration of Business Names Act. The Ministry of Reconstruction is assisted by an advisory council representative of all the leading interests concerned in reconstruction. The section of the advisory council working with the branch dealing with finance, shipping and common services is at this time engaged on the problem of the disposal of government stores after the war. This problem is regarded as so important that a special body will be created to take charge of the work and act as a selling organization for the government departments having surplus stocks to dispose of. Army demobilization is being considered and plans are now being formulated.

The Board of Trade has introduced two measures providing for strict application of the working clause in patent and trade-mark legislation, for greater facilities for licensing and for revocation of patents when patent rights are abused as, for example, failure to work the patent, to grant licenses on reasonable terms or unfair conditions imposed on the sale or use of the patented article. The regulations are intended to prevent the abuse of words as trade-marks and to provide facilities for the registration of marks which could not be registered under past legislation. The Registration of Business Names Act compels the registration of real names, surnames, nationality, nationality of origin, usual residence and other business occupations of the directories of all companies registered in Great Britain or with an established place of business in the country.

#### Britain's Technical Education

Technical education is to be promoted and is receiving the consideration of a number of committees. Five million dollars has been obtained from Parliament which is to be expended for this work. Private efforts in Great Britain include banking amalgamation, industrial amalgamations, such as the organization of the United Steel Companies, comprising six concerns and capitalized at \$50,000,000; the British Trade Corp., which will supply extraordinary credit to concerns that are members and to colonial concerns allied with it; the Federation of British Industries, an association of British manufacturers, which assists the government in framing industrial legislation, settling labor difficulties and the promotion of British trade interests; the British Empire Producers Organization, designed to create economic self-sufficiency for the British Empire; the British-Italian Corp. for the promotion of closer trade relations between the two countries.

In France the Association Nationale d'Expansion Economique has undertaken a comprehensive economic survey of the country, and the Comité Republicain du Commerce, de l'Industrie et de l'Agriculture has investigated organizations and published the results, expressing their views in regard to the changes in economic structure necessitated by the war together with preparations for the future.

The Imperial Ministry of Economics created in Germany is divided into two main sections, one dealing with war economics, tariffs, monopolies, syndicates, etc., and the other with such social questions as unemployment, insurance, savings, housing, etc. Bank amalgamation has also taken place in Germany. An export trade organization somewhat like the British Trade Corp. has been capitalized at 25,000,000 marks and will undertake the construction and operation of railroads, harbors, electric plants, factories, etc. There is also a movement for the establishment of a special bank for export trade to insure that small German concerns will receive acceptance credits in the countries now at war with Germany.

## Tax on Car Owners Cut 50%

### Senate Committee Halves Original Figure—Consider "Gas" Tax Effect

WASHINGTON, Oct. 12—The Senate Finance Committee yesterday reduced the tax on users of automobiles 50 per cent, lowered the tax on sight-seeing automobiles and taxicabs and gave consideration to the possibility of seriously affecting gasoline production through the proposed gasoline tax. New automobile taxes to be put on the users of cars as agreed to by the committee follow:

23 h.p. or less.....	\$5
Between 23 and 30 h.p.....	10
Between 30 and 40 h.p.....	15
Over 40 h.p.....	25

Electric automobiles will pay \$2 per horsepower instead of \$5, as was fixed by the House, and 25 cents for each 100 lb. of weight instead of 50 cents.

The tax on sight-seeing automobiles was changed from 10 per cent of the gross receipts to a flat tax of \$20 per year per vehicle.

The tax on taxicabs and other automobiles operated for hire, carrying not more than seven passengers, was changed from 5 per cent of the gross receipts to a flat tax of \$10 per car per year.

The committee also listened to Mark L. Requa, Director of the Oil Division of the Fuel Administration, who told of the shortage of gasoline and the needs for it for war purposes, and urged that special consideration be given to the oil producers in the revenue legislation. At present the revenue bill as passed by the House provides for a tax of 2 cents per gallon of gasoline.

### Chevrolet-General Motors Merger Ratified

NEW YORK, Oct. 14—The merger of the General Motors Corp. and the Chevrolet Motor Co. has been finally ratified,

the stockholders voting at a meeting last Friday to adopt the basis of exchange originally laid down. Under this arrangement, holders of Chevrolet stock will receive one and one-seventh shares of General Motors common and 44 cents in cash for each share of Chevrolet. The General Motors Corp. has declared a dividend of \$3 per share payable Nov. 1 on common stock of record Oct. 18. Hence, stockholders who prior to that date forward their certificates to the Guaranty Trust Co., New York, properly endorsed, will receive this dividend. Stock delivered after this date will not carry the dividend but holders will receive an equivalent amount from the Guaranty Trust Co. Following is the balance sheet of the Chevrolet Motor Co. as of Oct. 11, 1918:

Assets	
Cash .....	\$278,042
732,680 Shares G. M. Common.....	73,268,000
Total .....	\$73,546,042
Liabilities	
Capital stock outstanding, 641,095 shares .....	\$64,109,500
Surplus and undivided profits.....	9,436,542
Total .....	\$73,546,042

### Electric Storage Battery Has Record 6 Months

PHILADELPHIA, Oct. 15—During the first 6 months of 1918 the Electric Storage Battery Co. realized profits only slightly less than the amount realized during the whole of 1917. In 1917 the profits were \$2,220,613, as against \$2,000,000 for the first 6 months of 1918. The earnings are at the rate of over 26 per cent per annum on a capitalization of \$16,130,000. The company is largely engaged on government contracts but is doing work with which it is thoroughly familiar and which has not required extensive plant additions. Following are comparative earnings since Jan. 1, 1910:

Year	Net Earnings	Net Income
1917.....	\$2,220,613	\$2,477,882
1916.....	1,318,796	1,582,058
1915.....	1,188,618	1,360,748
1914.....	848,628	1,103,238
1913.....	1,035,918	1,208,765
1912.....	1,023,836	1,125,280
1911.....	1,026,747	3,263,608
1910.....	871,573	1,120,012

## General Motors Nets \$26,078,120

### Profits During First Six Months of 1918 at Rate of 10.28% on Common Stock

NEW YORK, Oct. 15—General Motors Corp. for the first 6 months of 1918 showed earnings on common stock at the rate of 10.28 per cent in excess of the 12 per cent dividend now being paid. During that period it realized net profits, after deducting taxes, insurance and depreciation, of \$26,078,120. The surplus for the 6 months after paying dividends at the rate of 6 per cent on the preferred stock is equal to 11.14 per cent on the \$105,141,700 of outstanding common stock; this is at the rate of 22.28 per cent per year.

Following is the balance sheet as of June 30 compared with the balance sheet as of Dec. 31, 1917:

Assets—	June 30, '18	Dec. 31, '17
Permanent investment	\$68,708,687	\$38,931,930
Miscellaneous invests.	5,922,688	2,030,274
Cash .....	31,186,737	18,865,640
Liberty bonds.....	9,098,123	1,255,009
Notes and accts. receivable .....	23,975,413	13,595,539
Inventories .....	56,219,729	46,559,394
Deferred expenses....	1,281,360	854,435
Good will.....	.....	*11,697,503
Total assets.....	\$196,342,737	\$133,789,724
Liabilities—	June 30, '18	Dec. 31, '17
Preferred stock.....	\$19,676,800	\$19,676,800
Common stock.....	105,141,700	76,873,300
Outstanding stock sub. cos. not owned by G. M. Corp.....	540,500	540,500
Surplus sub. cos.....	1,138,558	859,083
Accounts payable.....	16,032,126	10,665,718
Notes payable .....	1,100,000	.....
Taxes, pay rolls, etc..	7,287,600	4,858,327
Reserve for two months proportion preferred dividend..	190,768	196,768
Reserve for Federal taxes and extraordinary expenditures..	15,865,735	6,939,019
Reserve for sundry contingencies .....	2,657,196	1,671,818
Surplus .....	26,705,753	11,508,392
Total liabilities.....	\$196,342,737	\$133,789,724

### Curtail Electric Heaters

WASHINGTON, Oct. 14—The War Industries Board has ruled that the manufacture of certain electrical heating appliances, including carburetor heaters, hand wheel heaters, intake heaters, manifold heaters, primer heaters, cigar lighters and foot warmers, must be discontinued after Dec. 27, 1918. Prior to that date, manufacturers of such devices will be permitted to match up their stocks and to continue the manufacture of such products as are partly manufactured and to use up stocks of materials on hand. After Dec. 27, however, manufacture of the above mentioned devices must cease absolutely.



This board has been the means of stimulating production at the forge shop of the Timken-Detroit Axle Co. During August (when the plan was inaugurated) the men aggregated an output 26 per cent in excess of the average production for the previous 6 months. The men know by referring to the board the quota they must meet each day; if they fail to meet it, the figure of the Hun is put ahead of that of the Yank and ~~stay~~ there until the latter regains his ground. The thought to keep the Yank always ahead spurs on the workmen



**James L. White Dies of Influenza**

INDIANAPOLIS, Oct. 14—James L. White, assistant general manager and assistant to the president of the Cole Motor Car Co. died suddenly Oct. 10 from Spanish influenza. He had been associated with the Cole organization for many years, going there from the Northway Motor & Manufacturing Co.

J. E. Baum, of the factory service department, Nash Motors Co., Kenosha, has accepted the position of service manager of the Philadelphia Nash Motors Co. and assumed his new duties in Philadelphia on Oct. 10.

A. W. Dietzel, for several years superintendent of the Waukesha Motor Co., Waukesha, has resigned to accept the position of works manager of the I. B. Rowell Co., Waukesha, manufacturer of Ford starters, tractor parts and farm implements.

Donald R. Black, formerly chief draftsman of the L-W-F Engineering Co., is now in the Air Service, U. S. A., having been inducted by his request. He is assigned to Langley Field, Hampton, Va.

H. L. Hall has been appointed manager of the Chicago branch of the Swinehart Tire & Rubber Co.. The Central Western territory is controlled by this branch.

E. H. Geyer has been appointed general sales manager of the Hercules Motor & Mfg. Co., Canton, O. He has been associated for a number of years with the Byrne-Kingston Co. and Kokomo Electric Co., Kokomo.

Charles M. Smith, formerly affiliated with the Detroit Steel Castings Co. and the Michigan Steel Castings Co., Detroit, has been appointed superintendent of the foundry operated by the Nelson Bronze Co., Saginaw, Mich.

Frank M. Taylor has been appointed efficiency engineer of the Russel Motor Axle Co., Detroit.

**To Make Removable Body Truck**

NEW YORK, Oct. 14—A company is in process of formation for the manufacture of a new type of motor truck and removable body with which it is hoped to solve many of the short haul problems of the railroads. The plan, in brief, is to produce wheeled bodies which may be carried intact by the railroads on flat cars and shifted from these cars at the end of the run direct to motor truck chassis. The cars would then be delivered by the motor truck to the consignee, who would draw them off the truck chassis and move them into position for unloading on their own wheels. Both the truck chassis and the bodies are the invention of Jos. C. Bonner, who heads a syndicate which shortly is to be converted into a manufacturing company.

## Men of the Industry

### *Changes in Personnel and Position*

**Graham Heads "Exiles"**

WASHINGTON, Oct. 15—George M. Graham, chairman of the Motor Truck Committee of the N. A. C. C., has been elected president of a new association styled "The Exiles," in which membership is limited to men of the motor car industry who have spent two months or more in Washington since the war began. Other officers are: Vice-president, Alfred Reeves; secretary, Harry W. Perry; Automotive Products Section, War Industries Board.

**Wolverine Tractor Elects Directors**

SAGINAW, MICH., Oct. 14—The Wolverine Tractor Co. has elected the following board of directors: W. J. Wickes, Arnold Boutel and W. E. Laur of Saginaw; C. A. Bigelow of Bay City; W. E. Wood, W. G. Wagenhals and W. F. Austin of Detroit. The company has been capitalized for \$300,000, of which \$175,000 has been subscribed.

**Steel Products Builds Shop Addition**

DETROIT, Oct. 14—The Steel Products Co. has taken out a permit for a one-story machine shop addition, 89 by 123, at 2177 East Sixty-fifth Street. The estimated cost of the job is \$30,000.

**Grand Rapids Brass Enlarges**

GRAND RAPIDS, MICH., Oct. 14—The Grand Rapids Brass Co. will erect at once an addition to its factory of three stories and basement, the building to be completed before Jan. 1.

**Supplies and Accounts Contracts**

WASHINGTON, Oct. 12—The Bureau of Supplies and Accounts of the Navy Department has placed contracts as follows:

Ford Motor Co., Detroit, ambulances.  
Willys-Overland Co., Toledo, blocks.  
Livermore Mills Co., Livermore, N. H., airplane spruce.  
Curtiss A. & M. Corp., Buffalo, N. Y., HS-2 shells.

**Bureau of Supplies Orders**

WASHINGTON, Oct. 12—The following orders were placed by the Bureau of Supplies and Accounts of the Navy Department:

Jamestown Propeller Co., Jamestown, N. Y., propellers.  
Hendeen Mfg. Co., Springfield, motorcycles.  
Harley-Davidson Motor Co., Milwaukee, motorcycles.  
Federal Motor Truck Co., Detroit, motor trucks.

**Fenner Appointed Assistant to Hanch**

WASHINGTON, Oct. 10—David C. Fenner, member of the Highways Transport Committee of the New York State Council of Defense, has been appointed as assistant to C. C. Hanch, Chief of the Automotive Products Section of the War Industries Board.

Albert W. Russell, formerly president of the Russel Motor Axle Co., and treasurer of the Russel Wheel & Foundry Co., Detroit, has been appointed a member of the War Credits Board to fill a vacancy caused by the resignation of F. P. Neal.

E. B. Foote, who has for some time been connected with the sales department of the Jaxon Steel Products Co., Jackson, Mich., has been placed in charge of the newly created wheel division of that company, with headquarters in Detroit, for the marketing of the Jaxon steel wheel.

Lee Anderson, vice-president and sales manager of the Hupp Motor Car Corp., Detroit, has taken charge of the publicity and advertising work of the Aircraft Production Bureau in Detroit. Newspaper advertisements, a house organ for employees and feature posters are among the means which he will use to stimulate increased production.

C. E. Morton, formerly Pacific Coast district manager for Packard, has been appointed manager of the Packard overseas division.

Thomas A. Russell, for 2½ years chief engineer of the Tractor Bearings Division of the Hyatt Roller Bearing Co., Detroit, and J. E. Martin, for 2 years dynamometer expert of the same division, were recently commissioned lieutenants.

V. C. Fuller has been appointed special traveling representative of the Bearings Service Co., Detroit, with headquarters at the main office.

**Motor Truck Sales Managers to Meet**

CLEVELAND, Oct. 14—The first regular meeting of the Association of Sales Managers of the Motor Truck Industry will be held in this city, Oct. 18, for the purpose of electing a board of directors and executive officers. Different points regarding the sale of motor trucks, their use, the possibility of trailers and the importance of good roads will be discussed.

**New International Steel Plant**

MILWAUKEE, Oct. 14—The International Steel Products Co., manufacturing gas engine silencers and other accessories and parts of pressed sheet steel, has broken ground for its new and permanent works in Hartford, Wis., the first unit of which will cost about \$30,000.

### General Motors to Make Frigerators to Be Marketed by Car Dealers

DETROIT, Oct. 12—W. C. Durant has bought the equipment and the rights of the Guardian Frigerator Co., Detroit, thereby bringing the General Motors Co. into the ranks of general utilities manufacturers. The entire Plant 5 of the Cadillac will be utilized in the manufacture of frigerators. The new company will be styled The Frigidaire Co.

The frigerator is a large insulated box in which food is kept at a low temperature generated and controlled by means of an electric motor.

The Guardian Co. had been in business for 2 years. The inventor of the machine and founder of the company, A. W. Mellows, will retain an interest in the new company. J. W. Murray of the J. W. Murray Manufacturing Co. becomes a stockholder. The officers of the new company have not been elected.

The product manufactured, which is more than a mere ice box or refrigerator, will be marketed through the General Motors dealers and distributors, thus filling in for them to a large degree the gap which has been caused by the reduction of passenger car production.

The frigerators will be sold to dealers on the same basis as cars with a slightly better percentage of profit. There are two models—one sells for \$350, the other for \$365—and the profit averages 25 per cent. The machines will take up very little space in a dealer's showroom and no accessories need be carried in connection with the proposition.

Within 30 days it is planned to have agencies established in Washington, Atlanta, Buffalo, New York, Pittsburgh, Philadelphia, Cincinnati and Dayton. Before Jan. 1, 1919, every General Motors agency will represent this company.

### Supreme to Erect Plant

CLEVELAND, Oct. 15—The Supreme Motors Corp., Warren, Ohio, has completed arrangements for the erection and equipment of a plant in which it will produce a complete line of engines. For the present, however, the company will confine its operations to war work. The officers of the company are: President, A. W. Green, Windsor, Ohio; vice-president and general manager, C. H. Davies, Warren, Ohio; secretary, C. F. Erickson, Ashtabula, Ohio; treasurer, C. N. Mitchell, Cleveland.

### More Room for McCord

DETROIT, Oct. 14—The McCord Mfg. Co., has let the general contract on a three-story addition to its factory at Jefferson Avenue and Connors Creek.

### Hospital of Milwaukee Ford Plant

MILWAUKEE, Oct. 14—The Milwaukee assembling plant of the Ford Motor Co., formerly serving the Wisconsin and Upper Michigan territory, has been requisitioned by the Government and will be converted immediately into a hospital of 1000 beds, with full equipment of surgical laboratories, operating rooms,

## Current News of Factories

*Notes of New Plants—Old Ones Enlarged*

etc. In recent months the plant has been used entirely to supply parts to Ford dealers in this territory, the assembling of cars having been discontinued in March.

### Zenith Carbureter Enlarges

DETROIT, Oct. 14—The Zenith Carbureter Co. is erecting a new four-story addition, 40 x 64, to its factory at the foot of Hart Avenue. The new building will cost about \$75,000. The ground floor will be ready for occupancy after Nov. 1, and the balance after Dec. 1.

### Consolidated Mfg. Co. Operates 80 Per Cent on War Work

TOLEDO, Oct. 12—The Consolidated Mfg. Co. is now about 80 per cent on war work, which consists of tubing, stampings and drop forgings for everything from motorcycle side cars for the Italian government to airplane and ship forgings for the aircraft and shipping boards. The tubing division of the plant is making 100,000 tubular die handles, to be used on work of the Emergency Fleet Corp. The company formerly manufactured motorcycles, but the facilities of this branch of manufacture have been turned to the bicycle industry. The company is averaging 1500 bicycles a week.

### Continental Declares Another Dividend

DETROIT, Oct. 10—The Continental Motors Corp. has declared a dividend of 1½ per cent, payable Oct. 30, to holders of common stock of record Oct. 21. Books of the company will close at the end of business, Oct. 21, and will re-open Oct. 31. The dividend will make a total of 6 per cent the corporation has paid to owners of its common stock during the calendar year. The regular quarterly dividend of 1¼ per cent is payable Oct. 15 to owners of preferred stock of record Oct. 5. It is understood that the plants of the Continental Corporation will be running on a 100 per cent war order basis shortly before Jan. 1. The change from private to government work is being effected on a gradual basis and has been under way for some time past.

### Declare Dividends

Pyrene Mfg. Co., quarterly dividend of 2½ per cent on common.

Packard Motor Car Co., Detroit, 4 per cent on common, payable Oct. 31 to holders of record, Oct. 15.

### Kahlenberg Adds to Buildings

TWO RIVERS, WIS., Oct. 14—The Kahlenberg Bros. Co., Two Rivers, Wis., maker of marine and stationary oil engines, has commenced construction work on a large new assembling, testing and shipping building. The space released by this addition to the facilities will be devoted to manufacturing. The new building will be equipped with a large electric traveling crane and the most modern testing equipment and accessories.

### More Room for Langstadt-Meyer

APPLETON, WIS., Oct. 14—The Langstadt-Meyer Mfg. Co., manufacturer of farm lighting systems and direct-connected generating units for other purposes, is enlarging its capacity by taking over the building heretofore occupied by the Appleton Motor Car Co. as a salesroom, service station and public garage. The entire building will be converted into a machine shop.

### Oneida to Build Trailers

MILWAUKEE, WIS., Oct. 14—The Oneida Motor Truck Co., Green Bay, Wis., is reported to have been granted a large contract to build trailers to be used for mobile army kitchens by the American Expeditionary Forces.

### Kissel Adding a Building

HARTFORD, WIS., Oct. 14—The Kissel Motor Car Co., which is devoting practically its entire facilities to the production of Four Wheel Drive trucks for the Government, has awarded contracts for the erection of a one-story warehouse building, 50 x 260 ft.

### Twenty-five Houses for Foundry Workers

BUCYRUS, OHIO, Oct. 12—The Ohio Steel Foundry and Carroll Foundry & Machine Co. have let a contract to the Bucyrus Builders Co. for the erection of twenty-five moderately priced houses, valued at from \$1,800 to \$2,000 for employees.

### Another Extension for Falls

MILWAUKEE, Oct. 14—Another large addition to the plant of the Falls Motors Corp., Sheboygan Falls, Wis., will be erected immediately. It will consist of a one-story shop addition, 120 x 275, and is the fourth extension made within a year's time. The company is devoting 100 per cent of its facilities to the manufacture of engines for Government trucks and other army purposes.

### Detroit Concerns Expanding

DETROIT, Oct. 12—The Detroit Lubricator Co. has been given a building permit to erect a one-story shipping room, 104 by 120, to cost \$25,000.

The Packard Motor Car Co. has obtained a permit for an addition to its plant to cost \$30,000.

The American Car & Foundry Co. will build a two-story factory addition, 33 by 120, to cost \$20,000.

**Tractor Development in Iowa***(Continued from page 665)*

far has been able to deliver only very few machines owing to inability to get needed machine tools and other equipment. The worm gear used is manufactured for the concern by the Cleveland Worm & Gear Co. This tractor has a  $4\frac{1}{4} \times 5\frac{1}{2}$  in. four cylinder engine, and the present price is \$1,685. Some years ago William Galloway took over the old Maytag automobile plant, which is directly adjacent to its own implement plant, and this is being converted into a tractor factory.

The fourth Iowa manufacturer of farm tractors is the Dart, which has just about completed its development work and is ready to begin production. The Dart has long been known as a manufacturer of motor trucks, having for some years produced a high-wheel motor delivery wagon and more recently heavier trucks of conventional design. The firm owns a manufacturing plant of modest dimensions and will continue the manufacture of trucks. The eastern agency for the new Dart Blue J tractor has been taken over by the Maxim Munitions Corp. and the tractor has been brought prominently to public attention by the activities of this concern. The Dart tractor is the work of W. H. Johnson of the company, who has acted in a consulting capacity to other tractor firms in the past. The machine is of clean-cut design throughout.

**Leader Becomes Rex**

Des Moines also has its tractor factory in the Leader, which in 1916 took over the business of the Ohio, which was started in 1901 or 1902 and manufactured about 850 all told during its existence. Owing to the use of the name Leader by another tractor company, the Des Moines concern has chosen the name Rex for its new model, which will shortly be put in production. This is a 3-plow, 12-25-hp. tractor, weighing about 5500 lb. and using kerosene as fuel. It is fitted with a Waukesha engine  $4\frac{1}{4}$  by  $5\frac{1}{4}$ , equipped with a Kingston carbureter, Eisemann magnet with impulse starter and Perfex radiator. The fuel tank holds 20 gal. of kerosene and 5 gal. of gasoline. S K F ball bearings are used in the gearbox. The engine sets crosswise of the frame and the drive is through spur gears exclusively. A Bierman clutch is used. Two forward speeds are obtained through the sliding type gearset of  $2\frac{1}{2}$  and 4 m.p.h. respectively. Sliding pinions on an extension of the clutch shaft mesh with a double gear on the differential shaft, and thence the drive is by bull pinions and gears to the rear wheels. The rear axle, which is  $2\frac{1}{2}$  in. in diameter, turns in bearings on the axle housing.

The rear wheels are 60 x 10 in. and the front wheels 46 x 4 in. The front axle is built up and is provided with automobile type steering knuckles. The frame is made of 7-in.  $12\frac{1}{4}$ -lb. channels and is very narrow in front where it is pivoted to the front axle, this feature, of course, being designed to permit of turning the tractor in a short radius. Steering is

effected through the intermediary of screw and nut steering gear, by means of a nearly horizontal shaft, to the rear end of which is secured the steering hand wheel. It is planned to provide extensions for the steering shaft and also for the other control members, so that the tractor can be operated from the seat of an implement drawn by it, such as a binder.

**Air Cleaners Analyzed and Compared***(Continued from page 680)*

of water containing dust are thrown out of the air while passing through the inner cleaner and drop back into the water reservoir again. This also accounts for the low water consumption.

Except at the instant of starting, the frictional resistance of this water cleaner is no greater than that of an equivalent one of the dry type because after once started it requires but little force to keep the body of water revolving.

**Air Cleaner Types**

The fourth type of air cleaner and the most widely used works on the centrifugal or gravity principle. Figs. 7 and 8 are examples of this type of cleaner. Fig. 8 was the first successful centrifugal or gravity cleaner on the market and is used on 75 per cent of the different makes of tractors which use air cleaners. It has been so widely used during the past 3 years as to require little explanation. The air is drawn by the motor suction through the openings in the sides of the cleaner into the spiral tubes. These spiral tubes have a downward pitch which gives the dust laden air a whirl, so that centrifugal action and gravity throws the dust out of the air under the cone and into the container below, while the clean air passes upward through the top and into the carbureter.

Fig. 7 shows a centrifugal cleaner of the same type as Fig. 8, differing only in outward appearance and size. The principle and action are identical and the construction nearly so.

There are several other forms of the four types of cleaner, but the ones shown and described in this paper are representative and serve to show the principles and design involved.

**Electric Dynamometers for Aircraft Engine Tests***(Continued from page 677)*

neto of the engine in case of tripping of the main circuit breaker, and to this is frequently added an attachment for shorting the engine ignition in the event of overspeed.

For the measurement of speed an indicating tachometer is regularly provided, either of the electric type or of the same type as is used in the airplanes themselves. It is customary also to have a speed counter for accurate measurement of the revolutions.

A recent application of the electric dynamometer is for the making of efficiency and endurance tests on propellers. The dynamometer is used as a driving

motor and the propeller is mounted upon a sliding shaft coupled to the dynamometer in such a manner that not only is the torque required to drive the propeller measured, but the thrust or reaction is also indicated. This arrangement is proving of great value in making overspeed tests on propellers.

Electric dynamometer testing of airplane engines is coming into very general use in all of the different departments of the Government in which engine tests are made, and with the leading engine manufacturers.

One of the most noteworthy installations of electric dynamometers is in one of the plants of the Willys-Overland Co., where engines of the training type have been produced. This plant has put over 6000 engines through the electric test and was the first plant in the country to reach a production of fifty airplane engines a day.

**Tractor Makers Protest Curtailment***(Continued from page 659)*

- W. S. Franklin, Jr., secretary Parrett Tractor Co., Chicago, Ill.
- R. F. Florian, general manager Square Turn Tractor Co., Norfolk, Neb.
- Merritt J. Osborn, general manager Nilson Tractor Co., Minneapolis, Minn.
- S. G. Miller, president Belt-Rail Tractor Co., St. Paul, Minn.
- H. C. Berry, engineer U. S. Tractor & Machinery Co., Chicago, Ill.
- J. B. Foote, president Foote Bros. Gear & Machine Co., Chicago, Ill.
- J. C. Westmont, general manager Wisconsin Farm Tractor Co., Sauk City, Wis.
- B. J. Larkin, vice-president Brewer Mosel Automobile Co., Madison, Wis.
- M. D. Herron, sales director Dart Truck & Tractor Corp., Waterloo, Iowa.
- P. Morris, Illinois Tractor Co., Bloomington, Ill.
- M. B. Falvey, Kokomo Electric Co., Kokomo, Ind.
- A. C. Bennett, Wilcox-Bennett Carburetor Co., Minneapolis, Minn.
- D. V. Kennedy, sales engineer Perfex Radiator Co., Racine, Wis.
- George D. Bailey, G. D. Bailey Co., Chicago, Ill.
- Henry Farrington, Agrimotor, Chicago, Ill.

**Implement Dealers Losing Tractor Sales***(Continued from page 684)*

once every year. One session is a joint meeting. Each organization sends to the other in advance of the joint conference a list of subjects which it appears desirable to discuss in order that sales managers and dealers may reach accord, if possible, upon trade policies which affect both. This joint conference is highly regarded by both. *What takes place at that conference is likely to make implement history.* There is a frank interchange of opinion. Manufacturers and dealers, through their accredited representatives, meet face to face and let the bars down. *Policies momentous to the implement trade have been determined upon at past conferences; policies equally momentous will be determined at future conferences.*

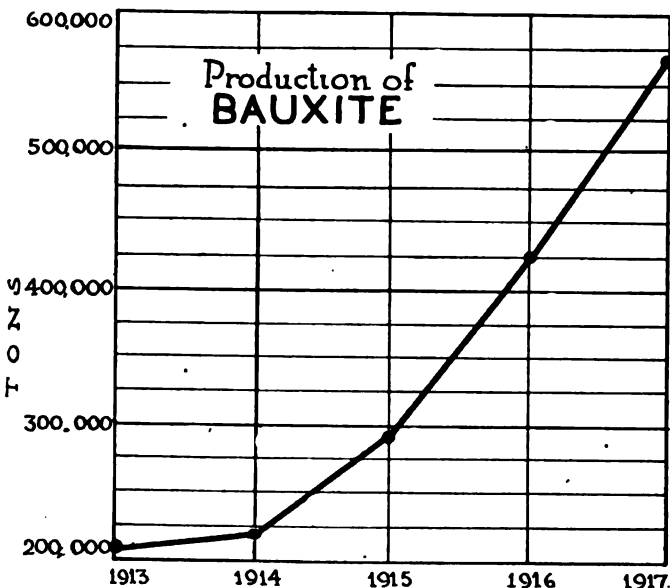
That was the stage upon which the drama of last week was played.



## AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>		<b>Burlap:</b>	
Muriatic, lb.....	.02 -.03	8 oz., yd.....	12.4 -15.85
Phosphoric (85%)..	.35 -.39	10½ oz., yd.....	14.6 -18.6
Sulphuric (60), lb..	.008	<b>Copper:</b>	
<b>Aluminum:</b>		Elec. lb.....	.26
Ingot, lb.....	.33	Lake, lb.....	.26
Sheets (18 gage or		<b>Fabric, Tire (17½ oz.):</b>	
more), lb.....	.40	Sea Is., combed, lb.	1.65-1.70
Antimony, lb.....	.13 -.13½	Egypt, combed, lb.	1.25-1.35



Bauxite is of value chiefly as a source of metallic aluminum, being first purified by chemical processes, after which the aluminum hydroxide is reduced in an electric furnace

Egypt, carded, lb..	1.20-1.30	<b>Rubber:</b>	
Peelers, combed, lb.	1.05-1.20	Ceylon:	
Peelers, carded, lb.	.95-1.05	First latex pale	
Fibre (¼ in. sheet		crepe, lb.....	.62
base), lb.....	.50	Brown, crepe, thin,	
<b>Graphite:</b>		clear, lb.....	.56
Ceylon, lb.....	.07½-.25	Smoked, ribbed	
Madagascar, lb....	.10 -.15	sheets, lb.....	.61
Mexican, lb.....	.03½	<b>Para:</b>	
Lead, lb.....	.08 -.09	Up River, fine, lb.	.63½
<b>Leather:</b>		Up River, coarse,	
Hides, lb.....	.18 -.35½	lb.....	.36½
Nickel, lb.....	.40	Island, fine, lb....	.59
<b>Oil:</b>		Shellac (orange), lb..	.74 -.75
Gasoline:		Spelter .....	.09¼-.09½
Auto., gal.....	.24½	<b>Steel:</b>	
68 to 70 gal.....	.30½	Angle beams and	
<b>Lard:</b>		channels, lb.....	.03
Prime City, gal..	2.50	Automobile sheet	
Ex. No. 1, gal....	1.70	(see sp. table).	
Linseed, gal.....	1.63-1.65	Cold rolled, lb.....	.06½
Menhaden (Brown),		Hot rolled, lb.....	.03½
gal.....	1.30-1.31	Tin .....	.80
<b>Petroleum (crude),</b>		Tungsten, lb.....	2.45-2.50
Kansas, bbl.....	2.25	Waste (cotton), lb...	.12¼-.17
Pennsylvania, bbl.	4.00		

AUTOMOBILE SHEET PRICES  
(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping.	6.20	6.10
Automobile body stock, extra deep stamping .....	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
<b>Automobile Sheet Extras for Extreme Widths:</b>		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
<b>Black Sheet Extras to Apply to Narrow Widths:</b>		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Knobloch in Ordnance Department

CLEVELAND, Oct. 14—A. F. Knobloch, vice-president and works manager of the Cleveland Tractor Co., Cleveland, has been appointed assistant to L. J. Horowitz in the Ordnance Department at Washington. In that capacity he will represent Mr. Horowitz in matters having to do with the practical, manufacturing and technical details in providing the fighting tanks required in Europe.

## Wheel Makers Convene

DETROIT, Oct. 16—Representatives of 24 manufacturers of wheels attended the third meeting of the Automotive Wheel Association held here yesterday. How the manufacturers can better assist the Government and efforts to standardize the wheel industry were the principal subjects discussed. The next meeting will be held at Chicago Dec. 9.

## Complete Detroit-Toledo Road

DETROIT, Oct. 16—The last 14 miles of paved highway between Detroit and Toledo were formally opened to traffic yesterday after appropriate dedicatory ceremonies had been held. A Govern-

ment train of twelve army trucks was the first to traverse the new road, which is the most important link of state highways in Michigan, as it is the gateway to the seaboard. The newly completed section of road was in course of construction since 1915, and from time to time new pieces were added until the entire 14 miles were completed. Eleven miles were built during this year and 3 miles since 1915. The cost of the project was approximately \$600,000.

## Federal Withdraws 3½-Ton Model

DETROIT, Oct. 16—The Federal Motor Truck Co. has withdrawn from the commercial market its 3½-ton truck. The move has been necessitated by the heavy demand by the Government for vehicle of this type.

## American Bronze Makes Changes

BERWYN, PA., Oct. 14—The American Bronze Co. has made a number of changes in its organization. Matthew C. Dittman, vice-president and treasurer, has been appointed general manager, and C. H. Baker, formerly auditor of the Timken Roller Bearing Co., Canton, will be his assistant. E. G. Anderson, sales

manager, has been appointed advertising manager.

## Curtail Road Making Machinery and Parts

WASHINGTON, Oct. 10—Road making machinery and parts cannot be manufactured in any quantities for the 6 months beginning Oct. 1, 1918, except:

- Repair parts.
- For work for railroads and other public utilities.
- For roads repaired by the United States Government, the several states, counties and municipalities.
- For new construction by the United States Government either directly or indirectly.

This curtailment is by the order of the War Industries Board. Briefly, it means that no road making machinery will be manufactured for the construction of new highways except where such construction is either directly or indirectly for the Government. Parts for the repair of road making machinery can be secured however, where the machinery is to be used in the repair of roads and highways either for the Government or for state, county or municipal order.

## Contracts Placed

WASHINGTON, Oct. 14—The following orders were placed by the Bureau of Aircraft Production:

Wright-Martin Aircraft Corp., New Brunswick, engine spares.  
Spranger Wire Wheel Co., Detroit, spares for planes.  
Howell & Lesser, San Francisco, Cal., spares for planes.  
Budd Wheel Corp., Philadelphia, spares for planes.  
Marlin-Rockwell Corp., New York, radiators.  
The Acklin Stamping Co., Toledo, Ohio, spares for Handley-Page.  
B. F. Goodrich Co., Akron, tires and tubes.  
Willys-Overland Co., Toledo, nuts.  
Light Mfg. & Foundry Co., Pottstown, Pa., lower crank cases.  
Disco Mfg. Co., Detroit, synchronizing generators.  
English & Mersick Co., New Haven, radiators.  
Doehler Die Casting Co., Toledo, Ohio, engine spares.  
Wright-Martin Aircraft Corp., New Brunswick, tools for repairing engines.  
Pittsburgh Steel Products Co., Pittsburgh, Pa., seamless steel tubing.  
Wire Wheel Corp. of America, Buffalo, wire wheels for planes.  
Ericsson Mfg. Co., Buffalo, magneto terminals.  
Fitzgerald Mfg. Co., Torrington, Conn., gaskets.  
Taylor Instrument Co., Washington, D. C., thermometers.  
Taylor Instrument Co., Washington, D. C., barometers.  
Curtiss Aeroplane & Motor Corp., Buffalo, cap screws.  
Lewis Spring & Axle Co., Chelsea, Mich., spares for planes.  
Hayes Ionia Co., Grand Rapids, parts for planes.  
Springfield Aircraft Corporation, Springfield, airplanes.  
Curtiss Aeroplane & Motor Corp., Buffalo, airplanes.  
Bosch Magneto Co., New York, N. Y., magnetos.  
Harrison Radiator Corp., Lockport, radiators.  
Goodyear Tire & Rubber Co., Akron, streamline wheel covers.  
Rome-Turney Radiator Co., Rome, N. Y., radiators.  
North East Electric Co., Rochester, voltage regulators.  
North East Electric Co., Rochester, N. Y., overland relays.  
Corcoran-Victor Co., Cincinnati, Ohio, aero navigation lights.  
Curtiss Aeroplane & Motor Corp., Buffalo, bolts and nuts.  
John A. Roebling's Sons Co., Trenton, N. J., wire.  
St. Louis Aircraft Corp., St. Louis, airplanes.  
Joseph N. Smith & Co., Detroit, generator mounts.  
Curtiss Aeroplane & Motor Corp., Buffalo, spares for planes.  
The Rubay Co., Cleveland, Ohio, spares for planes.  
G. & O. Mfg. Co., New Haven, Conn., radiators.  
Wright-Martin Aircraft Corp., New Brunswick, wrenches.  
Curtiss Aeroplane & Motor Corp., Buffalo, gaskets.  
Boston Auto Gauge Co., Boston, Mass., gauges.

## Gas Engine for Indian Office

WASHINGTON, Oct. 14—The United States Indian Office, Department of the Interior, Washington, D. C., requests bids on the following tractors and gaso-

## Contracts

line tank. Bids must be accompanied with certified checks or drafts for bond equal to 5 per cent of the total amount.

One 20-40 H.P. Gas Tractor, with following specifications:

Tractor must be equipped with four cylinder, horizontal motor, flat spoke drive wheel, and equipped to burn gasoline, kerosene and distillate oil.

OR

One 20-40 H.P. Gas Tractor, with following specifications:

Tractor must be equipped with two cylinder, vertical motor; cylinder to be 8 3/4 in. in diameter and 9 in. stroke; equipped to burn gasoline, kerosene and distillate oil. One Five-hundred gallon gasoline steel tank with truck.

Tractors which do not differ radically from the specifications given above will also be considered; give full description of what you propose to furnish, with cuts.

Bidders to plainly mark their envelopes containing their bid:

Hour, date and place of opening.  
Character of supplies to be furnished.  
Name of Indian Agency requiring the supplies.

Any supplies awarded under this bid will be delivered within .... days from receipt of order.

Please show your delivery point plainly.  
Make price f.o.b. Garrison, N. Dak. ....  
f.o.b. your plant .....  
or other points which you may name.

NO PERSON WILL BE RECEIVED AS A CONTRACTOR who is not a manufacturer of, or regular dealer in, the articles which he offers to supply on the attached advertisement and he must expressly warrant that he has employed no third person to solicit or obtain this contract in his behalf, or to cause or procure the same to be obtained upon compensation in any way contingent, in whole or in part, upon such procurement; and that he has not paid, or promised or agreed to pay, to any third person, in consideration of such procurement, or in compensation for services in connection therewith, any brokerage, commission, or percentage upon the amount receivable by him hereunder; and that he has not, in estimating the contract price demanded by him, included any sum by reason of any such brokerage, commission, or percentage; and that all moneys payable to him hereunder are free from obligation to any other person for services rendered, or supposed to have been rendered, in the procurement of this contract. He must further agree that any breach of this warrant shall constitute adequate cause for the annulment of this contract by the United States, and that the United States may retain to its own use from any sums due or to become due thereunder, an amount equal to any brokerage, commission, or percentage, so paid, or agreed to be paid.

## Engineers Corps Contracts

WASHINGTON, Oct. 10—Following is a list of contracts placed by the General Engineer Depot of the Army:

Detroit Twist Drill Co., Detroit, ratchet drills.  
Commerce Motor Car Co., Detroit; Dodge Bros., Detroit.  
White Co., Cleveland; Dunbar Mfg. Co., Chicago; American Car & Foundry Co., Berwick, Pa.; C. R. Wilson Body Co., Detroit.

and Grant Motor Car Corp., Cleveland, handbooks.  
Nash Motors Co., Kenosha, steering wheels.  
Keystone Vehicle Co., Reading, truck tops.  
Locomobile Co. of America, Bridgeport, labor on assembled machines.  
Hale & Kilburn Corp., Philadelphia, body drawings.  
Holt Mfg. Co., Peoria; Ford Motor Co., Detroit, tractors.  
Republic Stamp & Enamel Co., Canton, Ohio, cups.  
Nash Motors Co., Kenosha, nut cutters and steering knuckles.  
Four Wheel Drive Auto Co., Clintonville, chassis winch prints, radiator gaskets.  
Atwater Kent Mfg. Co., Philadelphia, machine-gun sight tracings.  
Edward G. Budd Mfg. Co., Philadelphia, steel loops and tabs.  
International Harvester Co. of New Jersey, Chicago, machine-gun wagons.

## Supplies and Accounts Contracts

WASHINGTON, Oct. 11—The following list of contracts has been placed by the Bureau of Supplies and Accounts of the Navy Department:

B. F. Goodrich Rubber Co., Akron, insulated copper wire.  
Ingersoll-Rand Co., New York, air compressors.  
J. T. Wing & Co., Detroit, gaskets.  
Fitzgerald Mfg. Co., Torrington, gaskets.  
Anderson Engine Co., Chicago, generator sets.  
U. S. Light & Heat Corp., Niagara Falls, storage batteries.  
Willard Storage Battery Co., Cleveland, storage batteries.  
Curtiss Aeroplane & Motor Corp., Buffalo, steel pins.  
Aeromarine Plant Motor Co., Keyport, floats.  
Empire Rubber & Tire Co., Trenton, hose, cotton, rubber.

## Quartermaster Contracts Let

WASHINGTON, Oct. 14—Following is a list of contracts placed by the Quartermaster Department, Board of Review:

Harley - Davidson Motor Co., Milwaukee, motorcycle parts, \$6,425.99.  
Craycroft Oil Co., New York, gasoline, \$7,050.  
Standard Oil Co. of Kentucky, Louisville, airplane gasoline, \$8,100.  
Standard Oil Co. of New Jersey, New York, gasoline and kerosene, \$9,285.  
Columbus Forge & Iron Co., Columbus, vises, \$12,806.79.  
The Columbian Hardware Co., Cleveland, vises, \$47,292.60.  
Dover Stamping & Mfg. Co., Cambridge, funnels, \$698.74.  
Standard Oil Co. of New York, Blissville, L. I., airplane gasoline, \$17,100.  
Standard Oil Co. of New York, New York, Motor gasoline, \$9,800.

## Timken Axle Making Additions

DETROIT, Oct. 14—The Timken-Detroit Axle Co. is erecting a two-story addition to its factory, also a one-story addition to its foundry.

## Bohn Foundry Expands

DETROIT, Oct. 14—Charles B. Bohn Foundry Co. is building a two-story addition to its foundry on Hart Avenue, also a one-story core room at the plant.

## Calendar

## ENGINEERING

Nov. 14-15 New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

## SHOWS

Oct. 12-19 — Atlanta. Tractor demonstrations Eastern State Fair and Automotive Exhibition.  
Oct. 14-27—Dallas, Tex., Seventh Annual Texas Auto-

mobile Show. Texas State Fair.

Oct. 16-18—Ottawa, Ont., International Plowing Match, Tractor and Farm Machinery Demonstration. Experimental Farm.

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration State Fair.

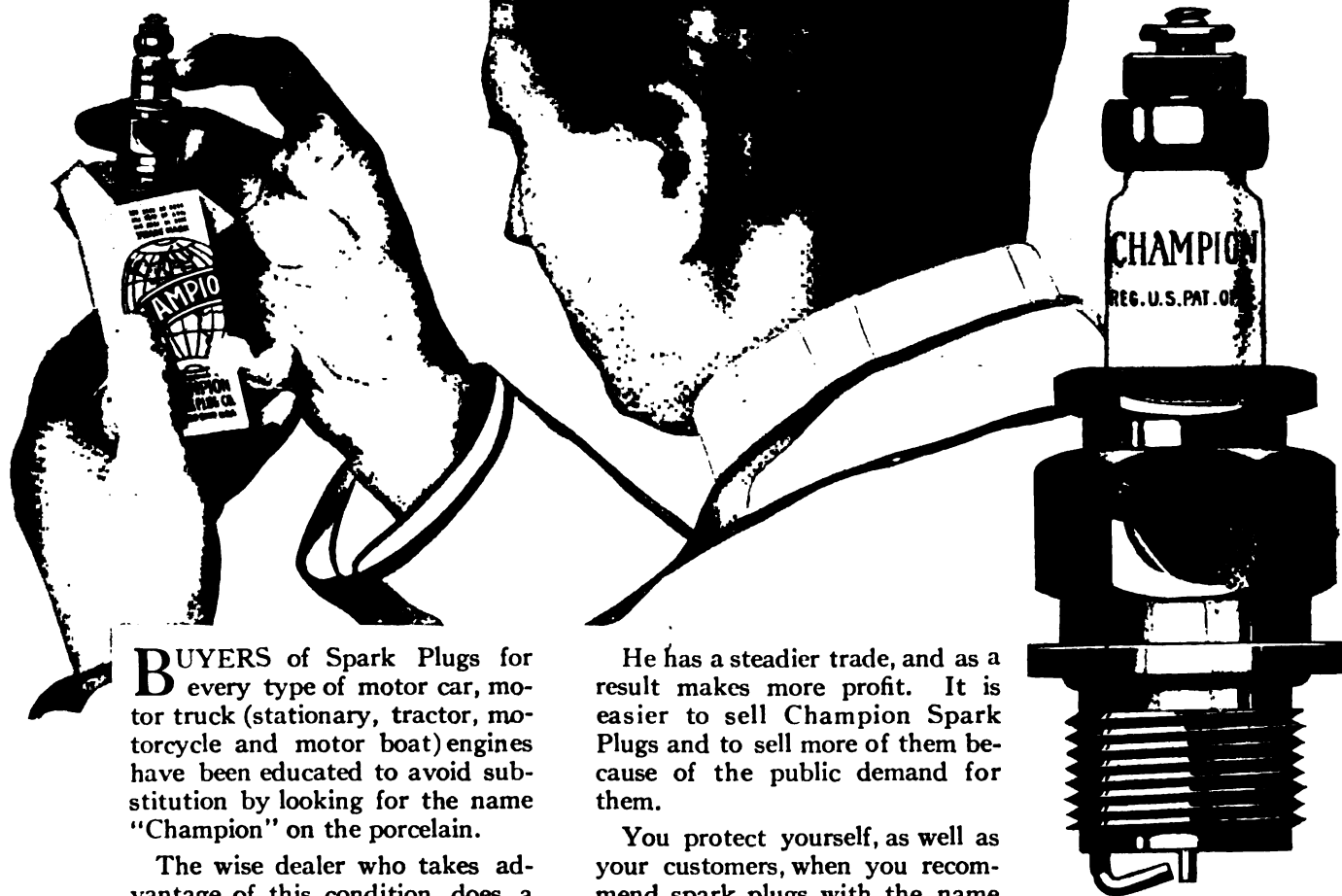
Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.

# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE



Look for the Name "Champion" on the Porcelain as well as on the Box



**B**UYERS of Spark Plugs for every type of motor car, motor truck (stationary, tractor, motorcycle and motor boat) engines have been educated to avoid substitution by looking for the name "Champion" on the porcelain.

The wise dealer who takes advantage of this condition does a larger volume of business.

He has a steadier trade, and as a result makes more profit. It is easier to sell Champion Spark Plugs and to sell more of them because of the public demand for them.

You protect yourself, as well as your customers, when you recommend spark plugs with the name "Champion" on the porcelain.

Champion Spark Plug Company, Toledo, Ohio  
Champion Spark Plug Co. of Canada, Limited, Windsor, Ontario

Champion  
7-8 18  
Price \$1.00



## *A Guaranteed Anti-Freeze*

**WE GUARANTEE** that Johnson's Freeze-Proof has no more effect than water on the metals of the radiator or on rubber. We guarantee that when used according to directions Johnson's Freeze-Proof will give absolute protection to radiators at any temperature.

## **JOHNSON'S FREEZE-PROOF**

This is the logical anti-freeze preparation for you to stock—it is put up in compact form so will not require much space—it is the most economical because there is no freight to pay on the water—it will be the most extensively advertised non-freezing preparation on the market.

Johnson's Freeze-Proof is put up in packages containing 6½ lbs. net, packed 12 to a case. List price \$1.50 each in the U. S. A. East of the Rockies—subject to liberal discounts to the trade. All live jobbers handle it.

### **FREE OFFER!**

We will send interested dealers a regular \$1.50 package *free* and *postpaid*, this is sufficient to protect a Ford from freezing to 5° below zero. We make this liberal offer to show the trade just what our product is. Write on your business letterhead to

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# **JOHNSON'S**

# **FREEZE-PROOF**



**Your Radiator Can't Freeze**  
**One Application Lasts All Winter**

# AUTOMOTIVE INDUSTRIES AUTOMOBILE

VOL. XXXIX

NEW YORK, THURSDAY, OCTOBER 24, 1918—CHICAGO

No. 17

## Extracts from Senate Aircraft Report Testimony

Indicate Predjudice Against Automobile Industry and Disclose  
How Report Was Not a Fair Deduction from the  
Evidence—Credit Should Have Been  
Given Where It Was Due

**W**HILE waiting for the Hughes aircraft report, which is expected at almost any time, a careful perusal of the 1200 pages of evidence taken by the Senate Military Affairs subcommittee in the investigation which resulted in its report establishes more and more the conviction that the final report failed to represent the bulk of the evidence. The report was highly prejudiced against the automobile industry and as such told only one side of the story, leaving the other hidden in the report of the hearings.

Without mention of the numerous facts that testify to the loyalty, the willingness, the sacrifices and the RESULTS achieved by the automobile industry as told in the testimony, without comment in the report of the numerous delays caused by army officials and civilians in the Government employ who never were connected with the automobile interests, the comparison of the testimony with the report creates the impression that exaggeration and possibly prejudice entered into its compilation.

Thorough reading of the voluminous testimony develops several outstanding features:

a—Complete ignorance of many army officers, in aviation work, with aeronautics.

b—Appointments of army officers to important aeronautical work who were in no way familiar with their duties.

c—That the automobile industry has been most patient, active and efficient in view of the ignorance, delays, procrastination and indecision it encountered.

d—That the blame attached to the automobile industry seems to be based chiefly upon the words of a few concerns envious both of the facilities of the automobile industry and its ability to handle aircraft business.

e—That several of the Senators were more anxious to find evidences of graft than means for improving the aircraft program, although their mission was in no way to be related with the Hughes inquiry into the possible dishonesty of officials.

f—That the Liberty engine is without doubt the peer of all aviation engines.

g—That the statements made in Congress that no airplanes reached France prior to July 1 from America were untrue.

h—That the word of a single official has been accepted as the basis for wholesale denunciation of the members of the original Aircraft Board.

i—That in its anxiety to make a report severely critical much that was to be commended was left unsaid.

First to emphasize themselves to the reader because of their absence in the report are the numerous statements in the testimony that reflect great



credit on the automobile industry, and second comes the ignorance charged in the report to the automobile industry and actually merited only by the army officials and Government civilian employees who, in the main, were never connected with the automobile industry.

The Senate Committee visited the many plants throughout the country engaged in war and aircraft work. One of the first was Packard, where the committee learned of the invaluable work performed by the company in its early experiments on a Packard aviation engine and which work gave J. G. Vincent the experience that aided him in his share of the designing of the Liberty engine. They were told of the patents in the Liberty engine held by Packard "given without cost to the Government." They heard of the important services by Vincent given to the Government while he was in the pay of Packard, and how until he actually accepted a commission in the army, Packard donated his services to the nation.

### Ford Ahead of Schedule

At Ford's the committee learned that in addition to the vast war work the company is doing other than in aviation, it holds a contract for hundreds of thousands of Liberty engine cylinder forgings, and that the company was not only up to the minute on its contract, but could complete it faster than the Government could consume the product. They heard also that the company installed new machinery for the work.

The General Motors Corp., the committee was told, built a plant especially for the aviation work and at the time of the investigation was up to 100 per cent production on many parts of the Liberty engine and close to that figure on the others. The committee was told, and no mention was made in the report, of the critical hindrance to production created by army officers who visited the plant and enticed the important workers away by telling them they could avoid trench service if they enlisted for repairshop work abroad.

The committee was told, and made no mention in the report, of the keen competition for workers among various concerns in the country and the need for Government control of the labor situation.

No mention was made in the report about the fact that the Cadillac delay in Liberty engine production was due to the fact that all its tool-room capacity had already been given over to other Government war work. No mention was made that Cadillac was at the same time turning out 3,000,000 airplane parts for the Fisher Body Co., besides thousands of micrometer gages for the Liberty truck. And no mention is in the report of the "splendid co-operation between the various automobile companies" engaged in Liberty engine production in the exchanging of surplus parts, thus increasing the outputs.

At the Lincoln plant the committee learned and never mentioned that Lincoln was started as a patriotic venture with the outbreak of the war because the founders believed manufacturers should be ready to aid the Government. They learned that the

Lelands invested over \$2,000,000 in the establishment of the plant, which cost was not in any way figured in when the cost-plus contracts were made. Also, they heard how the Lincoln company sent representatives to all sections of the country, visiting 83 factories to secure the tool-makers necessary for the Liberty engine work. And the report did not tell how the Government itself delayed the company by its ignorance of whether it would use an eight or twelve-cylinder engine. And they did not report that the company shipped 236 engines complete and perfect by June 1, and was quickly nearing schedule production.

No mention was made of how the Fisher Body Co. lost 2 months in production and was forced to cut down its organization from 800 men to 200 men because following receipt of a contract only 5 per cent of the drawings arrived from the Government and were followed by changes ordered almost daily, or how W. C. Potter, who lately has been Acting Chief of Aircraft Production, testified that the Fisher Body Co. was "doing wonderful," or how Captain D'Annunzio of the Italian Mission told that the Fisher Body Co. "had a very good plant."

The committee heard from C. F. Kettering, a recognized engineer of automobile parts and a member of the Dayton-Wright Airplane Co., how his every suggestion was turned down by army men with the statement that "it would not work."

### Board of Competition

And at this part of the testimony Senator Chamberlain himself said that, because of the testimony, the situation could be compared to that of the Ordnance Department of a year previous, when "its proper purpose was to furnish the American Army with the best practical equipment that would be up to date, but instead of performing that function they had long ago resolved themselves into a board of competition with the inventive genius of the world."

And in the report is no mention of the statement by Senator New of Indiana, who testified that at Nordyke & Marmon "I found the company very greatly embarrassed and their work seriously retarded through their inability to receive deliveries of tools at an early date, but this embarrassment has been overcome and the plant is now ready to begin deliveries at an early date." He also told that Walter Marmon stated that one of the greatest difficulties was caused by interference with the work by the Government itself, particularly the Ordnance Department, which stopped workmen making tools and diverted their activities.

It may be that the report intended in its criticism of the automobile industry to blame only those members of the industry who were officially connected with the Government in its aircraft program. This inference may seem warranted by the severe denunciation given later in the report to those men. But it is not warranted by the testimony which shows that the actual aircraft program and actual production were the direct work of the Signal Corps under General George O. Squires and that this section in the reorganization came in under the name of the



Bureau of Aircraft Production, the body that is actually responsible for the placing of contracts and the inspection and production. In the original body under General Squires this was known as the Equipment Division and it included within its reorganization practically every man who had served under the General. John D. Ryan, testifying that this was the body that actually made contracts and purchases, and which was, therefore, the one to be held responsible, told that it included W. C. Potter, formerly with the Guggenheims in mining and metallurgy; Kellog, Potter's assistant and a metal manufacturer; Colonel Mixter, formerly with the John Deere Plow Co., and in charge of production; Major Wold, formerly a certified accountant and in charge of finances; Major Downey, a Regular Army officer, in charge of disbursements. All of these men, with the exception of Colonel Mixter, who was replaced by A. A. Landon of the American Radiator Co., are still holding the same positions. None were automobile men.

#### Where the Denunciation Originated

The denunciation of the automobile interests seems, after perusal of the report, to be founded upon the testimony of H. B. Mingle, president of the Standard Aircraft Corp., Elizabeth, N. J., who laid stress on the fact that the automobile industry was considerably interested in this aircraft production and was trying to monopolize it. It may also have been occasioned by the possible misunderstanding of the committee that such concerns as the Excelsior Mfg. Co., making an inferior engine in the "Lawrance motor," were automobile concerns. The Standard Aircraft Corp., which complained of the automobile industry interest in aircraft, is a company financed by Mitsui & Co., Japanese bankers, who hold the \$2,000,000 preferred stock of the company, and who, according to the testimony, were also the paymasters for the German secret service prior to the war. This concern, now engaged in making airplanes for Japan, was criticised as inefficient by Major C. B. Rose, who told that the company was trying to make De Havillands, H.I I-L navy boats, J.R. I-B training planes, flying boats for Japan, Handley-Page planes and M. defense planes at one time. This concern is the one, also, that caused Captain D'Annunzio the impression that Capronis could be built there quickly in quantity, by its promises. The president of this company, according to the testimony, was a lawyer prior to the war and without manufacturing experience, whose salary of \$62,000 as president of the company is figured into the cost-plus contract the company holds with the Government.

Further, the Senate report does not tell in any detail of the ignorant army officers placed in important positions and who delayed the air program. It does not tell of the testimony of W. F. Parish, chief of the oil and lubrication section, Bureau of Aircraft Production, who told that engineers at the various fields were men who had been given a hurried 3-months course in engineering at the Massachusetts Institute of Technology and other institutions, men who prior to holding these important

places were bill clerks in freight offices, grocery clerks, wooden box makers, bond salesmen and others who had been in occupations in no way connected with engineering.

There was also criticism of the automobile men by Col. T. H. Bane, who complained that the automobile engineers assumed they could make airplanes without reference to men who are practical fliers and aeronautical engineers. He did not tell which aeronautical engineers in this country had been ignored. He probably referred to himself and other fliers in his statement, which brings to mind the possible analogy of asking a chauffeur to collaborate with an automobile engineer in the design of a machine.

#### Other Reasons for Delay

Other reasons for the delay in the program revealed in the testimony and in some instances touched upon by the report include the difficulties encountered by the Curtiss Aeroplane & Motor Corp. where a contract was received from the Signal Corps for Spad airplanes on Sept. 19, 1917, following which the company started tooling up and got in such shape they could have completed the order, according to the testimony, by February, 1918. On Oct. 2, 1917, the company received a telegram ordering modifications in the plane to adapt it to the Marlin machine gun, which caused delay. On Oct. 10, when 1500 drawings had been completed, new orders called for the use of the Vickers gun instead of the Marlin and this meant new drawings. On Oct. 22, 1875 drawings were ready and the company awaited the list of materials as used by France in the Spad. These were secured on Oct. 27, when the company wired for instructions to go ahead with the contract. Washington did not reply, and finally, on Nov. 7, orders were received to withhold all work on Spads, and no work has since been done on this contract. On Sept 15, 1917, Curtiss also received an order for 500 Caproni planes, on which it has never been able to get the "go ahead" orders. And according to George H. Mueller, chief engineer of the company, when they finally received an order for Bristol airplanes they were so troubled with changes ordered by the Government (which amounted to more than 1200 in March, 1918, alone) that it was almost impossible to turn them out.

That the Senate Committee was also out to learn about possible personal interest in the placing of contracts is revealed by the frequent question into the value of the Delco ignition system in which Col. E. A. Deeds was interested. Senator Frelinghuysen inquired of George H. Mueller of the Curtiss Corp. if the Delco ignition system could be improved upon. Mueller replied that he did not believe so. Senator Chamberlain asked Charles M. Manly, Curtiss engineer, what his opinion of the Delco system was, and was told that he approved of it. Senator Reed, who displayed the keenest interest in this matter, asked O. E. Hunt of the Packard Motor Car Co. what ignition he used on the Packard airplane engine and was told the Delco. He asked Mr. Hunt if he regarded the Delco as the best ignition system

(Continued on page 739)

# Tractor Activities in the Twin Cities

Tractors in All Sizes and in Many Types Being Built in Minneapolis—Number of Manufacturers in the City Large, But Big Producers Are Few—What the Different Firms Are Doing

By P. M. Heldt\*

**M**INNEAPOLIS has been a fertile field for tractor development for many years past, and the lists of tractor makers at various times have shown more than a score of manufacturers located there. The neighboring city of St. Paul has shared, to a small extent, in this development. A few of the manufacturers on the Minneapolis list have got into production on a large scale and turn out tractors by the thousands annually; several others operate on a more modest schedule and of these some have their machines manufactured for them on contract. Of the concerns listed with addresses in downtown office buildings, the majority seem to have gone out of business. Some still have a place where they receive their mail, while others have vanished entirely. Minneapolis to-day has more individual tractor factories than any other city in the country, though she may not be producing the largest number of tractors.

The Minneapolis Steel & Machinery Co. is a very large concern, and although tractor manufacture is only a small part of its business it turns out a couple of thousand machines a year. The firm manufactures four different models, with ratings ranging from 16-30 to 60-90 hp. Of course, the 16-30 is the leading model; that is, the one produced in the largest numbers. Although the firm is now 80-85 per cent on war work, it is continuing to turn out tractors in large numbers and is doing development work at the same time.

## All E-B Models Burn Kerosene

Emerson-Brantingham Implement Co. also count among the largest tractor concerns in the country. They operate several tractor plants in different parts of the country, the Minneapolis plant turning out tractors of the smaller sizes. The medium-sized machines (20-35) are manufactured at Waynesboro, Pa., and the large ones (40-65) in Indiana. The present output of the Minneapolis plant is about 25 tractors per day. All of the E-B models are burning kerosene and distillate, but development work is being done on the heavy fuels problem by the company's engineers.

The "Big Bull," which has long been a prominent product on the tractor market, is being manufactured for the Bull Tractor Co. The engines for the Bull

tractor are being manufactured by the Toro Motor Co., which is related to the Bull Tractor Co. through stock ownership, and the frames and other structural parts have been manufactured by the Minneapolis Steel & Machinery Co.

The Bull is a two-cylinder tractor with a 12-24-hp. rating. It has a frame of 9-lb. channel steel which is hot riveted. The engine is of the opposed type, with L-head cylinders of 5½-in. bore and 7-in. stroke. It is provided with a governor and its speed is controlled at 750 r.p.m. Lubrication is by circulating splash and ignition by magneto with an impulse starter. Kerosene is the fuel burned and a supply of 18½ gal. can be carried in the fuel tank, besides 3½ gal. of gasoline used in starting. The weight of the tractor is 4870 lb., and it is geared to operate at a plowing speed of 2.4 m.p.h. The drive is direct through spur gear and roller pinion to the bull wheel. A contracting type of clutch is used, which is lined with Thermoid asbestos fabric and acts on a flange cast on the flywheel. The belt pulley has a diameter of 12 in. and a face of 6½ in.

## Is of the Three-Wheel Type

The Bull tractor is of the three-wheel type, having a large drive wheel running in the furrow, a small land wheel which also has power applied to it, and a single front steering wheel. The drive wheel is 60 in. in diameter by 14-in. face; the land wheel 40 in. in diameter by 8-in. face, and the front wheel 30 in. in diameter by 6-in. face. The frame extends around the main drive wheel. Hyatt roller bearings are used.

Recently the Bull Tractor Co. has brought out a lawn roller which is equipped with the same power plant as the Bull tractor. It has a single central front roller and two rear rollers, the three overlapping so that a space equal to the width over the two rear rollers is compacted at each passage of the machine. The rollers are made of boiler steel and are designed to be ballasted with water. When the machine is light it weighs about 5700 lb. and when filled with water the weight is about 7700 lb. The drive is from the engine crankshaft through the clutch and a spur-gear reduction to the jackshaft and thence by chains to sprocket wheels secured to the outer ends of the two rear rollers. There is thus a double chain drive to the two rollers which are mounted rigidly on the axle, and in order that each chain may take an equal amount of driving effort a

\*P. M. Heldt has been making an extensive investigation of farm tractor manufacturing conditions throughout the Middle West.

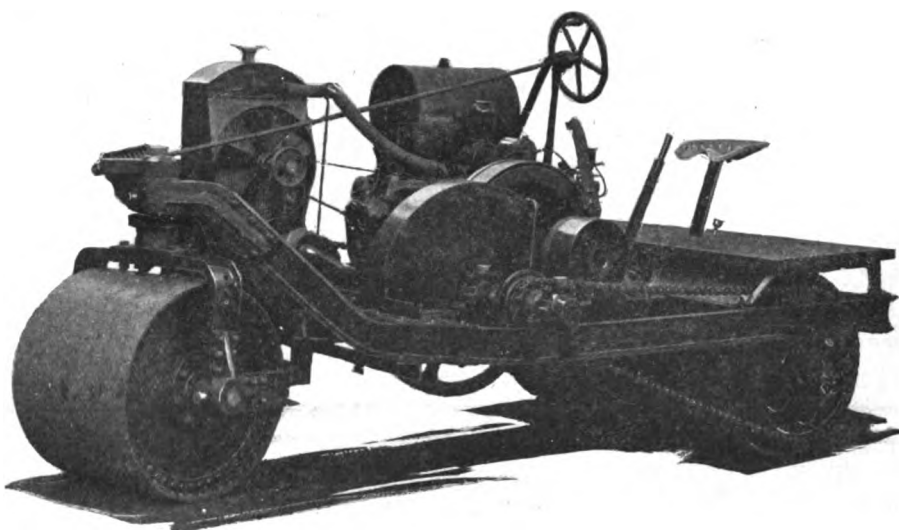
frictional equalizing device is incorporated in the jackshaft which slips if one of the chains transmits all of the power, but holds if the power is equally divided between the two chains. Steering is effected in the same way as on the Bull tractor, viz., through a worm and worm-gear sector, and the backward thrust on the forward roller is taken through a horizontal yoke spanning it on a small thrust roller mounted on the frame.

This roller is intended for use on golf links and parks, on large estates, etc., and it is believed that it will also prove useful as a road roller. The first machine was built to the order of the Minneapolis Golf Club, of which the officials of the Bull Tractor Co. are members.

The Nilson Tractor Co. began operations in 1914 and has turned out to date a little over 1000 machines.

It is now producing two models, known as the Nilson Senior and the Nilson Junior respectively. Both are equipped with Waukesha four-cylinder engines, the Senior having the  $4\frac{3}{4} \times 6\frac{3}{4}$  size and the Junior the  $4\frac{1}{4} \times 5\frac{3}{4}$ -in. size. One of the features of the Nilson tractor is the triple drive wheel, and another the patented lever hitch, by which some of the weight normally carried on the front wheel is transferred to the rear wheels when the tractor is pulling a load, so as to increase the traction which it is possible to obtain without slippage of the driving wheels. Either gasoline or kerosene equipment is furnished. The fuel capacity is 28 gal. on the Senior and 18 gal. on the Junior. Ignition is by K-W high-tension magneto with impulse starter. Both engines are governor-controlled, the governor speed being 800 r.p.m. in the Senior and 1000 r.p.m. in the Junior.

The transmission has a three-point support and gives two forward speeds and one reverse. Hyatt roller bearings are used throughout. Three different gear reductions can be obtained by using sprocket pinions of 10, 11 and 12 teeth respectively. With an 11-tooth pinion the speed range is  $2\frac{1}{2}$  to 5 m.p.h. for both



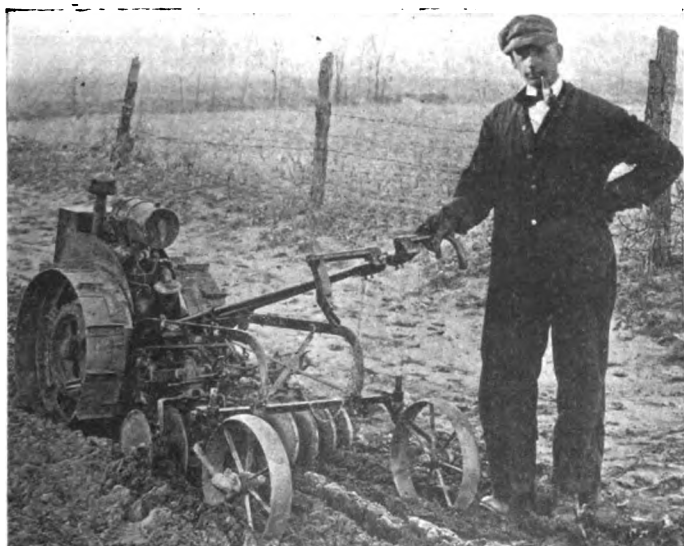
*This power roller has the same engine as the Bull tractor. It is designed for use on golf courses, in parks and on large estates, and may be used also for road rolling*

models. There is a double-chain drive to sprockets between the outer and the central driving wheels. Shock-absorbing and equalizing devices are embodied in the rear-drive sprockets. The frame of the Senior is made of 6-in. channel steel and that of the Junior of 5-in. Both frames are mounted on half-elliptic springs with adjustment and equalizing features. The Senior complete with its side wheels weighs about 6200 lb., while the weight of the Junior is 5000 lb. Owing to the use of the three driving wheels the weight per unit of ground contact area is low and the tractor should be able to operate on very soft ground.

The Gray Tractor Co. continue to manufacture their drum type of tractor, for which they have had a very good sale. Gasoline equipment is furnished regularly with this tractor, but where the customer desires to use kerosene a Bennett carburetor is fitted. During the past year quite a number of Gray tractors have been exported, the majority of them to France and Switzerland. Some also were sold to the U. S. Aircraft Production Board and the Engineers Department, undoubtedly for use in construction work.

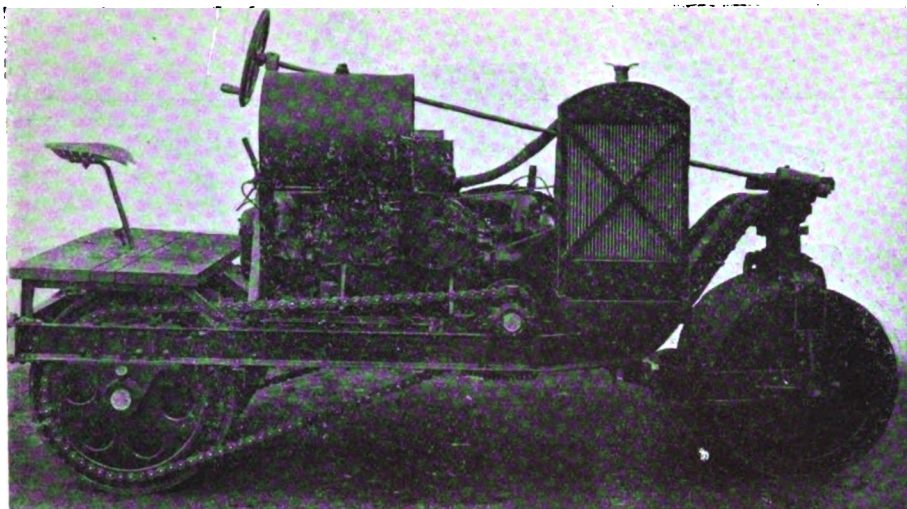
A tractor of a rather unusual type is manufactured by the Beeman Garden Tractor Co. It is designed more particularly for use by truck farmers, and is essentially a one-horse motor cultivator and an all-purpose portable power plant. The machine is claimed to operate successfully any implement which is ordinarily drawn by one horse, and as a portable engine it delivers 4 hp. at the belt. Being a small outfit and therefore appealing particularly to farmers working small places, it is no wonder that the machine has a large sale in the East, and the writer was told that the New York agent alone placed an order for a thousand of these machines for the coming year.

The C. O. D. Tractor Co., which maintains a salesroom in Minneapolis, sells about 200 tractors a year. The machine, which is of three-plow size, is manufactured for them in St. Paul. It is equipped with a two-cylinder opposed engine of  $6\frac{1}{2}$ -in. bore by 7-in. stroke, and is characterized by unusually large rear driving wheels (70 in.). A leather-faced cone clutch is used, and the transmission to the driving wheels is by two pairs of spur pinions and wheels. The frame is built up of 6-in.  $10\frac{1}{2}$ -lb. channel steel and is strongly braced. The driving axle is 3 in. in diameter and made of cold-



*Beeman garden tractor doing field work. This machine is much used in truck farming*





*Right side view of Bull lawn roller, which is designed to be operated with water ballast*

rolled steel. It is mounted in white metal bearings. As stated, the reduction from the engine crankshaft to the rear axle is obtained in two steps, the first being through a set of spur gears with a face of  $2\frac{1}{2}$  in., and the second through the bull gear and pinion of 4-in. width of face. The countershaft gear has a diameter of 36 in. and the bull gear of 48 in., these very large gears permitting of obtaining the large reduction required on account of the high driving wheels in two steps. The radiator is mounted so its plane is parallel to the longitudinal axis of the tractor and is driven from the engine crankshaft through two belts and a pair of intermediate pulleys. The entire front axle swings in steering, and is operated through a worm and worm-gear sector. The weight of the C. O. D. tractor is approximately 6400 lb. It is rated at 13 hp. at the drawbar and 25 hp. at the belt.

The Short Turn Tractor Co., which was formerly located in the Globe Building, Minneapolis, has secured a plant in Bemidji in the northern part of the state.

A plant that is devoted almost exclusively to tractor work is that of the Imperial Machine Co., 1611 Central Avenue, Minneapolis. The Imperial company manufactures for its own account a heavy tractor known as the Imperial 40. This machine is built on order only and five of them were turned out during the past year.

It is equipped with a four-cylinder  $7\frac{1}{2} \times 9$ -in. engine which is said to develop 70 hp. on the belt and 40 hp. on the drawbar at an engine speed of 400 r.p.m. While the engine is of the four-cylinder type, the cylinders are arranged horizontally in two opposite sets. The radiator is of the company's own design and construction, and consists of vertical brass tubes extending between upper and lower tanks. It is mounted with its plane parallel to the longitudinal axis of the tractor. The total capacity of the cooling system is 40 gal. An internal expanding sector type of clutch is fitted. The transmission gives two forward speeds, viz.,  $1\frac{1}{2}$  and  $2\frac{1}{4}$  m.p.h., and one reverse speed equal to the low forward speed. The regular drive wheels are 8 ft. in diameter with 24-in. face, but if desired, extra wide drive wheels with 36-in. face can be furnished. The forward wheels are

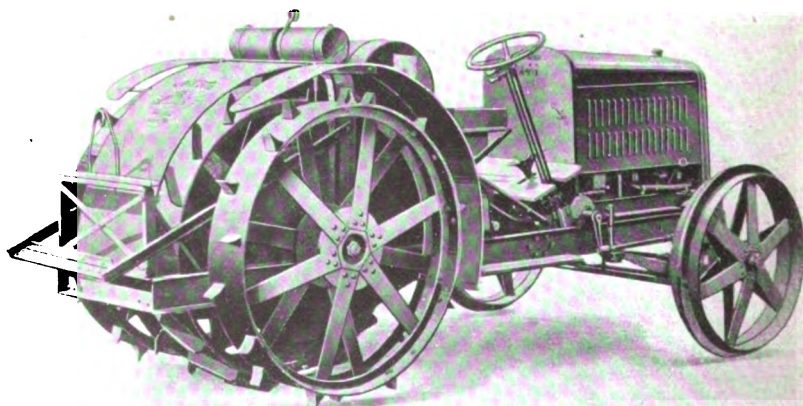
5 ft. in diameter with 15-in. face. The whole front axle is pivoted at its center on a vertical axis around which it turns in steering. An all-spur drive is used, with bull wheels on the two rear driving wheels. Gasoline is used as fuel and a supply of 70 gal. can be carried. The tractor has a shipping weight of 21,000 lb. and should be capable of hauling at least ten bottoms.

Located at the same address as the Imperial Machine Co. is the Stinson Tractor Co. The latter concern during the past year turned out about 100 of its 18-36 Stinson tractors, which so far have been manufactured on order. The Stinson company has, however, purchased the equipment of a machine shop that has been doing

some of its work in the past and will probably, before long, manufacture its own tractor.

The Stinson is an assembled machine employing a four-cylinder Beaver engine of  $4\frac{1}{4}$ -in. bore by 6-in. stroke. It is of the three-wheeled type, having a single forward steering wheel which runs in the furrow when plowing. Most of the weight is supported on a cast frame secured to the rear axle. This frame connects to the goose neck of the steering wheel by a pair of steel tubes. A dust separator of the company's own design is fitted, in which the air for the engine is drawn through water. Ignition is by Dixie high-tension magneto with impulse starter, and the carburetor is a Kingston. Transmission is by a spur pinion and intermediate gear and thence by a bull pinion and bull gear, the latter of  $4\frac{1}{2}$ -in. face. The intermediate gear and its pinion are cut gears and have a 3-in. face. Two speeds are obtained, viz., 2 and  $3\frac{1}{2}$  m.p.h.

The driving wheels are 60 in. in diameter by 12-in. face and are fitted with 18-in. angle-iron lugs. The front wheel is 36 in. in diameter by 8-in. width of face. Kerosene is used for fuel, and a supply of 22 gal. can be carried in the fuel tank, in addition to 3 gal. of gasoline for starting. The capacity of the radiator is 10 gal. The foot brake operates on the intermediate gear shaft



*The Wilson Senior, showing its characteristic features, such as three rear drive wheels and lever hitch*

and is of the band type with Raybestos lining. The weight of the tractor ready for shipping is 6350 lb. This is a four-plow tractor.

Formerly the Simplex Tractor Company had an office in the plant of the Imperial Machine Co. and during 1916 it had built 50 tractors on order by the latter concern. No more Simplex tractors have been made, however, and the writer was told that the manager of the Simplex company, G. A. Tudhope, had gone East.

The Common Sense Gas Tractor Co. manufactures a three-wheeled tractor having automobile lines. It has an eight-cylinder Herschell-Spillman engine mounted on the frame in front under an automobile type bonnet, and the driver's seat is arranged back of the engine space and ahead of the single rear wheel. Last year's production of this tractor was given as 50 and next year's schedule had not been fully decided yet at the time of the writer's call. The drive from the engine crankshaft is through an expanding clutch and a pair of bevel gears to a countershaft carrying the pinions for the two forward speeds. These are adapted to mesh with spur gears on another countershaft, whence the power is carried through two roller chains to the single rear wheel. Contrary to conventional practice, the gears of the transmission are arranged slidably, and in order that the load may be equally divided between the two driving chains the driving pinions are clamped on the shaft between friction disks and will yield if one of the chains takes the whole load or nearly the whole load. Hyatt roller bearings are used in the transmission, with ball bearings for end thrust.

An advantage is claimed for having the driver's seat close to the motor, as it will enable the driver to more readily detect and locate faults in the engine. The two forward speeds are  $2\frac{1}{2}$  and  $3\frac{1}{2}$  m.p.h. at a motor speed of 1200 r.p.m., for which the governor is set. The belt pulley, which is 20 in. in diameter by 3-in. face, is mounted on the lower transmission shaft and is used with the gears in neutral. It turns at one-third the speed of the crankshaft. The rear axle is a live axle revolving with the large driving drum, and is  $3\frac{3}{16}$  in. in diameter. This axle is mounted in babbitt bearings on the frame.

### Has Two Drawbars

The front wheels are 36 in. in diameter with 6-in. face and the main drive wheel is 62 in. in diameter and has a 24-in. face. This wheel is made of 7/16-in. boiler steel, welded and equipped with 54 spade lugs measuring  $4\frac{1}{2} \times 2\frac{3}{4}$  in. of the base by 5 in. in height. There are two drawbars, one directly under and about 6 in. below the frame and the other at the top of the frame. Each is made of  $3 \times 3\frac{1}{2} \times \frac{1}{2}$ -in. angle iron and has  $\frac{7}{8}$ -in. holes drilled along it so that implements can be attached to it. The Common Sense tractor has a wheel-base of 9 ft. and weighs 6000 lb.

One of the oldest firms in the tractor industry is the Kinnard & Sons Mfg. Co., which has been manufacturing farm tractors continuously since 1898. The firm was formerly known as the Kinnard & Haines Mfg. Co., but was reorganized under the new name a little over a year ago. The Flour City tractor, as the product of this company is known, is made in five sizes, rated respectively at 40-70, 30-50, 20-35, 15-25 and 12-20 hp. During the coming year a new model will replace the last two in the list, combining some of the features of both of them. The Kinnard firm manufactures practically all of the parts going into its tractors in its own plant. The smallest model of the line, the Flour City Junior, has a two-cylinder vertical engine, while all the

others are equipped with four-cylinder engines. Kerosene is used for fuel in all models.

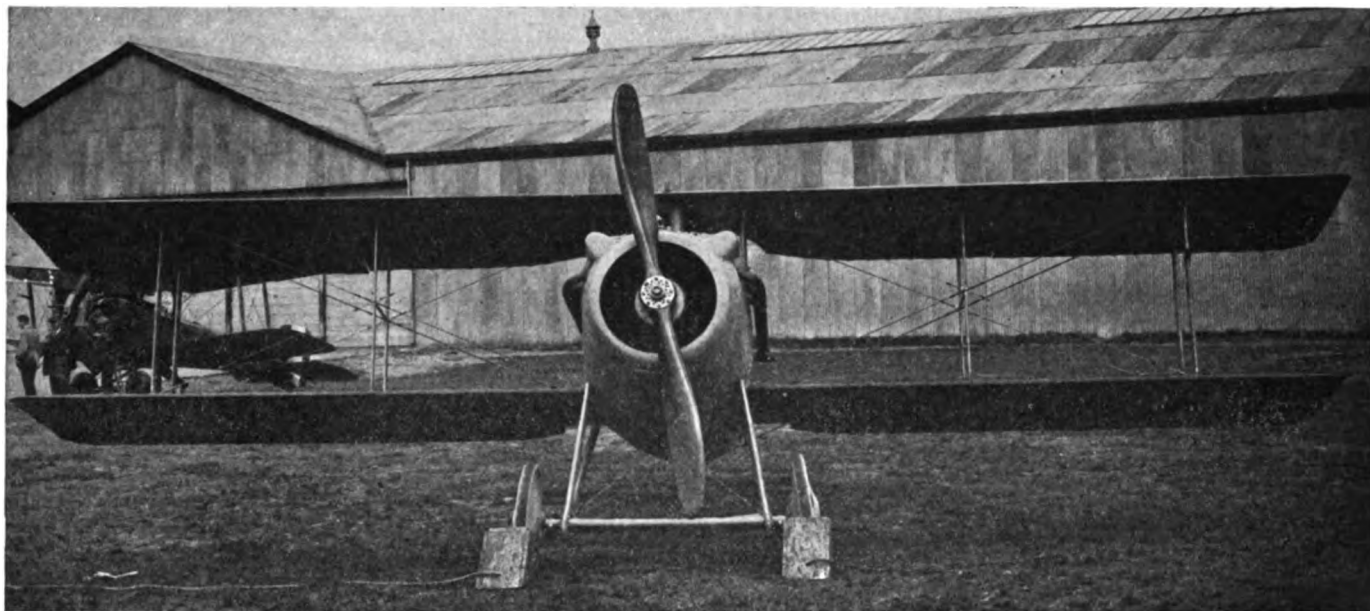
St. Paul at the present time boasts only of a single tractor plant, that of the Belt-Rail Tractor Co., which firm is as yet comparatively new in the industry. The Belt-Rail tractor is of the creeper type, having a single wide creeper tread at the rear and two steering wheels at the front. A peculiarity of the creeper construction is that the teeth of the driving wheel engage with extensions of the creeper shoe or link, instead of with the pins of the creeper tread, as is more usually the case. A full technical description of this tractor, which has been manufactured in moderate numbers so far, appeared in a recent issue of AUTOMOTIVE INDUSTRIES.

Another tractor formerly made at St. Paul was that of the Hackney Mfg. Co. This concern began the manufacture of tractors in 1908 and has turned out about 600 up to date. Early this year it had a fire in its plant, which proved quite a setback, and in view of the situation in the materials and labor markets, the company decided to suspend the manufacture of tractors for the duration of the war. This decision was reached after two new models had been completed, one a 3000-lb. tractor with high ground clearance for cultivating and similar light work, and the other an 8000-lb. standard tractor. While not manufacturing any tractors for the present, the company maintains a stock of repair parts for tractors it has put out in the past.

Another one of the pioneers in the tractor industry of the Twin Cities was the Andrews Tractor Co., which formerly put out a tractor having a number of unconventional features. It was a three-wheeled affair with a single drum-type driving wheel in the rear. The machine had a 2 cycle, air-cooled motor, friction transmission, and three wheels. All of these features have been more or less unpopular of late, and owing to the distrust of the farmer of the air-cooling and friction drive principles, Mr. Andrews decided to abandon the manufacture of the machine. He is now engaged in the manufacture of tractor conversion units for Fords and other passenger cars. One of the conversion units for Fords is known as the American Ford-A-Tractor and the other as the Handy Hank. A conversion unit is also being made at the Andrews plant for larger passenger cars than the Ford, to the order of the Big Auto Tractor Co. Converters of this kind have been applied to the Winton, Glide, Buick, Packard, White, Hudson, Locomobile, Stearns, Case and other large cars, and convert these into four-plow tractors. Another conversion unit is made for motor trucks and permits these latter to be used for both trucking and tractor purposes by the simple interchange of the front rims and rear wheels. To transform the Twin T from a truck to a tractor the demountable rim tires of the front wheels are replaced with tractor tires, and the rubber-tired rear wheels are replaced with steel tractor wheels. It is claimed that the change can be made in less than half an hour.

AN extensive motor bus service is to be started in Tokyo by Dec. 1 for both freight and passenger traffic. Eventually the service will be maintained by 180 passenger cars, each carrying 16 persons, and by 50 motor trucks for freight. The passenger fare will be  $4\frac{1}{2}$  cents with an extra half cent for transfers if needed. The route of the motor bus system will follow the principal street car lines of the capital of Japan. The company announces it is planning to buy the initial fleet of motor buses from American manufacturers by Oct. 1. Later the company will build its own buses at Tokio. The building of automobile bodies is carried on quite successfully in Japan, although the importation of practically all chassis used has been compulsory.

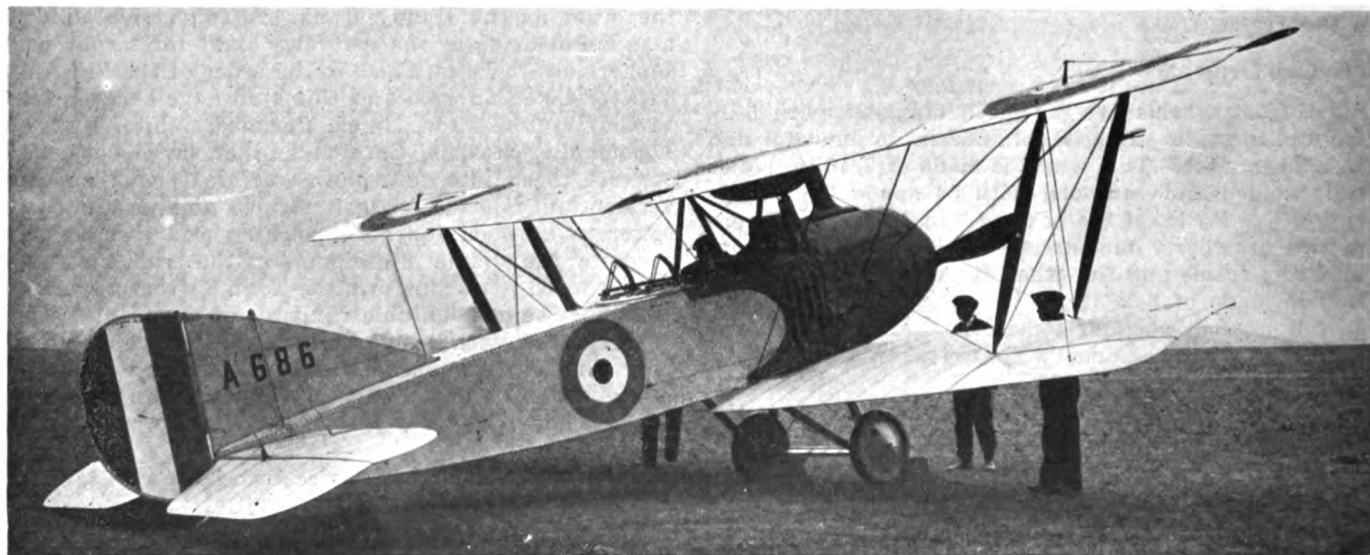
# Some Recent Types of



**Spad Single-Seater Tractor Scout**

Engine .....	200 hp. Hispano-Suiza	Climb to 10,000 ft. ....	12 min. 30 sec.
Armament .....	1 Vickers gun	Span .....	25 ft. 8 in.
Interrupter gear .....	Spad	Overall length .....	20 ft. 3 1/4 in.
Number of rounds carried .....	450	Height .....	7 ft. 2 1/2 in.
Total weight .....	1632 lb.	Designer .....	Société d'Aviation et ses Derives
Endurance at 10,000 ft., including climb .....	2 1/4 hr.	Approximate date of manufacture of first machine .....	December, 1916
Ceiling .....	17 500 ft.		
Speed, ground level .....	122 m.p.h.		
Speed, 10,000 ft. ....	115 m.p.h.		

This is a French machine but is largely used by the British Royal Flying Corps, and is built under license by several firms in England.



**Vickers F B-14, Long-Distance Reconnaissance Tractor Biplane**

Number of seats .....	Two	Speed, 10,000 ft. ....	84 m.p.h.
Engine .....	120 hp. Beardmore	Climb to 10,000 ft. ....	40 min. 30 sec.
Armament .....	1 Vickers, 1 Lewis gun	Span .....	39 ft. 6 in.
Interrupter gear .....	Vickers	Overall length .....	28 ft. 4 in.
Total weight .....	2672 lb.	Height .....	10 ft. 9 1/4 in.
Endurance at 10,000 ft., including climb .....	3 1/4 hrs.	Designer .....	Vickers, Sons & Maxim
Ceiling .....	10,000 ft.	Approximate date of manufacture of first machine .....	June, 1916
Speed, ground level .....	89 m.p.h.		



# Allied Military Planes



**Sopwith "Hippo" Two-Seater Fighter**

Engine ..... 225 hp. Clerget  
Armament ..... 1 Vickers, 1 Lewis gun  
Interrupter gear ..... Kauper  
Number of rounds carried ..... Vickers 500, Lewis 8  
double drums  
Total weight ..... 2590 lb.  
Endurance at 10,000 ft., including climb ..... 3 hr.  
Ceiling ..... 17,000 ft.  
Speed, ground level ..... 119 m.p.h.

Speed, 10,000 ft. .... 115 m.p.h.  
Climb to 10,000 ft. .... 13.4 min.  
Span ..... 29 ft. 6 in.  
Overall length ..... 32 ft. 4 in.  
Height ..... 10 ft. 5 in.  
Designer ..... Sopwith Aircraft Co.  
Approximate date of manufacture of first  
machine ..... March, 1918



**Avro Training Machine**

Number of seats ..... Two  
Engine ..... 100 hp. Monosoupape  
Total weight ..... 2100 lb.  
Endurance at 10,000 ft., including climb ..... 3½ hr.  
Ceiling ..... 14,500 ft.  
Speed, ground level ..... 89 m.p.h.  
Speed, 10,000 ft. .... 80 m.p.h.

Climb to 10,000 ft. .... 18 min. 50 sec.  
Span ..... 36 ft. 0 in.  
Overall length ..... 26 ft. 2 in.  
Height ..... 10 ft. 0 in.  
Designer ..... A. V. Roe & Co.  
Approximate date of manufacture of first  
machine ..... September, 1914

This is the principal training machine now used in the British Royal Air Force. All machines are fitted with dual control.



# South Africa Has Gasoline Shortage

Price Is \$1.30 Per Gallon—Taxis Idle—Fuel to Be Rationed—Willard Station  
Opened—Body Building Begun—Starts Rubber Industry

By M. Edward

**J**OHANNESBURG, SOUTH AFRICA, Aug. 14—Johannesburg and South Africa in general were just getting accustomed to a shortage of automobiles caused by a reduction in shipping facilities when a new scare occurred, namely, that of a serious gasoline shortage. This is the second one in 9 months. As a result, the government has decided upon the rationing of gasoline and has organized a committee for this work. The necessity for rationing has existed for some time. The price of gasoline to-day is \$1.30 per imperial gallon, if one is fortunate enough to obtain it at all. New supplies are not expected before the end of October, and it is now only the beginning of August. At present there are a few sailing vessels on the way with cargoes of gasoline, so that soon the stores of oil companies which are now empty will be fairly well stocked. At present 50 per cent of the taxi drivers in Johannesburg are out of work because of a lack of gasoline. It is expected that the use of taxis will soon be limited to essential requirements, and that the public will not tolerate their use for such purposes as attending races and joy riding.

Garages are reserving the gasoline for their customers, and in some cases only supplying those who they know need it for business. The joy-rider is looked upon sternly these days. There is also a paraffin famine in full swing, a case of 8 gal. being unobtainable at a time,

and charged for at, in some instances, \$5 a tin, which is real profiteering, as the Government has fixed the price at \$2.50. But as is often the way when prices in commodities are fixed, things become almost unobtainable, and anyway it is not much good trying to run one's car on paraffin that is almost the same price as gasoline.

This shortage has only just set in and falling off of motor traffic in South African cities is not yet noticeable. Most people have a little gas stored away somewhere in preparation for the famine that has threatened so often.

The motorcycle has always been a rival of the automobile in South Africa, owing to the high price of the latter. Although a motorcycle and sidecar of the Harley-Davidson and the Indian type costs around \$750, this price is low compared with even that of the Ford at much over \$1000.

Now that gasoline is scarce and high priced, motorcycles are still more favored by people who want a fast means of getting about for business—although with the few new cars that have come into the Union in the last few months it is impossible to gage the real effect of motorcycles on car sales, for nearly all new cars up to date are sold, and in most instances further shipments are being awaited to fill actual orders. Still the motorcycle will be a rival to the automobile so long as



*A group of trailers contracted for and designed by the General Garage and built by Wevell Bros. for the South African Railroads. The building is the new home of the South African General Electric Co.*



*Motor debris in an East African camp lately occupied by the Germans and used for repair purposes*



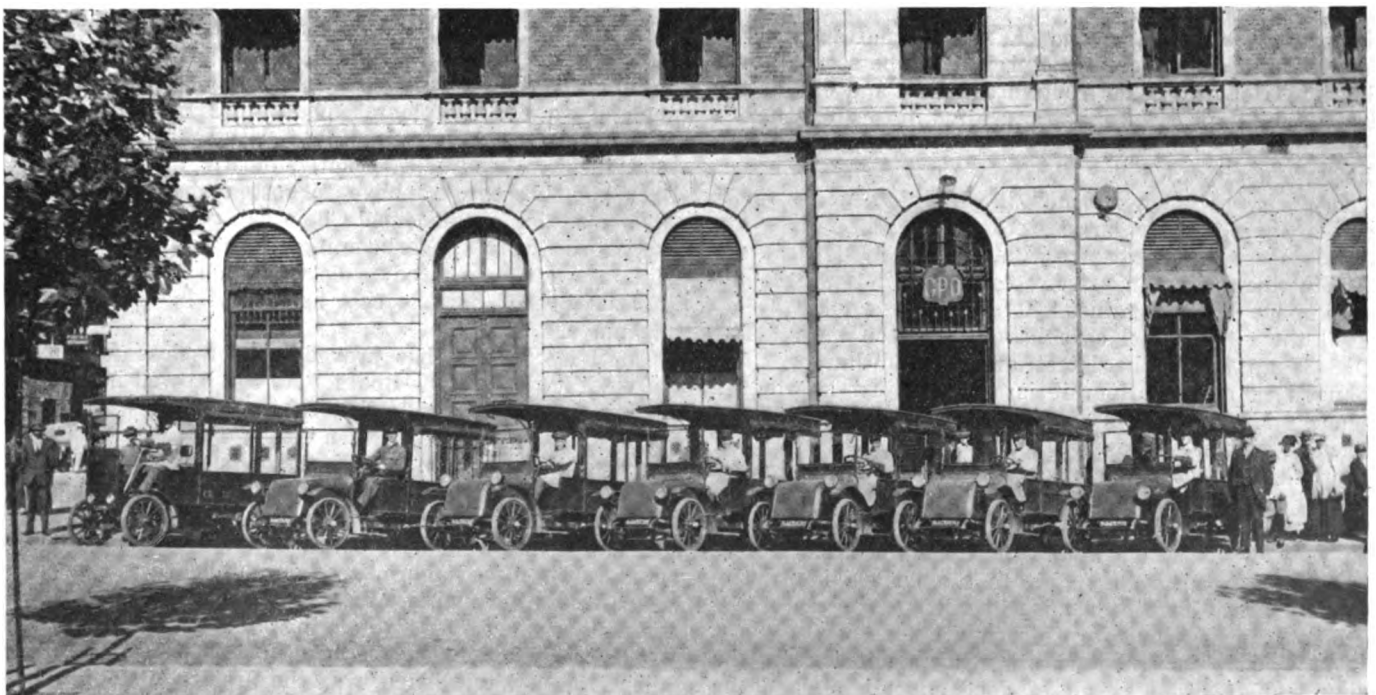
*Mixed convoy in German East Africa. Some roads are excellent*



*Roodepoort Municipality has a real fire engine. The body was built by Wevell Bros., Johannesburg*

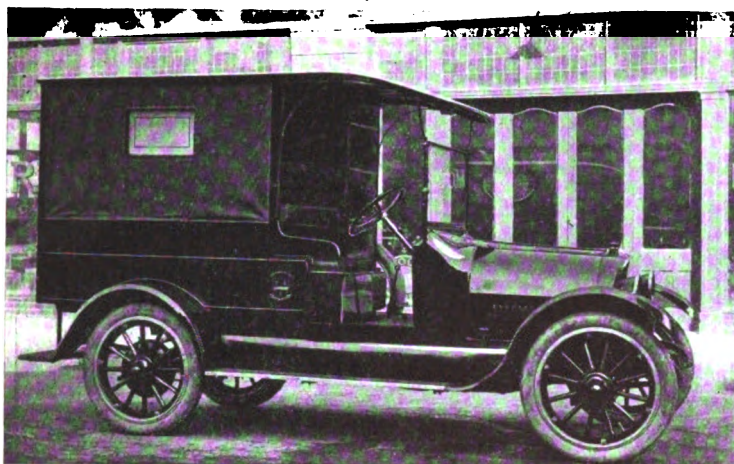


*The fire engine is convertible into an ambulance and is an excellent example of South African body building*



*Seven electric vehicles used by the Johannesburg general post office*





*An example of local body building; an ambulance built on a Reo Six chassis*



*One of the small body building firms which have started in many of the big towns in South Africa*



*A Ford camp in late German East Africa*



*British transport trucks burned by the enemy*

the present high petrol and car prices continue. It is surprising the number of motorcycles to be seen all over South Africa and other British colonies, and one of the first things that a visitor to the United States of America notices is the almost complete absence of motorcycles in the largest cities.

There is not much difficulty in obtaining spares, most agents having fairly large stocks on hand. Tires are also obtainable in most sizes, but, as is only natural, are steadily increasing in price. An 8 x 5 x 105 tire now costs about \$50, as against \$40 six months ago.

All the 1918 model cars have been seen now. The 1918 Hupp being the latest arrival and having most changed in construction, it is perhaps just as well to mention it from a South African point of view first. When it arrived it was so unlike what we think of as a Hupp that it took some time to get owners' opinions. Well, it is going to be just as popular as ever. The fact of less weight with more power is a selling feature in the country districts, where there had been a feeling that Hupps were going a bit to the heavy side. The manufacturers have been wise in still keeping the magneto, a Hupp feature for this country.

Studebaker cars are gaining in popularity in the country districts—a result of good advertising and the goods being up to it. The Johannesburg Motor Mart, the agents, have had a stiff fight to bring this car back

to its former popularity. It takes a long time to overcome any prejudice in the mind of the farmer.

The Chevrolet agency has not been placed yet, and none of the 1918 Colonial models has come to South Africa. A few 1917 models that arrived after the agency went in have been sold recently, mostly in Cape Town. Everybody appears to have forgotten about the much-advertised and over-boomed Chevrolet, whose failure was due more to this overbooming than car defects, the chief of which appeared to be too much power. South Africa will find out the best and worst in any automobile made.

Another car that has proved itself useless for country work is the Scripps-Booth. As can be well imagined, its daintiness does not lend itself to the hard work to be found on any South African road; but Wevell Bros., who run this car, do not advertise it for country use, and it is fairly popular in the towns, especially as a lady's car.

The Reo has won the respect of all. Saker's Garage, agents, has placed more Reos in public service works than three other makes, excepting electric vehicles. Reos are now to be seen as fire engines and ambulances. The Roodepoort Municipality, a town of 8000 inhabitants, 14 miles from Johannesburg, was the first to try out a fire engine built on a Reo six chassis. This month two Reo ambulances went into the Johannesburg municipal serv-



ice. Reos are snapped up by the municipalities almost as fast as they arrive. The 1918 Reo is a little heavy to appeal to the farmer.

One thing this great war has done. It has made South Africa more self-reliant. Spares and bodies that were deemed impossible to manufacture four years ago are now being made by several firms manufacturing exclusively.

The South African Rubber Mfg. Co. is turning out such things as rubber motor mats and retreading and vulcanizing tires. They might make tires soon, but this can in no way affect the importation of tires for a long while.

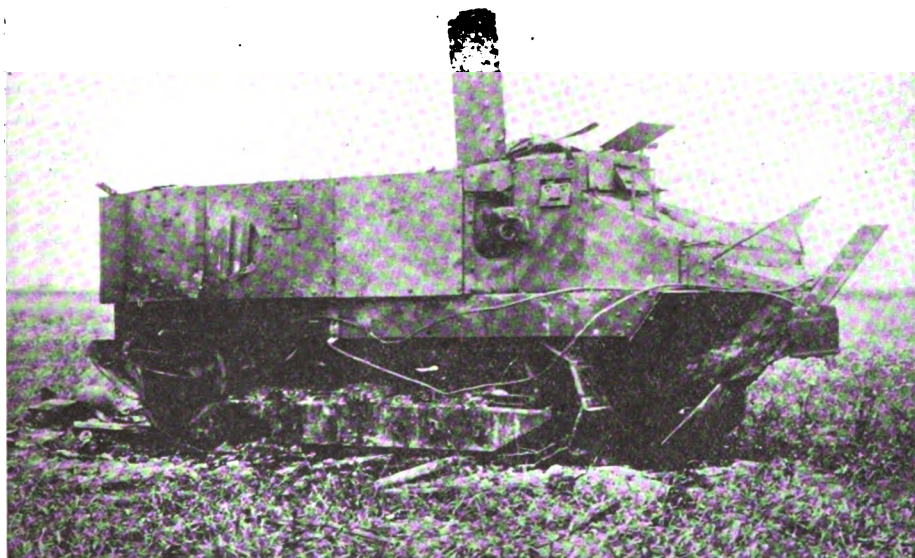
A Willard battery service station has been opened in Johannesburg. This is the first service station of its kind in South Africa, and it fills a want. All car owners

who use batteries are requested to employ the service.

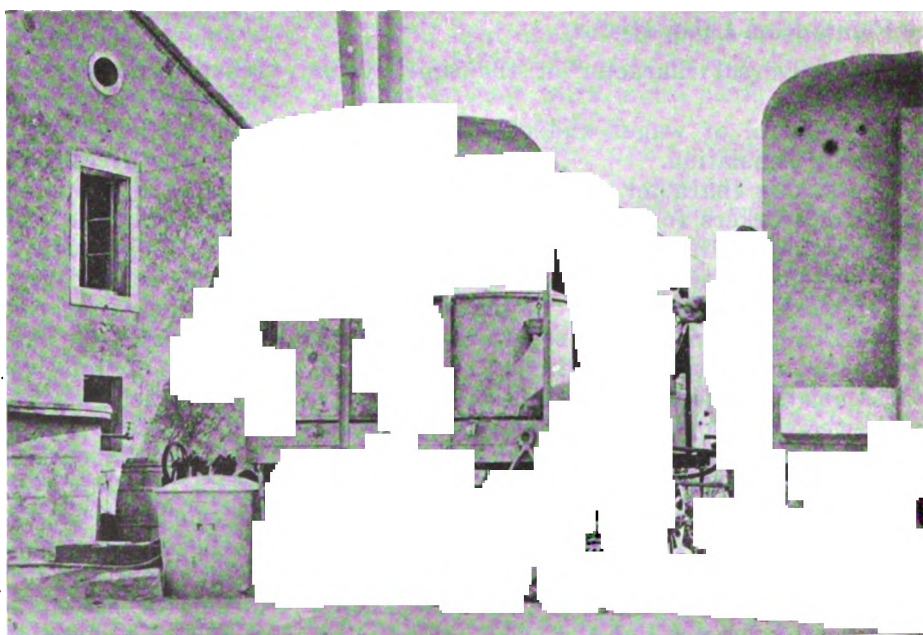
The word "service" is getting to mean something here now. Nothing succeeds like success, and success attending the efforts of those trying out service ideas has led to general betterment of the South African automobile business.

From a sales point of view things have not altered much yet, although most garagemen are getting anxious. Cars have been coming forward from the United States of America lately, spasmodically, it is true, but in fair quantities. It seems hard that just when salesmen are patting themselves on the back about having a few cars to sell there should be confronting them a scarcity of gasoline to run them on. It is fine to have cars that are supposed to have been wandering about the ocean for the last few months come to hand at last.

## Automotive Activities at the Front



*German tank of the large type which was put out of action by a direct hit from an American 75-mm. gun during a counterattack by the first division of artillery somewhere in France*



*This is a mobile laundry where much of the washing for soldiers is done. A number of these are in use in the various army divisions in France*

# Collective Bargaining Outside or Inside?

## The Manufacturer Must Decide Whether He Will Bargain Collectively with a Labor Union or Collectively with an Employees' Organization

By Harry Tipper

**F**ROM time immemorial the general method of payment for labor has been based upon a time consideration. Centuries have elapsed since the laborer's pay was a penny a day, but the daily or hourly measure as a basis for payment persists in most lines of work and involves most labor.

It is probable that with most classes of work the system will prevail which has been found most acceptable for the long period of history and for so large a section of the working public. This much is generally understood, but it is not usually appreciated in industry that for most of that same period of centuries the rate of wages and the conditions of labor have been the subject of collective action.

During most of that time the amount of wages for labor, the regulation of apprentices and other matters were the result of national legislation in Great Britain. In fact, the laws governing these matters were still on the statute books at the time of the formation of the United States, although they had by that time fallen into general disuse.

Three things came definitely out of the history of labor legislation in Great Britain, during those long centuries of growth.

### Three Points from Labor History

- 1—The universal character of the time system of payment.
- 2—The control of wages and conditions of employment by legislation.
- 3—The strong character of the law against combinations of workers for the purpose of increasing wages or changing the conditions of employment.

It is evident from these examinations that the choice of work and the liberty of private contract were practically unknown before the beginnings of the industrial revolution in that country.

It was not till 1824 that the right of private contract between employer and employee was recognized and it was recognized then only to bring in such chaotic conditions as resulted in the formation of labor unions and an era of great disturbance in industrial life, with the general adoption by the workers of the old principle of collective decision upon wages, but operated through the new machinery of collective bargaining.

As far as it is necessary to go back in the history of the matter, collective action on wages has been the normal method of settling the matter—that is to say, the collective method has obtained through 80 per cent of the time for a majority of the workers.

During the last part of the craftsman period in the last half of the eighteenth century the legislation determining wages had fallen into disuse, so that in this period of small workshops and intimate contact between master and man the private contract system had actually grown up in the form of an individual agreement between the master craftsman and his employee.

The employer of these artisans was himself a workman, who, by his skill and capacity, had accumulated around him a number of others for the privilege of studying with him, or because of the power and comparative wealth incident upon skilful operation.

### Employees Treated as Individuals

The skill of the worker was his own. It belonged to the master only as he treated the workman individually in accordance with his individual requirements.

The tools with which the workman produced a result in the days of hand labor were such that they depended for their usefulness entirely upon his skill, the unskilled being unable to do anything with them.

It was necessary, therefore, for the employer to treat each of his employees as an individual. The value of all the work was his own, the skill of his hands in executing and the skill of his brain in planning he could carry away with his bag of tools.

The industrial revolution changed the whole aspect of the matter. The whole craftsman life was based on his individual value as a worker and his individual character as a citizen. In everything which he did he stood out and measured himself and was measured by others as an individual. The table or chair, the saddle or shoe, the piece of cloth were his work and their value bespoke their quality.

He could express his individual ideals in his individual work and in that way at once satisfy his ambition for accomplishment and acquire his standing among his neighbors.



When steam power made it possible to enlarge the little shop, to multiply the speed, size and capacity of the tools and to transfer a large part of the skill from the man to the machine, there was a change from individual to collective work, a change from constructor to operator, from workmanship to tending a machine, from a broad knowledge of the skill of a trade to the narrow requirements of a specialized operation.

The individual value to the employer was lost, the individual place was lost and the workman became valuable only as he was combined in co-operative action with thousands of others similarly engaged.

There was no apparent reason for paying different wages to different men running the same type of machine; so the system of standard wages which had fallen into disuse during the latter part of the craftsman period, came again into general use and the union was born of standard wages to obtain the right amount of standard wages for a standard operation by standard methods of bargaining.

For a standard amount of time, therefore, involved in the same type of operation the standard wage has become the usual method, and while it is not subject to legislation it has been the subject of an increasing amount of collective bargaining, the workers of the one specialization getting together in order to be in a position to secure the highest standard for that operation.

Between 1800 and 1860 the right of private contract and the lack of general organization among the workers led to chaos under which the conditions of the workers in many lines of endeavor were appalling. Wages given in a competition with starvation and frequently under scandalous system of piece-work requirement, boarding the workers, payment of part of the wages in truck, long hours and unsanitary conditions of workshops are all recorded frequently as the result of the observation of competent and impartial observers.

### Wage Question Always Prominent

The rapid extension of the specialized industrial system, by which the tasks are being divided constantly, and the progress in labor organization have brought the question of wages to the front in the minds of all who have the work of labor management.

Higher standards of pay have been one of the demands of labor in almost all of the disputes which have arisen between the owners of industry and the workers.

Furthermore, standards of wage have necessarily tended toward standards of performance and the standard of performance has gravitated, just as logically toward a minimum. For most persons, workers of all classes not excepted, individual recognition is necessary in order to secure the maximum of accomplishment. Consequently the general presence of standard wages with its absence of individual recognition has led to the practical limitation of output and the jealous guarding of the subdivisions of specialization created originally by the necessities of industry.

Various systems of bonus for increased accomplishment, profit sharing and other attempts to provide the individual recognition necessary for incentive have been tried by individual manufacturing concerns with varying degrees of success.

These when they are fair and just and are arranged so that they win the worker's confidence, by the manner of their presentation and the character of their enforcement, are long steps in the right direction; but for much work they are not applicable and they are against the recognized platform of the labor organization as such.

That the labor organizations are against it is logical, for these are collective bodies, which do not thrive upon the recognition of the individual but upon the subordination of the individual to the precedents and traditions of the organizations themselves.

Furthermore, they are political bodies in character, acquiring their strength from the numerical weight of memberships. Their leaders must secure their mandate from the majority of the workers and the mediocrity of the majority must govern their actions.

The labor organization, formed to protect the interests of the workers of a particular occupation, not designed to assert their rights as individuals, can offer no solution for the wage trouble.

In fact, their best efforts must be spent, continually, in the extension of the standard wage scale and the increase of the relative amount of that standard. How far they are prepared to go in this cardinal principle of their organization tenets is indicated by the demand of the Labor Party in Great Britain for a national minimum wage as guarantee of living to all workers.

### Base Is Point of Interest

It is evident, however, that all the workmen engaged in the same kind of work in a factory are interested in the base upon which wages will be considered, whether that base be piece-work or time. They will continue to demand a collective hearing upon the subject, for they have a common requirement as to their work and a common ground as to their general necessities.

Unless the manufacturer is willing to accept this principle of collective bargaining, or the collective discussion of the wage problem with the workers at interest, he must face the alternative of being obliged to bargain collectively with the general body of labor in whom he is not particularly interested and who have no particular interest in his individual concerns.

It is upon this question more than any other that the council table of co-operation between individual employer and worker through some adequate and equitable system of representation is essential.

Collective bargaining is a fact, it is an increasing necessity—the question of whether the manufacturer believes in it or not is unimportant, the condition is upon us and the time for arguing upon its abstract merits and demerits is passed.

*(Continued on page 738)*

# What Langley Did for the Science of Aviation

Experiments Continued with Rubber-Driven Models and Others Using  
Compressed Air, Carbonic Acid Gas and Electric Batteries  
—Steam Adopted as Source of Power

## PART II

IT is safe to say that previous to the successful accomplishment of Dr. Samuel Pierpont Langley, in obtaining sustained free flight by means of steam-driven model aerodromes, no such mechanism or any type of heavier than air machine had ever sustained itself in the air for more than a few seconds. Upon the 6th of May, in 1896, Langley's Steam Aerodrome No. 5 flew for 1 min. and 30 sec., and during that time covered approximately 3300 ft., which means that it traveled at a speed between 20 and 25 miles per hour. That brief period, during which his model flew, was the result of more than 9 years of the most exhaustive research and unceasing application. Langley worked at his laboratory experiments and his field trials for nearly a full decade before he satisfied himself that he had actually been able to produce sustained mechanical flight.

In the introduction to his "Memoir on Mechanical Flight," Langley included a paragraph which can well be quoted here, in order that we may have a true conception of the state of the embryonic art at the time that Langley began his work in it.

"I desire to ask the reader's consideration of the fact that even 10 years ago [this was written in 1897] the whole subject of mechanical flight was so far from having attracted the general attention of psychists or engineers, that it was generally concluded to be a field fitted rather for the pursuits of the charlatan, than for those of the man of science. Consequently he who was bold enough to enter it, found almost none of those experimental data which are ready to hand in every recognized and reputable field of scientific labor. Let me reiterate the statement, which even now seems strange, that such disrepute attached so lately to the attempt to make a 'flying machine,' that hardly any scientific men of position had made even preliminary investigations, and that almost every experiment to be made was made for the first time. To cover so vast a field as that which aerodromics is now seen to open, no life-time would have sufficed. The preliminary experiments on the primary question of equilibrium and the intimately associated problems of resistance of the sustaining surfaces, the power of the engines, the methods of their applications, the framing of the hull construction which held these, the construction of the propellers, the putting of the whole in initial motion, were all to be made, and could not be conducted with the exactness which would render them final models of accuracy."

In taking up the second part of his work in aviation, Langley aims not to produce flying machines of man-carrying capacity, but rather merely to demonstrate that mechanical flight was possible, and his efforts during this period were directed to the securing within the years

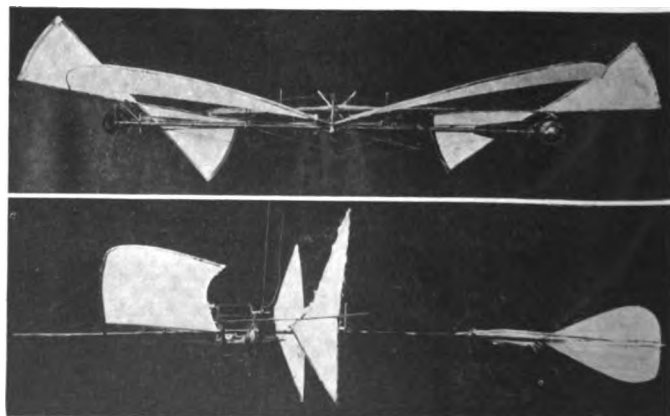
which he devoted to them, and which he regarded as an all-too-short space of time for the accomplishment of such an object, a demonstration of the kind which would be conclusive in the eyes of scientific men, as well as of a general public, which was, he held, nothing short of actual flying.

When his aerodrome, No. 5, built chiefly of steel and driven by a steam engine, had flown for more than half a mile, had alighted safely, and had performed a second flight on the same day, he felt that he had at last made such a great step as to provide the long-desired experimental demonstration of the possibility of mechanical flight.

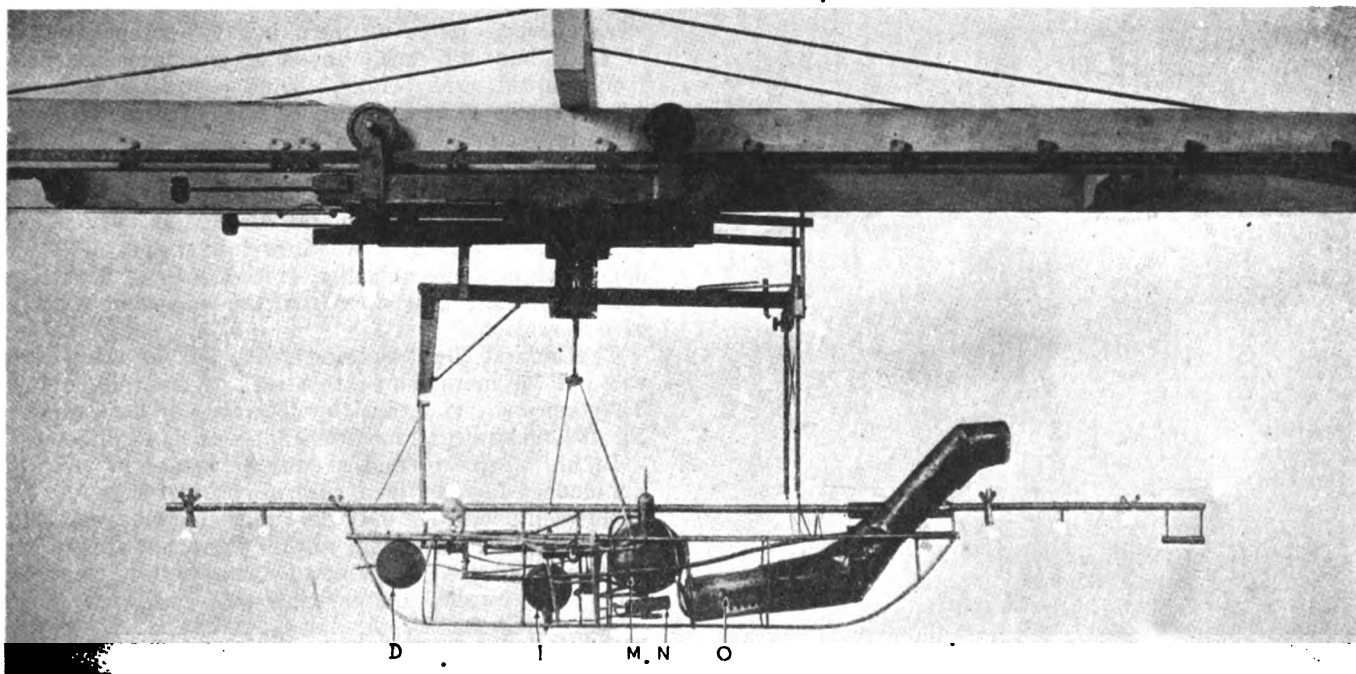
In April, 1887, Langley began his experiments with rubber-driven models, at the Alleghany Observatory. They were continued at intervals for three or four years, part of the time at the observatory, but for the most part in Washington. During this period, between 30 and 40 different models were constructed. Besides this, each one of the different models was altered a great many times, so that in reality, during the time that he was working with them, a total of something more like one hundred models were really tried out.

It will be understood that the models referred to here are those which were built before he undertook the propulsion of models by steam, and they were driven by the power developed by rubber bands untwisting or unwinding after having been twisted or wound up.

Following the experiments with the rubber-pull models came others with models driven by motors using compressed air, carbonic acid gas, and electric batteries. None of these models proved at all satisfactory, nor gave



Front and side elevations of one of the several rubber-pull aerodromes with which Langley experimented before making his steam power driven models



Side view of steel frame of aerodrome No. 5 suspended from launching car Oct. 24, 1896. This aerodrome and also No. 6 were light steam-driven models, with two pairs of main planes and two propellers located between them. The power plant as shown in this illustration consisted of D, a compressed air tank which forced the gasoline from the tank I, through the burner N, from which the flame of Bunsen type projected into the tubular boiler O. The steam generated here passed into the separator M, from the top of which it was led to the single-cylinder engine located in the center of the model. This engine was 33 cm. diameter by 70 cm. stroke, with slide valve, and weighed 464 grams. Power was transmitted to the propellers by shafting and bevels

as good results as had been obtained from the models which were rubber driven. In fact, the chief benefit derived from the rubber models was that they convinced Langley that he must seek some other source of power, which probably would be the steam engine, before he would be able to demonstrate that flight could be attained.

At the beginning of his experiments with models, it was necessary, as Langley points out in his memoirs, to determine the relationship of the center of gravity and the center of pressure. A great deal of experimentation was necessary to determine just what this relationship is. Another difficulty encountered was in finding some satisfactory method of launching his models in the air, and this difficulty increased as the models became larger.

### Anticipated Present Launching Methods

"It is frequently proposed," said Langley, in his record of the experiments, "by those unfamiliar with this difficulty, to launch the aerodrome by placing it upon a platform car or upon the deck of a steamer, and running the car or boat at an increasing speed until the aerodrome, which is free to rise, is lifted by the wind of resistance. But this is quite impracticable without means to prevent premature displacement, for the large surface and flight weight renders any model of considerable size unmanageable in the least wind, such as is always present in the open air. It is, therefore, necessary in any launching apparatus that the aerodrome be held rigidly until the very moment of release, and that instance a simultaneous release from the apparatus be made at all the sustaining points at the proper moment."

It is interesting to note that the method of launching which Langley found to be impossible at that time with his models is essentially the very manner in which aeroplanes are launched from the earth to-day, the only difference being that instead of being carried on cars, they carry their own cars with them.

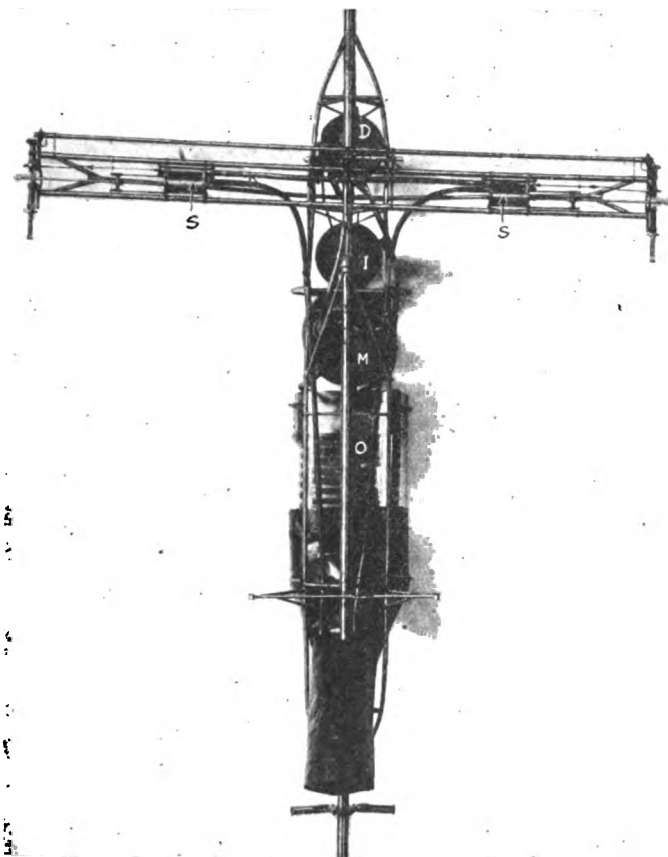
The first attempt, at the beginning of his experiments with rubber-pulled models, was made with one which consisted of a frame formed by two pieces of wood, each about one meter long and four centimeters wide. For the sake of lightness they were of star-shaped section, and were braced with cross pieces. They carried two long strips of rubber, each about one millimeter thick by 30 millimeters wide and 2 meters long. These rubber strips were doubled, and weighed 300 grams. It was possible to wind each of these strips to about 300 turns. One end was made fast to the front of the frame and the other to the shaft of a four-bladed propeller having a diameter of 37 mm. Light pine frames were used for the wings, and over these frames paper was stretched. The wings were double, one being superimposed upon the other. The wings were 15 centimeters wide by 120 centimeters long, and the distance between them was 20 centimeters. They gave a total surface of little more than 3600 square centimeters, or about 4 sq. ft.

The propellers were driven in opposite directions during flight. The whole apparatus weighed about one kilogram or something like 1 lb. to each 2 ft. of sustaining surface, and this weight proved to be entirely too great for the power provided.

### Whirling Table Tests

A test on the whirling table showed that the model would tend to soar at a speed of about 10 miles an hour, but its own propelling mechanism was not sufficient to sustain it in the air. The fundamental difficulty disclosed by this model and by others which followed it was that of making the model light enough and sufficiently strong to support the power required to drive it. Other difficulties encountered were, as Langley enumerated them, "the adjustment of the center of gravity to the center of pressure of the wings, the disposition of the wings themselves, the size of the propellers, the incli-





*Plan of the framework of Langley's No. 6 aerodrome, which was a development of No. 5 and differed from it only in a few details. Instead of the single-cylinder engine, two engines were used, one for each propeller, mounted at S S on the outrigger. The propellers were direct driven by the crankshafts, which, however, were connected by a cross shaft so that both went at the same speed*

nation and number of their blades, and a great number of other details which presented themselves from time to time."

Two other models, each with a single propeller, were constructed and ready for trial by June of 1887. One of these had an 18-in. propeller with 8 adjustable blades, and the other a 24-in. propeller with four adjustable blades. Each had two pairs of wings, which were curved and were 4 ft. 7 in. long. These models also proved too heavy in relation to their power, and neither succeeded in actually making flights.

Two years later Langley discarded the wooden frame idea and adopted instead frames made of tubes of light metal. These in turn were superseded by frames constructed from tubes, wound from paper, covered with shellac, and they proved to be the lightest and best material, in proportion to the strength provided, which had been found up to that time. The rubber strips were carried within these tubes, which of course had to be strong enough to withstand the end thrust imposed upon them when the bands were twisted up. The propellers used with the aerodromes made in this way were of the four-bladed type.

The weight and size of the models which Langley made at this time were too great to permit of their being launched by hand, and it was not until 1891 that a model light enough actually to fly was constructed.

Work with models of this kind was carried on until 1893. Usually the wings were flat. In some cases they

were curved. Some of them had two propellers, some of them had only one. In some, one propeller was in front and the other behind. Some were fitted with single wings, some with two pairs of wings, some with wings superimposed.

To quote Langley again, "The advantages and also the dangers of curved wings as compared with plain ones, were shown, and the general disposition, which would secure an even balance, was ascertained, but all this was done with extreme difficulty, since the brief flights were full of anomalies, arising from the imperfect conditions of observation."

The longest flight obtained with any of these models was not for more than 6 to 8 sec., or from 80 to 100 ft. They were so brief that the obtaining of data necessary for the making of improvements was most difficult.

In his efforts to find a suitable means of propelling his models, Langley gave careful consideration and made experiments with not only the rubber motors, which drove the models, considered up to this point, but steam, which he finally adopted; gun powder, hot water, compressed air, gas, electricity and carbonic acid gas.

### Stringfellow's Engine Unsatisfactory

The construction of the first steam-driven model was begun in November, 1891. Langley was forced to work without precedent or example. He was not trained in steam engineering, and when he called upon those who he thought might assist him with his problem, he found that they were unable to offer him any material assistance, as his undertaking was so new and so radically different from anything with which they were familiar.

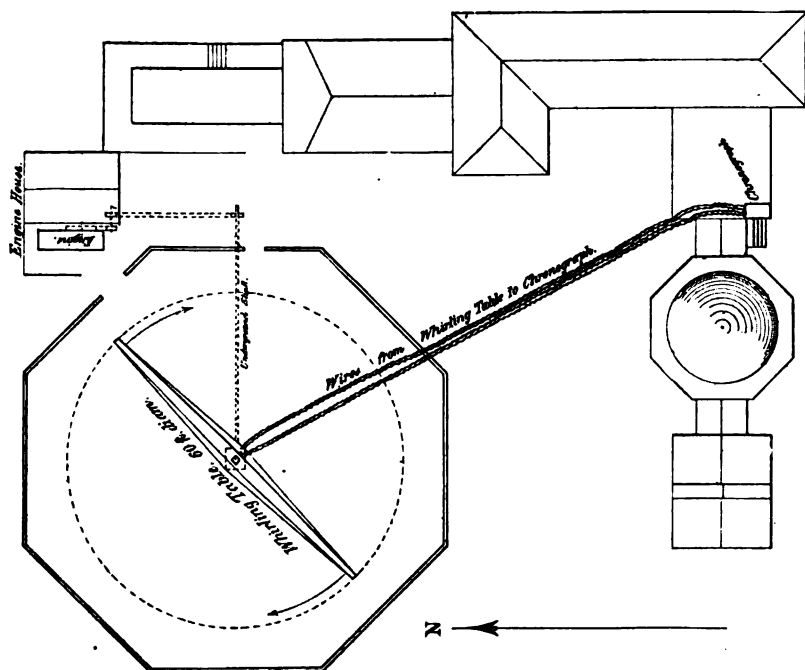
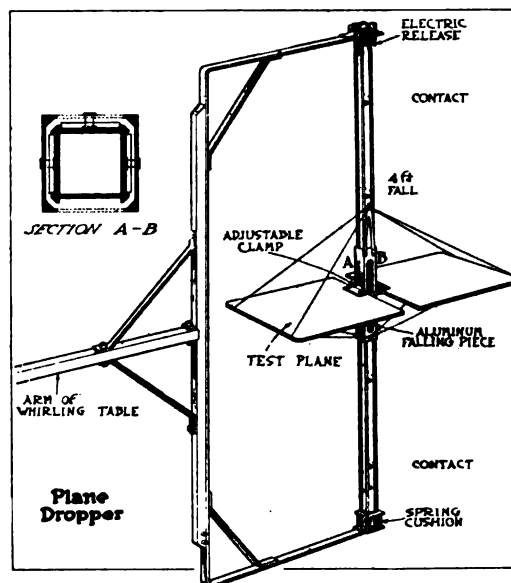
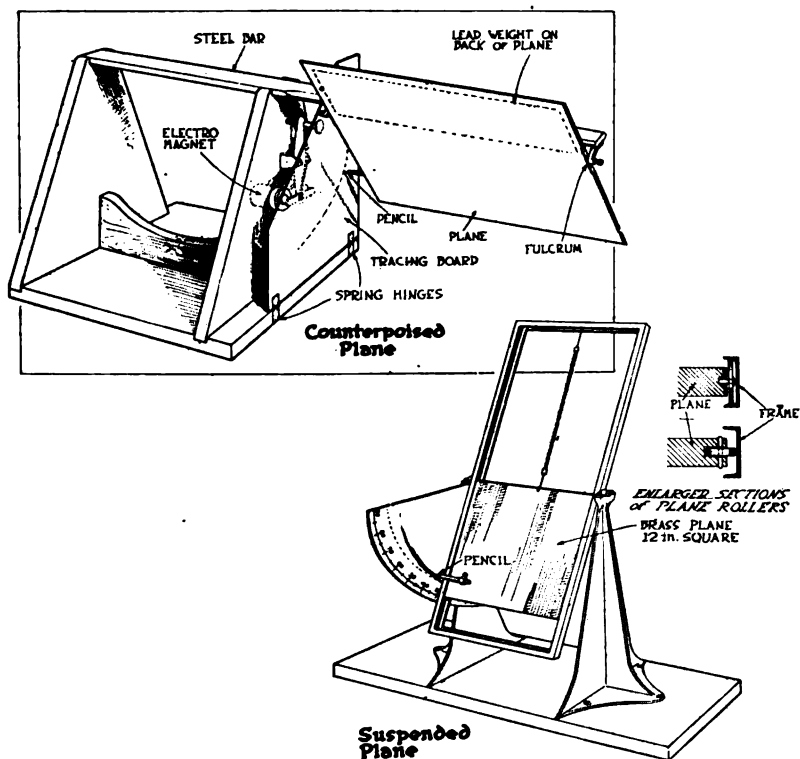
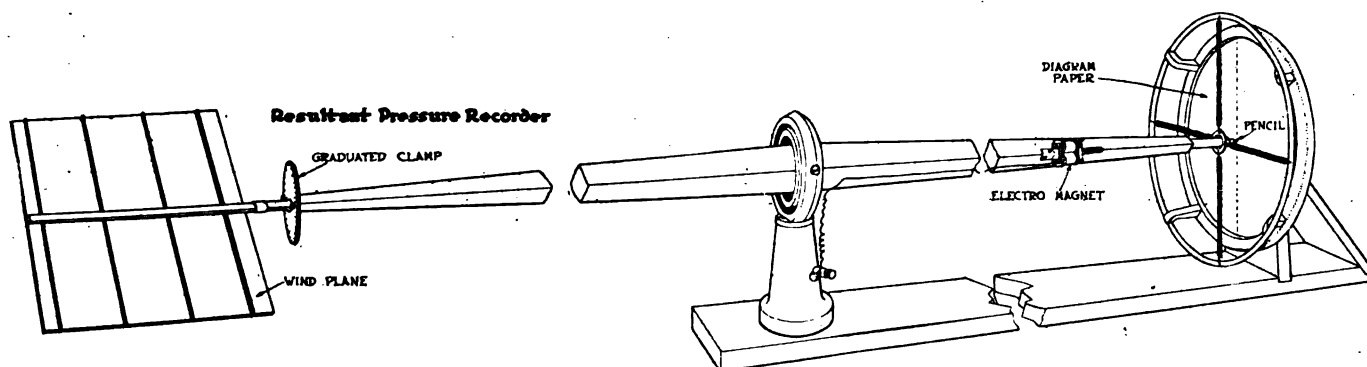
The lightest steam engine which had been developed up to that time was the Stringfellow, which had been exhibited at the Crystal Palace in London in 1868. It was capable, so it was claimed, of developing one horsepower for a total weight, including boiler and engines, of 13 lb. This engine came into the possession of the Smithsonian Institution in 1889. Investigations soon disclosed that it never had nor ever could develop the power claimed for it.

Langley had concluded from his experiments on the whirling table at the Alleghany Observatory that one horsepower was sufficient, with a plane "whose efficiency should be equal to that of a 30 x 4.8 in. plane set at an angle of 5 deg. and moving at a speed of 34 miles an hour," to propel 120 lb. He figured that with a smaller angle he could secure even better results, but concluded that the difficulties of guiding would increase as the angle diminished. He realized that no allowance had been made in the computation for the fact "that the results were obtained by means of a mechanism which forcibly maintained the supporting surfaces in the ideal condition of the best attainable angle of attack, as if in perfect equilibrium, and above all in the equally ideal condition of perfectly horizontal flight." The guide wires and the hull also contributed their share of factors to be given consideration. After taking all these things into consideration, Langley decided that one horsepower would serve to carry 30 lb. in flight, provided a supporting surface of at least 3 ft. to the pound could be obtained. Upon this basis the first steam-driven aerodrome was constructed.

It is interesting to note that the completed model actually weighed 44 lb. and 8 ounces as against an estimated weight of 27 lb. 11 ounces.

### Used a Mackerel Shaped Hull

For the shape of the hull, Langley decided to adopt the lines of the mackerel as being the most advantageous from the point of view of air resistance, but structural difficulties entered into the making of the hull, and the



Instruments designed and made by Langley for the purpose of obtaining data which he used in the construction and operation of his many model airplanes. These instruments were attached in turn to the end of the whirling table shown in another of the illustrations herewith, and the various results recorded by pencil on the instruments themselves or electrically by the use of a recording chronograph.

Plan of the grounds at Alleghany Observatory, showing the buildings in which Langley conducted his experiments in aeronautics, and the 60-ft. whirling table which he used for his velocity experiments with planes.

lines, therefore, did not follow the plan intended, the bow and stern being of the same shape.

The construction of a suitable boiler also gave Langley a great deal of trouble. He constructed an almost endless number of them, varying more or less in type, before he secured the one with which his successful aerodromes were driven.

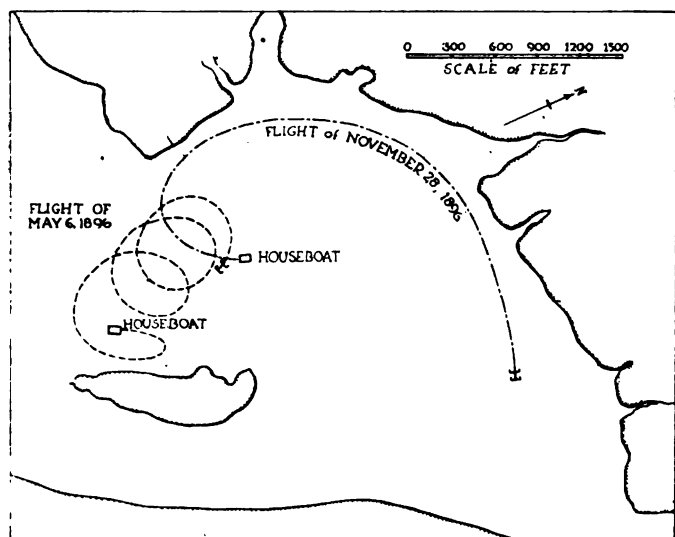
During the years 1892 and 1893 four steam-propelled aerodromes were constructed. They were known as Nos. 0, 1, 2 and 3. No. 4 was under construction by the end of March, 1893. Detailed descriptions of all these preliminary steam-driven models would be interesting, but space does not permit of giving them here. It would be well to pass them over hurriedly and to take up in greater detail the construction of Nos. 5 and 6, which were the ones whose performance satisfied Langley that he had actually obtained the results he sought.

The framework of aerodrome No. 5 was made of thin steel tubes. The main tube or midrod, as Langley called it, extended for the whole length of the machine, and carried the various attachments to which the wings were secured. A skeleton hull of steel tubing was suspended from this midrod. It was shaped somewhat like the frame of a boat, and arms ran out from the sides for carrying the propellers. The engine, aeolipile and boiler were placed within this hull. Together with the pump and separator they constituted the complete power generating portion of the model.

There were four principal parts in the aeolipile. They were the spherical air chamber which contained a supply of compressed air by means of which gasoline in the tank was forced into the burner, the tank which contained the gasoline used as fuel, the gas generator, in which liquid gasoline was converted into gas, and the burners where the fuel was burned to generate steam in the boilers.

The boiler consisted of a separator and generating coils, and was fitted with circulating pumps. The generating coils consisted of two windings of copper pipe, which had an outside diameter of 10 mm. and which were formed into 21 turns, 77 mm. in diameter on the outside. The turns were spaced 7.5 mm. apart, so that the total length of each coil was 36 cm.

The boiler was sheathed in a sheet of mica and at the front end by a strip of thin sheet iron as well. The stack was made of thin sheet iron and was slipped over the rear end.



*Plan of the most successful flight of aerodrome No. 6 near Quantico, Va., on Nov. 28, 1896. The distance traveled was about three-quarters of a mile*

The engine was of the slide-valve type, having a piston valve. The piston was without packing rings. The cylinder was made of steel tubing 35 mm. outside diameter and the heads were secured to flanges on the ends by means of machine screws. A thin cast-iron bushing was fitted inside of the steel tube. The bore was 33 mm., stroke 70 mm. The complete engine weighed 6.4 lb.

Bevel gears and shafts were used to transmit the power of the engine to the propellers, which were 1 mm. in diameter, and had an axial pitch of 1.25 m. They were made of white pine, in strips, 7 mm. thick, glued together. They were most carefully balanced, each blade with its mate, and each propeller with the other. They ran in opposite directions. The weight of each was 362 grams.

The photographs accompanying show the wing construction better than it can be put into words.

Aerodrome No. 6 differed from No. 5 in certain structural details, but not radically in general design. One difference was that two engines were used in No. 6 instead of one. They were located on the transverse frame, and their power was applied directly to the propellers. The cylinders of these engines were 2.8 mm. in diameter, with a stroke of 5 cm. The steel cylinders were lined with cast-iron bushings, and the pistons had cast-iron rings.

No. 6 was lighter than No. 5 and required much more careful handling and adjustment. Its flying qualities, however, were superior both as to speed and stability, when once these adjustments were correctly made.

The flying of these aerodromes was accomplished over the waters of the Potomac River. They were launched from the top of a houseboat anchored in the middle of the stream. On the roof of a house a platform was constructed, and the launching was accomplished by means of an overhead rail and suitable releasing mechanism.

### The Most Successful Flight

For a description of the most successful flight of aerodrome No. 6, which was also the most successful flight accomplished by any of the Langley models, and was accomplished on Nov. 28, 1896, let us use the words of the Langley Memoir:

"The aerodrome was launched at a steam pressure of not over 100 lb., the airdraft for the burners being temporarily bad. The midrod made an angle of approximately 3 deg. from the horizontal. On account of a slight rain, which had occurred just before the machine was launched, the wings were wet and the weight of the entire aerodrome was doubtless as much as 12 kilo. Immediately on being launched the aerodrome started directly ahead in a gentle south wind, moving horizontally and slowly turning to the right and appearing to approach dangerously near to some thick woods on the west shore. However, it fortunately continued turning until it pointed directly up the beach with the wind in the rear. It then moved more rapidly forward, dipped and rose but once, and this very slightly, and continued its remarkable horizontal flight, varying not more than 2 yards out of a horizontal course, and this for only a moment, until it finally descended into the bay at a point nearly in a line between the houseboat and the railroad station at Quantico.

"Upon being recovered it was found to be absolutely uninjured, and another flight would have been made with it immediately, but the darkness had descended. The time of flight, as determined independently by two stop watches, was 1 min. and 45 sec. The number of revolutions of the propellers was 2801, or at the rate of 1600 revolutions per minute, which, with an allowance of 50 per cent slip, should have carried the aerodrome a distance

(Continued on page 738)



# Single-Feed System Oils Car from Seat

Multiple-Plunger Hand Pump and Reservoir  
Supplies Oil Under Pressure to All  
Points on Chassis

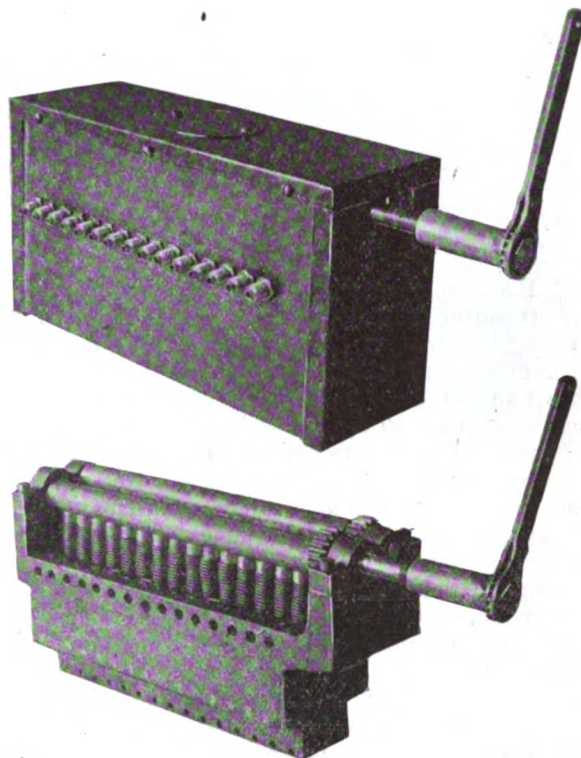
THERE has been a noticeable tendency toward the use of oil for the lubrication of car and truck chassis during the past two years. Now comes a centralized system of lubrication, the Semco-Skelly, in which a reservoir furnished with a number of tubes feeds oil under pressure simultaneously to the points on the chassis requiring lubrication, by a few turns of a small lever situated at the driver's seat. The manufacture is now in progress on this new lubricating system by the Smith & Egge Mfg. Co., Bridgeport, Conn. It consists of a sheet steel reservoir inside of which is placed a multiple pump with a separate plunger for each of the tubes. Shown in one of the illustrations, these plungers are arranged in parallel sets of fifteen, with a cam above each plunger. These cams give  $\frac{3}{8}$  in. throw and are geared together, 180 deg. apart, at the end. An extension of one of the shafts is fitted with a ratchet handle which projects through the front of the seat. The overall dimensions of the unit are 12 in. by 4 in. by 7 in. high.

As shown in the sectional drawing herewith, the plungers are ring-returned and double-ball intake and delivery valves are used in the pump. In the model now being made there are separate plungers. A corresponding number of flexible tubes  $\frac{5}{32}$  in. in diameter are carried along the chassis members and the ends fitted into the holes left vacant when grease cups are removed. The ends of the tubes are with unions each containing a spring ball check which the oil in the system and prevents leakage after the pressure has been removed.

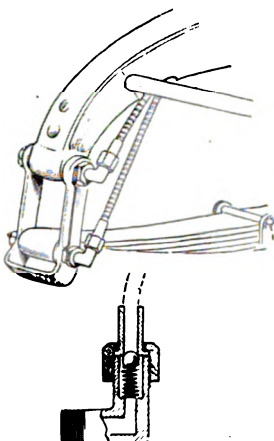
Points reached by this system include all spring shackle steering heads, brake connections, pedals, rear axle pads, etc. In the case of the shackle bolts, the tubes are drilled to the inside of the bolts instead of outside, which is the usual position for grease cups, so that they can be carried on the inside of the frame members, where they are out of the way.

At practically all other points the union fitted to the end of the tube is simply screwed into the grease cup hole. The tubes are clipped to the chassis members and taped to prevent any possibility of rattle, and the tube is sufficiently flexible to take care of the relative movement of the rear axle frame. The rear axle tubes are carried along the radius.

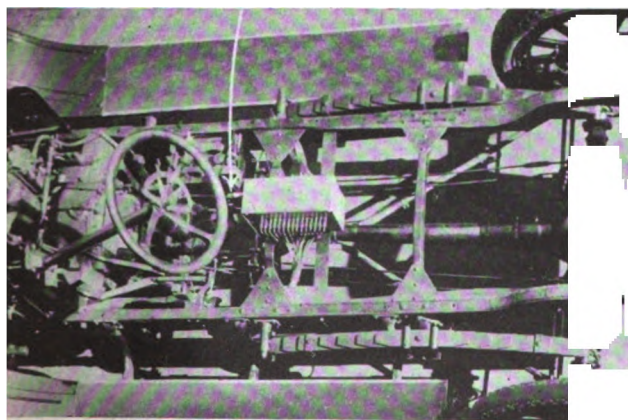
In the car fitted with this lubricator, in use for more than a year, no trouble was experienced in zero weather.



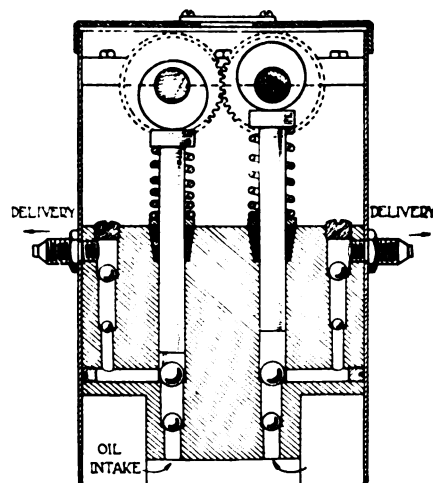
Above—The Semco-Skelly lubricator, showing the ratchet handle which operates the multiple pump. Oil is delivered through the thirty connections at the side. Below—The multiple plunger pump is a single casting, drilled vertically to form the cylinders



Sketch showing the attachment of the flexible steel tubes to the spring shackles. The section shows the ball check installed in each union to prevent leakage of oil



Chassis fitted with the Semco-Skelly lubricator under the front seat. The arrow indicates the operating handle. Right—Section through lubricator



# Avery 5-10 Orchard and Farm Tractor

One of the Smallest Machines on the Market Recently  
Redesigned—Will Pull Any Three-Horse Farm  
Implement and Do Belt Work

By P. M. Heldt

**W**HAT is undoubtedly the most extensive line manufactured by any single firm in the tractor field is that of the Avery Co., Peoria, Ill. The line comprises seven different models of tractors, of which six are of exactly the same pattern, whereas the smallest one, the 5-10 hp., is designed on somewhat different lines. This tractor is specially suited for work in orchards, on account of its compact size, and it can be used also for all ordinary kinds of farm work. As a plowing tractor it is recommended to haul two 10-12-in. bottoms, or one 16-in. bottom.

The engine, a four-cylinder, vertical block type, with L-head cylinders, has 3-in. bore and 4-in. stroke. The cylinders are cast integrally with the upper half of the crankcase. The crankshaft is supported in two die-cast bearings, and is  $1\frac{3}{4}$  in. in diameter. The valves are of  $1\frac{1}{8}$ -in. diameter and have a lift of  $\frac{5}{16}$  in. Detachable cylinder heads are used, and the wrist pins are tight in the pistons. The cam followers are of the mushroom type and are provided with means of adjustment in the shape of a number of shims located in a socket formed in the tappet. The bottom half of the crankcase is also of cast iron and is provided with shelves on the inside to which are riveted the sheet metal splash troughs. A centrifugal governor is fitted and keeps the engine running in the neighborhood of 1200 r.p.m.

Gasoline is recommended as fuel, although a gasifier is fitted and some owners have been using kerosene. The gasifier is similar to that used on other Avery models and consists essentially of a combination inlet and exhaust manifold. Eleven gallons of fuel are carried in a tank located crosswise of the frame directly behind the engine. The carburetor is either a Kingston or a

Zephyr. Atwater Kent ignition is used, with hand control.

Lubrication is by the circulating splash system, the oil being circulated by means of a plunger pump, bolted to the outside of the crankcase and driven by an eccentric on the camshaft. This pump takes the oil from the sump and delivers it to the splash troughs. All internal parts are lubricated by splash in the crankcase. A float type of indicator shows the level of oil in the case. Cooling is by water which is circulated through a tubular radiator of the company's own make by thermo-syphon action. Back of the radiator is located a  $15\frac{1}{2}$ -in. fan, which is driven at twice crankshaft speed through a  $1\frac{1}{2}$ -in. flat belt. Three-point support is used for the engine.

The clutch is of the dry-plate type, and its control is on automobile lines in that it is held in engagement by a spring. Back of the engine is located a three-speed-and-reverse gearbox, which operates on the selective sliding principle. All gears are cut from chrome-nickel steel, and are heat treated. The three speeds are  $1\frac{1}{2}$ ,  $2\frac{1}{8}$  and  $4\frac{1}{4}$  m.p.h. The transmission gears are mounted on Hyatt roller and ball thrust bearings. Combined with the change-speed gear is a cross shaft driven through a pair of bevel gears. It will be understood that the primary and secondary shafts of the gearbox are in line with and parallel to the crankshaft, respectively, and a set of bevel gears is therefore required between the change gears and the final drive. The cross shaft at one end carries a spur pinion, which meshes with a gear on the differential shaft. The latter at its ends carries the bull pinions, which mesh with the bull gears on the rear wheels.

Rear wheels of 38 in. diameter by 10 in. width of rim



Avery 5-10 hp. tractor hauling Oliver disc harrow





*Another view of the Avery 5-10 hp. tractor*

sed, these being of the built-up type, and provided driving lugs. The front wheels, which are 28 x 10 in dimension, are cast and have the guiding rings integral with them. The rear axle is 2 in. in diameter. The front axle is of the automobile type and is in a swivel connection with the frame at the center. The front wheel hubs are bored out to form a bearing for the front axle spindle. Of the total weight of 2600 lbs, only about 25 per cent rests on the front wheels. Steering is therefore comparatively easy. In order to enable the tractor to turn in a relatively small circle, the frame is narrowed at the front. In this way a minimum turning radius of 10½ ft. is obtained. Steering is accomplished by means of a 16-in. hand wheel at the rear end of a horizontal shaft, extending over the engine hood. The steering motion is reduced at the forward end through a bevel pinion and gear and a spur pinion and gear. This sector is mounted on a shaft extending up through a high bracket secured to the fore part of the frame. At the bottom of the bracket the shaft carries a hand wheel extending lever, which is connected by links to the steering knuckles.

A pressed steel seat is fitted, which can be adjusted up and down and swings sideways. There are two pedals, one for the clutch, which is provided with a hand brake, and the other for the brake, which acts on the differential gear. Two control levers, for the spark and throttle respectively, are mounted on a bracket on a cross bar in front of the driver. A swing-draw bar is fitted, to enable the driver to make a U-turn. The exhaust pipe is divided into two sections, which discharge close to the bull pinions, tend to keep the pinions lubricated and clear of dust.

The frame is built up of 4-in. channel steel, weighing 150 pounds to the foot. Steel plates are riveted to the channel at the forward end. There is a platform at the rear for the driver. The rear axle is a one-piece job, bent down, passed through holes in the frame members, and held in place by means of brackets. A metal hood extends over the top of the engine and is bolted down the sides, the side portions being bolted to the center portion, which is about 10 in. wide. The hood rests on two arch-shaped steel strips which are bolted to the frame, and is held in place by means of wing latches.

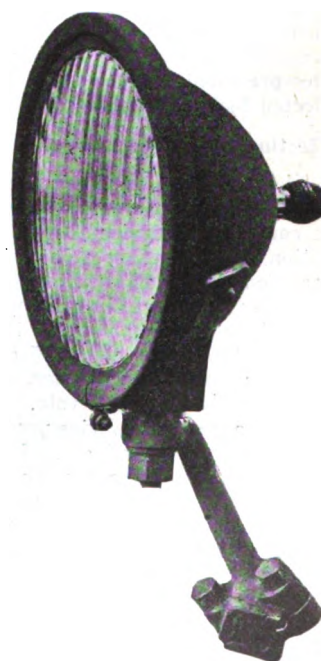
The tractor is provided with a 12 x 5-in. belt pulley, on the left side, in plain view of the operator. One of the features on which considerable emphasis is laid by the manufacturers is the large size of the bull gears. These are semi-steel castings, with a face of 2¼ in., and are bolted to the driving wheels by means of six lugs. The driving wheels, as already stated, are of the built-up type; that is, they comprise a central cast-steel wheel to which an extension rim is bolted. As to the capacity of this tractor, the company states that it is designed to pull a three-horse load, but on account of its greater speed and greater endurance, it will ordinarily accomplish the same amount of work in a day as four horses.

The price of this tractor is \$550, which makes it probably the lowest priced farm tractor on the market.

### Guide Tractor Lamp

A FIELD tractor lamp for night plowing and other night field work is manufactured by the Guide Motor Lamp Mfg. Co., Cleveland. It is of special heavy-duty construction and made dust and water tight. A lens, specially designed for the purpose, throws a broad, clear beam of light about 120 ft. forward, and spreads it to about 60 ft. at right angles to the tractor. The front diameter is 7½ in., and the lamp can be furnished either with prop standards or with an extended arm.

As yet only few tractors are equipped with electric lighting outfits, but the subject is receiving the attention of both tractor manufacturers and makers of electrical equipment. The outfits must be made specially robust for this service, on account of the severe short-period vibration in tractor work.





# Handling Employment Relations Without Help from the Outside

A Collective Bargaining Plan Comprising an Organized Business Government for Handling Entirely Within Any Establishment All Matters Relating to Wages, Hours of Labor, Discipline, Discharges and Grievances

**A** SO-CALLED collective bargaining plan, now in operation in a Middle Western concern, but which may be applied in any manufacturing establishment, which provides for the collective bargaining between an employer and his own employees, without the intervention of any union outside the establishment, is described by Boris Emmet, Ph.D., in an article which has just appeared in the *Monthly Labor Review* of the U. S. Department of Labor. The plan has been thoroughly tried out by three years' operation, and has resulted in putting on a collective basis the wage bargaining of the establishment, as well as the hours of labor, discipline, discharges and adjustment of grievances.

Under the scheme there are three separate bodies, known respectively as the senate, the cabinet and the house of representatives. The senate and the cabinet, both of which represent the interests of the firm, were created simultaneously in June, 1914. The organization of the employees, termed the house of representatives, was created one year later.

The members of the senate are salaried employees directly connected with the planning of the work of the institution, namely, heads of departments, their assistants, superintendents and their assistants. Application for membership must be submitted in writing to the secretary of the senate after the applicant has secured the indorsement of the firm and of at least one member of the senate. A majority vote of the members present is required for election. Membership ceases upon termination of employment with the company. Each member of the senate has one vote. By a two-thirds vote of the members present the rules and regulations governing the deliberations may be amended. Regular meetings are held once a week, but special sessions may be convened whenever occasion arises. The officers of the senate are a president, vice-president, treasurer, secretary and sergeant-at-arms, all elected by the membership for a term of one year.

## Election of Representatives

The members of the house of representatives are elected from among those employees of the company who have been in continuous service for at least six months. This qualification is at present relatively unimportant for the reason that four-fifths of the employees of this company have been in its service more than six months. The representatives are elected by popular vote of the employees, in the ratio of 1 representative for every 15 employees, but each department, however small, has at least one representative. Each member of the house has 1 vote. The officers of this organization include a president, vice-president, treasurer, secretary and sergeant-at-arms, all elected by popular vote. Elections are held regularly twice a year, during the first weeks of February and August. Regular meetings of the employees' representatives are held every other Tuesday and special meetings may be called whenever necessary. The rules of procedure of the body may be amended by a two-thirds vote of its membership.

The cabinet consists of members of the executive board of the company, and has the final word in all matters referred to it by the joint action of the house and senate. Members of the cabinet may attend the meetings of either the senate

or the house, but have no power to vote. Unless especially requested, however, members of the firm do not, as a rule, attend any of the sessions of the representative organizations of the employees.

The jurisdiction of the house and senate is unlimited. These bodies are privileged to discuss and act upon any proposition that may affect the interests of the employees and the firm. A proposition may originate in either house, but must also be referred to the other house for discussion and action there. In case of disagreement in the decisions reached the disputed points are referred to a joint conference committee consisting of an equal number of representatives of both organizations. The conference committee endeavors to reach some mutually satisfactory compromise, and usually succeeds. The compromise is then submitted to the cabinet for approval. As a matter of actual practice, propositions agreed to by both houses in the manner indicated above are usually assented to by the firm.

## Joint Standing Committees

Under the provisions of the scheme there are a number of standing committees consisting of an equal number of representatives from both organizations. The most important of these are the betterment committee, which hears complaints and adjusts grievances, and the welfare committee, which deals with matters affecting the general comfort and welfare of the employees. There are many other committees, mostly of minor importance, such as a committee on appropriations, in charge of expending the funds annually appropriated by the company for entertainments, athletics, etc., a program committee for entertainments, and a fire-drill committee. New committees are created whenever necessity arises for handling special questions.

A discharged employee has the right to refer his case to the betterment committee. If the decision of the betterment committee is not satisfactory to the employee, he may file a notice to that effect with the "professional" secretary of the house of representatives and the senate. The latter two organizations then select a board of review consisting of five persons, two selected by the senate, two by the house, and the fifth by mutual consent of both organizations. The majority decision of the board is final. The board has full power over discharge cases and may reinstate any employee who, in its opinion, was wrongfully discharged. The company, however, specifically reserves the right to lay off employees on account of lack of work, and a lay-off, even when in effect equivalent to a discharge, is not subject to the jurisdiction of the board.

By a special resolution adopted April 17, 1918, a permanent wage committee was created. This committee is composed of one member selected by the employees of each factory department and one employee chosen to represent the office and clerical force of the firm. The functions of this committee, as defined in the resolution, are as follows: (1) To recommend and pass upon general changes in wages; (2) to suggest and pass upon minimum and maximum rates to be paid for the various operations according to skill involved, length of service, and steadiness in attendance; (3) to sit with the

factory planning board, composed of the superintendents, for the purpose of passing upon individual increases in wages; and (4) to receive complaints of individuals to whom increases were denied.

That this collective bargaining scheme has been of benefit to the employees may be seen from the list presented below, enumerating some of the more important matters dealt with and adjusted collectively, as well as from the brief account given later of the changes in wages during the last 18 months.

Ordered that raw materials be sold to employees at cost plus 15 per cent.	Apr. 23, 1915
Ruled that no freight be carried on elevators between 7.15 and 7.45 a. m. and 11.30 a. m. to 12.15 p. m.	Feb. 22, 1916
Ordered that 1 week's vacation with pay be granted to those in service 1 year or longer.	Apr. 25, 1916
Introduced a 48-hour week.	June 16, 1916
Ordered that 2 weeks' vacation with pay be granted to those in service more than 3 years.	May 20, 1916
Decided that, whenever possible, promotions be made from rank and file.	Sept. 19, 1916
Employed a "professional" secretary for the house and senate.	Jan. 10, 1917
Granted increases in wages of 5 and 10 per cent.	Jan. 23, 1917
Formulated rules of procedure to govern a board of review to handle discharges.	Jan. 10, 1917
Decided that the positions of enlisted men be held open for them.	May 29, 1917
Granted an increase in wages of 5 per cent.	June 20, 1917
Agreed to readjust wages in accordance with the changes in the cost of living.	Jan. 23, 1918
Created a permanent committee to deal with wage questions.	Apr. 17, 1918

In these days of advancing prices the attention of employees is centered on the question of wages. Since the beginning of 1917 the question of wages has been the subject of frequent discussions of the representative bodies. The procedure of arriving at wage changes was somewhat as follows: The workers, feeling the need of larger incomes, usually called a meeting of their representatives and by resolution instructed them to make certain demands for increases in wages. The matter would then be taken up at the next meeting of the house for the purpose of arriving at a definite figure. As a rule, the house, being more familiar with the general conditions of business, modified considerably the demands of its constituents. The figure agreed upon by the house would then be referred to the senate. The latter, after detailed discussions and informal conferences with the management, then arrived at some decision. In cases of disagreement the matter went through the regular procedure of reference to a joint conference committee and then to the firm, which, in the great majority of instances, approved the compromise arrived at by the joint conference committee.

On Jan. 29, 1917, an increase of 10 per cent was granted to employees with a continuous record of one year or more, and of 5 per cent to those in service less than one year. On

June 20, 1917, an additional all-round increase of 5 per cent was given.

In the early part of December, 1917, the representatives of the employees, in view of the still mounting cost of living, submitted a demand for an additional all-round wage increase of 10 per cent. The matter was referred to the senate, where it was discussed at great length. The opinion prevailing in the senate was "that inasmuch as it would not be right to ever cut wages, it might be unwise to grant increase after increase, as the cost of living rises, if such raises are made permanent, \* \* \* but that temporary raises as long as this high cost of living remains on the same level, or goes up, are necessary." In view of the difference in the viewpoints of the house and the senate the subject was referred to a joint committee, which was instructed to work out some equitable method for the adjustment of wages to the rising cost of living. The action of this committee was announced on Jan. 9, 1918. It suggested that periodic (monthly) changes in wages be made in accordance with the changes in the prices of commodities. A resolution to this effect was passed and subsequently approved by the firm. In accordance with this resolution, the company on Jan. 23 made the following announcement:

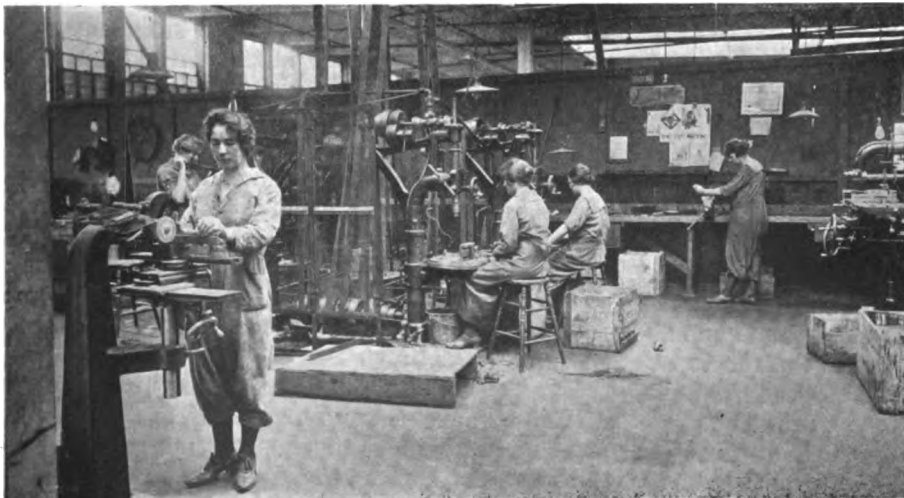
The company believes there is justice in the suggestion that the wages of the employees be readjusted in accordance with the higher cost of living. It wishes to meet the suggestion by paying a separate high-cost-of-living envelope to each employee once a month. This envelope will contain an amount of money which will represent the average increased cost of living to each employee.

This amount will be figured by using Bradstreet's index figures as a basis. These index figures represent an average of the prices of 96 articles used in everyday life. As the prices change, these index figures change, so that they are a fair measure of the increase in the cost of living. These figures have been used by Bradstreet's since 1904 and are recognized all over the United States as being impartial and reliable.

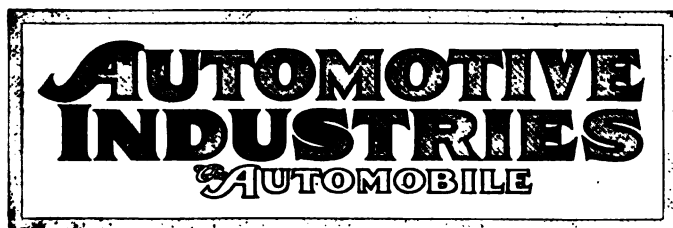
As these monthly index figures are not available until the 15th of the month the index figures of November the 1st will be taken instead of December 1st, and this November the 1st figure will be continued to be used as a basis. Therefore, the high-cost-of-living envelope for December will be the percentage of difference between the index figures of November the 1st and December the 1st. The high-cost-of-living envelope for January will be the difference between November the 1st and January 1st, and so on. This payment will be made on the second Tuesday of every month.

The company does not obligate itself to continue this payment indefinitely, and as soon as circumstances arise that make this payment unnecessary or impossible to maintain the employees will be advised through the house of representatives of this fact.

This new wage arrangement was to be retroactive to December, 1917, when the wage demand of the employees was presented. Since the date of the announcement, the following percentages of the regular earnings of the employees have been paid as cost-of-living bonuses: For the month of December, 1917, 5 per cent; January, February and March, 1918, 6 per cent; and April, 1918, 8 per cent.



Nearly 200 men who have gone into national service have been replaced by women operators in the plant of the Elgin Motor Car Corp. The results have been so satisfactory that the company is planning to enlarge its force of female workers for various kinds of light machine and general factory work.



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## Fool-Proofing the Tractor Engine

MOTOR truck manufacturers in the early years experienced no end of trouble as a result of the inclination of the drivers to overload their machines. As a preventive, plates were attached to the dashboard warning the driver and owner that the guarantee on the machine would become void if the latter was overloaded; but even this did not seem to have the desired effect. Finally it was concluded that the one effective way to prevent overloading was to so limit the engine power that the truck was incapable of taking overloads up hill. It is far better to so design the truck that it cannot be abused than to trust to the driver's intelligence to prevent abuse.

A similar line of reasoning may be applied to tractors and especially to tractor engines. We hear a good deal of farmers abusing their tractors by hooking on four bottom plows when a three-bottom is all the tractor was designed for. It seems that the

engine is the part which suffers most from such abuse, as the pressures on the bearings are too high and perhaps the cooling system is inadequate to take care of the heat absorbed by the jacket under overload conditions.

Tractor engines should be protected by simply making it impossible to produce excessive bearing pressures and excessive cylinder temperatures. That these engines have not been so designed in the past has been due largely to the fact that they have been evolved from the automobile engine which works under much less severe conditions. Whereas the automobile engine carries an average load of about 20 per cent its maximum, the tractor engine in plowing works at 70 to 80 per cent its maximum load. From this it will be readily perceived that if the tractor engine bearings were no larger, in proportion to the cylinder dimensions, than automobile engine bearings, they would wear out very quickly. As a matter of fact, the tractor engine always has larger bearings, but still they are not large enough. They ought to be so large that even under full load the engine works smoothly, without pounding and without danger of the bearings heating excessively. Then there is no possibility of "abusing" the engine as far as the bearings are concerned. Of course, the engine weight will be increased thereby. There is plenty of chance in most tractors of cutting down weight where such cutting down can do no harm, and even were this possible, it would be preferable to carry around a little additional weight if this would result in a smooth running engine.

Large bearings imply a robust crankshaft, which will not yield appreciably under the stresses imposed upon it. With a substantial crank, large bearing surfaces and adequate cooling capacity, it is absolutely impossible to abuse an engine by overloading it. A tractor engine should not need any nursing, but should be capable of standing up under continuous full-open throttle operation.

## Oil Cooling of Kerosene Engines

BEFORE a liquid fuel can burn it has to be vaporized because only when the fuel is in the gaseous state can its molecules approach sufficiently close to the molecules of oxygen in the air to effect a chemical combination.

As the temperature of vaporization of kerosene extends from about 300 to 500 deg. Fahr., this fuel cannot draw its heat of vaporization from the atmosphere, like high test gasoline, but must have heat supplied from outside sources. This heat may be supplied to the fuel before being mixed with the air, to the air previous to mixing, to the mixture on its way to the cylinder or to the mixture after it has entered the cylinder.

Each of these methods has something to commend it, and all are now in practical use. The difficult problem with most of them seems to be to control the heat supplied to the fuel mixture in accordance with the load on the engine. At low engine loads and speeds the fuel is less energetically sprayed than at high speeds and full load, and as the fuel globules



then are larger, a higher degree of heat is required to effect vaporization in the limited time available, whereas the temperature of the exhaust under these conditions is actually far lower.

If some of the fuel remains unvaporized at the time of ignition, combustion is retarded, with the result that much more heat goes into the waterjacket than would be the case if the mixture were completely in the gaseous state and burned almost instantaneously.

In a four-cylinder engine it seems necessary to supply heat to the mixture before it enters the cylinders, because if the fuel is still in the globular state it is impossible to get equal qualitative distribution, some cylinders receiving a richer mixture than the others, owing to the greater inertia effect on the liquid fuel particles than on the air. In two-cylinder engines there is less danger of such faulty distribution owing to the simple form of the inlet piping and in a single cylinder engine there can be, of course, no question of unequal distribution.

If the mixture is introduced into the cylinder cold, the advantage of a greater volumetric efficiency is gained. The fuel must be thoroughly vaporized before ignition, if the conversion of heat into mechanical energy is to be commensurate in effi-

ciency with that obtained in the gasoline engine.

This is not possible where water cooling is employed, as the water keeps the cylinder wall temperature down to less than 212 deg., and it is impossible to draw heat from a wall at this temperature to vaporize fuel whose vaporization temperature extends up to 500 deg.

It is this condition that has brought about the introduction of oil cooling in tractor engines. Mineral oils can be safely heated to between 400 and 500 deg. and oil at this temperature in the cooling jacket not only insures the vaporization of the fuel introduced into the cylinders in a finely divided liquid state, but it tends to lower the loss of heat to the jacket from the burning charge, by reducing the temperature difference between opposite sides of the cylinder wall.

Thus oil cooling and high cylinder wall temperatures seem to be advantageous from several points of view. There is, however, the question of pre-ignition and consequent knocking to be considered. To eliminate this, either very low compressions must be used or water injection must be resorted to.

Oil is now employed as the cooling medium on a number of tractor makes and we should not be surprised to see the practice extend.

## Italy Stages Automotive Exposition

ITALY, which has been practically in the front yard of the war and which has had to defend her finest cities against attacks, has recognized the essential character of the automobile and other automotive apparatus to the extent that one of her leading manufacturers has assisted in staging what might be designated a war apparatus exposition along the lines suggested in AUTOMOTIVE INDUSTRIES Aug. 24. At that time it was suggested that there be staged in New York and Chicago exhibits of automotive apparatus serving in the war and that the receipts from such an exhibition be turned over to war organizations, such as Red Cross, Y. M. C. A., K. of C., Salvation Army, etc.

The following letter from the Fiat company at Turin, Italy, expresses a lofty sentiment along this line. It shows that in Italy, too, there is necessity for bringing the automobile and all automotive apparatus into their true field in the war:

"Editor AUTOMOTIVE INDUSTRIES:

"By following Mr. Beecroft's suggestion the last remnants of the denigrators of the 'pleasure car industry' would be sensibly reduced, the industry would finally come into its own, viz., the recognition of its *essential* character, and the charitable institutions he alluded to (Red Cross, Y. M. C. A., etc.) would be the richer to a considerable amount to help them with their work.

"The thought that Fiat has for this time forestalled Mr. Beecroft's wishes and had already put in practice the suggestion he makes in his article is very gratifying to us, and we think you will be interested to know that at Bologna we are actually exhibiting in a local show the only output of our war

industry, viz., aero engines, transport trucks and agricultural tractors.

"When we consider that all the efforts of our firm during the last 4 years have been devoted to warlike purposes, you will agree with us that we could not enhance with a better show the actual products of our factory.

"In accordance with Mr. Beecroft's suggestion the profit of the show will be handed over to the Fund for War Orphans and we will be happy in the thought that the industry will have been an instrument in both helping the war and in alleviating the consequent ravages of it.

"We are glad to ascertain the identity of ideas and sentiments which are binding the two Allied Nations, United States and Italy, and we will look forward confidently to the future for a stricter union of the two countries. Hail Columbia!

Yours faithfully,

FIAT, Società Anonima, Torino."

THE call for improvements in internal combustion engines raised in connection with our military aircraft program has resulted in much work being done on rotary valve and sleeve valve engines. However, in airplane work, where weight efficiency is the prime consideration, the poppet valve stands firmly intrenched, and no other valve construction seems to stand any chance of competing with it. There is, of course, a chance that the noiseless sleeve valve and rotary valve engine will receive more consideration in the automobile industry after the war and that experimenters who produce successful engines of this type may yet reap their reward.

# □ Latest News of the

## Detroit Subscribes \$29,868,935

### Automotive Industry Gave the City a Big Push in Going Over the Top

DETROIT, Oct. 21—Automobile and truck manufacturers and those of the allied industries have subscribed most liberally to the Fourth Liberty Loan, in some cases doubling and tripling their Third Loan subscriptions. The large subscriptions of such firms as Ford, Dodge Brothers, Packard, Cadillac, Hudson, Lincoln, Continental, Fisher Body and others have contributed largely to the brilliant showing of Detroit, the first city in the United States with a population of over 100,000 to "go over the top" with an over-subscription of \$6,000,000. In some instances manufacturers who have been slow in either converting their plants or in following suggestions of the war industries board were not able to contribute as generously as might have been expected.

The Ford subscription to the Fourth Loan is 150 per cent greater than to the Third Loan. The Paige-Detroit Motor Car Co. increased its subscriptions by 100 per cent. At the Packard plant the average bond purchased per employee was \$90, as compared with \$67 for the Third Loan. The 1318 workers at the Motor Products Co. averaged more than \$100 per man, the total subscription being \$138,750. At the General Aluminum & Brass Co. 947 employees bought \$66,200 worth of bonds, or more than double what they had purchased in the Third Loan.

At the plant of Morgan & Wright, where 800 of the 3500 workers are girls, the latter subscribed an average of \$95 each. The total subscriptions by the workers was \$354,000, to which \$135,000 was added by the firm. The employees of the Timken-Detroit Axle Co. averaged \$103 worth of bonds per man. The Lewis Hall Iron Works subscribed two and one-half times as much as for the last loan.

The workers at the Holden Avenue plant of the Lincoln Motors Corp. made 100 per cent subscriptions, totaling \$128,350, or four times the Third Loan total. The Motor Products Corp. and employees subscribed \$238,000, as compared with \$102,400 for the Third Loan. Both company and employees doubled their former subscriptions.

#### Tabulation of Subscriptions to the Fourth Liberty Loan Campaign—Detroit District

Packard Motor Car Co.	\$1,000,000
Hudson Motor Car Co.	877,900
Maxwell-Chalmers Co.	300,000

Studebaker Corp.	250,000
Timken-Detroit Axle Co.	225,000
Detroit Steel Products Co.	100,000
Morgan & Wright	135,400
Michigan Lubricator Co.	27,000
Michigan Lubricator Co. employees	52,000
Northern Engineering Works	73,000
Northern Engineering Works employees	27,000
R. H. Collins, president Cadillac Motor Car Co.	450,000
Detroit Steel Products Co.	150,000
Continental Motors Corp.	200,000
Mr. and Mrs. Henry B. Joy	100,000
Detroit Steel Castings Co.	100,000
Anderson Electric Car Co. employees	44,800
W. O. Briggs, president Briggs Mfg. Co.	30,000
Roberts Brass Co.	17,350
Roberts Brass Co. employees	24,650
Michigan Pressed Steel Co.	100,000
Mallometer Co.	10,000
Mallometer Co. employees	9,200
Gray Hawley Mfg. Co.	1,000
Gray Hawley Mfg. Co. employees	2,400
Candler Radiator Co.	4,800
Metal Wood Mfg. Co.	7,000
Metal Wood Mfg. Co. employees	7,450
Sewell Cushlon Wheel Co.	3,500

(Continued on page 734)

### Dupont Heads Flint Varnish

DETROIT, Oct. 23—W. W. Mountain, president and general manager of the Flint Varnish & Color Works has resigned as the company's chief executive officer and member of board of directors to become associated with John N. Willys. The board has also accepted the resignations of James E. Kepperly as vice-president and director, and B. A. Greene secretary and purchasing agent. The former is general manager of the Curtiss Aeroplane & Motor Co. of Buffalo. The latter will become affiliated with Dort Motor Co. Lamot Dupont, vice-president of the E. I. Dupont de Nemours company, was elected to the presidency to succeed Mountain. S. J. Sohlinger, who has been vice-president and assistant general manager for nearly 2 years was made general manager of the company and elected to the board of directors. F. M. Howard, treasurer, was also elected to the board.

### No Airplane Show Next Year

NEW YORK, Oct. 24—The Manufacturers Aircraft Association has abandoned plans for its annual show during the coming year. The directors last week adopted resolutions against such a show because of the necessity for devoting all time and energy to government requirements.

### Artillery Tractors in Production

WASHINGTON, Oct. 24—Five-ton and ten-ton artillery tractors are in quantity production of approximately 500 of each type per month, and the production is steadily increasing, according to announcement by Major General C. C. Williams, Chief of the Army Ordnance.

## Orders for 117,154 Vehicles

### Motors and Vehicles Section of Quartermaster Contracts Placed in Four Weeks

WASHINGTON, Oct. 24—During the past four weeks, the Motors and Vehicles Section of the Quartermaster Corps has placed contracts for various types of motor trucks, tractors, motorcycles, bicycles and passenger cars aggregating well in excess of \$130,000,000. A summary of the contracts shows that included in the total are 41,722 trucks and chassis, 3000 delivery cars, 9858 passenger cars, 18,755 motorcycles and 25,000 bicycles. It is stated there are all for the recently organized Motor Transport Corp.

The total of 41,722 trucks includes the order for 25,000 class B vehicles which was placed two weeks ago and also an order for 5000 Militors, 4000 of which are to be made by Packard. Also included are the 17,500 Nash, F. W. D., Pierce-Arrow and Garford trucks, contracts for which were placed last week. Although the Quartermaster Corps estimates the total value of the contracts at \$130,000,000 it seems likely that this figure is low and that it should be nearer to \$230,000,000. Following is a summary of the contracts:

800	3½-ton trucks
202	2-ton trucks
600	1½-ton trucks
600	5-ton chassis
1020	3½-ton chassis
6250	3-ton chassis
2100	2-ton chassis
565	1½-ton chassis
5000	Militor trucks
1200	Class AA chassis
24,500	Class B chassis
3584	10-ton trailers
150	4-wheel trailers
13,500	F. W. D. trucks
8000	Ford touring cars
1000	Dodge touring cars
300	Dodge winter cars
558	Limousines
3000	Delivery cars
18,775	Motorcycles
25,000	Bicycles

### Paige to Maintain Service

DETROIT, Oct. 21—In sections where Paige dealers are going to relinquish their agencies the company will endeavor to make arrangements with dealers of other cars to maintain Paige service in those territories.

### "Eagles" from Kearney Nov. 15

DETROIT, Oct. 16—Henry Ford's ship-building plant at Kearney, N. J., is progressing rapidly, and it is believed production of Eagles will start there Nov. 15.

# Automotive Industries □

## Car Output Holds Steady

### Average Weekly Production Maintained for Months Despite War Work

DETROIT, Oct. 22—Despite war work production of cars has been maintained at a steady level for some months past; the average weekly output has been about the same.

The Maxwell plant, which is engaged on a wide variety of war work, has been producing an average of 125 cars daily for several months. The production of Chalmers has been 30 a day since August. This plant is working on an order for armored artillery tractors and also on one for 5-ton artillery tractors in addition to working on motors, transmissions and clutches for tanks, two-horse reels, gun limbers and two sizes of shells. The company is also making airplane parts at Dayton.

Production at the Willys-Overland plant has been averaging 225 daily since September; Paige and Saxon, 25; Liberty, 5; King, 4; Columbia, 3; Dort, 25.

Saxon expects to build 1700 cars during the remainder of the year and now has 60 per cent of the most essential parts in stock. The company has started work on the Government order for Class AA trucks and will deliver 50 during November. Liberty, which also has an order for this type of trucks, will start production Nov. 1, and expects to deliver 30 the first month of production.

Work on gun carriages is progressing very rapidly. Up to date 70 have been made and 20 have been shipped. The initial shipment of five left the plant 2 weeks ago. In a few months the Toledo plant will be producing shells at the rate of 4000 a day.

Ford is getting ready for quantity production on its 15,000 order for 3-ton tanks.

Packard is preparing to start production of the 3-ton trucks, for which it received an order from the Government for 5250. It is believed when quantity output is reached the company will be making 600 to 700 a month. An order for 4000 Militar tractors has been received, and the company will be ready for production by the first of the year.

The Columbia Motor Car Co. has enough material on hand to build 300 cars this year. Within 30 days it will be in quantity production on the G. M. C. ½-ton truck order. The capacity of the plant is four or five trucks a day, but production will depend on the ability of General Motors to furnish axles.

In addition to making kitchen trailers for the Government, the King Motor Car Co. will continue to make repair parts for ambulances for the Marine Corps.

### Marine Engine War Service Committee

WASHINGTON, Oct. 23—A War Service Committee representing the marine internal combustion engine and accessory industries has been formed and consists of the following seven members: James Craig, James Craig Engine & Mach. Wks., Jersey City; Charles A. Criqui, Sterling Engine Co., Buffalo; Ora J. Mulford, Gray Motor Co., Detroit; Charles W. Pank, Fairbanks Morse & Co., Chicago; Eugene A. Riotte, Standard Motor Construction Co., Jersey City; J. A. Seymour, McIntosh & Seymour Corp., Auburn, N. Y.; Richard R. Young, Union Gas Engine Co., San Francisco. Mr. Riotte is chairman of the committee. One of the first duties of the committee will be the preparation of a questionnaire which will be filed by every marine engine builder in the country. The committee has established headquarters at 29 West 39th Street, New York.

### S. A. E. Section Meetings Abandoned

DETROIT, Oct. 23—The Spanish influenza epidemic has played havoc with the S. A. E. Section meetings. Buffalo, Indianapolis and Detroit Sections have all been compelled to postpone their meetings indefinitely.

### Wichita Motor Adds Tractor

WICHITA FALLS, TEX., Oct. 23—The Wichita Falls Motor Co., which for some time has produced motor trucks, is entering the field with a farm tractor. It is a four wheel machine with a four cylinder, vertical, 4½ x 6 valve-in-head engine with magneto ignition. It has two speeds forward and one reverse with drive through gears to the rear wheels and all driving mechanism operating in an oil bath. The weight is 4500 lb. and the drawbar pull 3000 lb. It will sell for \$2,000.

### Many Detroit Additions

DETROIT, Oct. 22—Among building permits granted this week in Detroit were the following:

Hudson Motor Car Co., one-story storage and repair building, 100 by 240 by 30, to cost \$45,000.

Clayton Lambert Mfg. Co., one-story water tank, 17 by 17 by 15, \$4,000.

Detroit Shell Co., addition to factory, to cost \$2,000.

Paige-Detroit Motor Car Co., \$1,000 addition to plant.

Maxwell Motor Co., addition to plant, to cost \$900.

## Canadian Merger of Four Companies

### General Motors Consolidated with McLaughlin and Chevrolet—Continue Branches

OSHAWA, ONT., Oct. 21—An amalgamation that will prove of far-reaching importance to the motor vehicle manufacturing industry has been effected by the consolidation of the McLaughlin Motor Car Co., the Chevrolet Motor Co. of Canada, Ltd., and the McLaughlin Carriage Co., Ltd., with the General Motors Co. The arrangement will be effective from Nov. 1.

One of the primary objects of the consolidation is the reduction of production costs. All the present plants, branch houses and distributing stations in Canada will be operated as heretofore and, in addition, engines which have formerly been imported will be manufactured in Canada, together with axles, transmissions and all other important parts.

With this end in view the General Motors Co. recently purchased a site in Walkerville, Ont., of 38 acres, where manufacturing operations will be conducted as soon as materials can be obtained and buildings erected. Provision will also be made from time to time to take care of the Canadian business of the Cadillac, Oldsmobile, Scripps-Booth, General Motors trucks and Samson tractor lines. All the plants in Canada will be operated to full capacity, it is stated, as soon as the raw material situation permits.

### Pool Allied Air Resources

WASHINGTON, Oct. 18—An agreement by which the aircraft resources of the United States and its Allies are to be developed under a joint program was the chief result of the trip of John D. Ryan, Second Assistant Secretary of War in charge of aircraft, to Europe with Secretary of War Newton D. Baker. Details of the plan, said Mr. Ryan on his return here, cannot be disclosed at this time.

In the operation of the planes in battle, he explained, Marshal Foch and the field commanders, Generals Pershing, Petain and Haig, will continue to control the air fleets as they do the other sections of the armies. In describing as much as could be told of the joint air program, Mr. Ryan told that each country will use its production resources and that the air forces of the three countries, France, United States and Great Britain, will be supplied out of this production on a pro rata basis.



# Adopt Specifications for Gasoline

## Standard Tests and Requirements Set for Truck and Airplane Fuels

WASHINGTON, Oct. 18—Following conferences between the Specifications Commission of the Allies and the American Committee on Standardization of Petroleum Products, standard specifications for motor and aviation gasoline have been adopted.

Under these specifications aviation gasoline has a far higher end point than commercial grades of fuel; motor gasoline, which is for the use of motor transport vehicles, is slightly different from the commercial grade. Ordinary commercial gasoline has an end point of approximately 450 deg. Fahr. Under the new specifications aviation gasoline has an end point of 347 deg. Fahr. for domestic purposes and 257 deg. Fahr. for the fighting grade, and motor gasoline of 420 deg. Fahr.

Following are the specifications as adopted by the Committee on Standardization of Petroleum Specifications:

### SPECIFICATIONS FOR MOTOR GASOLINE

**QUALITY:** Gasoline to be high grade, refined and free from water and all impurities, and shall have a vapor tension not greater than 10 lbs. per sq. in. at 100 deg. Fahr. temperature, same to be determined in accordance with the current "Rules and Regulations for the Transportation of Explosives and Other Dangerous Articles by Freight"—paragraph 1824 (k)—as issued by the Interstate Commerce Commission.

**INSPECTION AND TESTS:** *Inspection*—Before acceptance the gasoline will be inspected. Samples of each lot will be taken at random. These samples immediately after drawing will be retained in a clean, absolutely tight closed vessel and a sample for test taken from the mixture in this vessel directly into the test vessel.

*Test*—One hundred cubic centimeters will be taken as a test sample. The apparatus and method of conducting the distillation test shall be that described in Bureau of Mines Technical Paper No. 166, Motor Gasoline.

- Boiling point must not be higher than 140 degrees Fahr.
- 20 per cent of the sample must distill below 221 degrees Fahr.
- 45 per cent must distill below 275 degrees Fahr.
- 90 per cent must distill below 336 degrees Fahr.
- The end or dry point of distillation must not be higher than 428 degrees Fahr.
- Not less than 95 per cent of the liquid will be recovered from the distillation.

### SPECIFICATIONS FOR AVIATION GASOLINE

- COLOR:**—The color shall be water white.

*Test*—Inspection of a column in a standard 4-ounce oil-sample bottle.

- FOREIGN MATTER:**—The gasoline shall be free from Acid, undissolved Water and Suspended Matter.

*Acid Test:* The residue remaining in the flask after distillation is completed is shaken thoroughly with 1 cc. of distilled water. The aqueous extract must not be colored red on

addition of a few drops of methylochrome solution. *Water and Suspended Matter* would be in evidence in the test for color.

- DOCTOR TEST:**—The gasoline shall yield a negative doctor test.

Directions for making doctor test on gasoline:

(A) *Preparation of reagents:*—Sodium Plumbite or "doctor solution": Dissolve approximately 125 grams of Sodium Hydroxide (NaOH) in a liter of distilled water. Add 60 to 70 grams of litharge (PbO) and shake vigorously for 15 to 30 minutes, or let stand with occasional shaking for at least a day. Allow to settle and decant or siphon off the clear liquid. Filtration through a mat of asbestos may be employed if the solution does not settle clear. The solution should be kept in a bottle tightly stoppered with a cork.

Sulphur: Obtain pure flowers of sulphur.

(B) *Making of Test:*—Shake vigorously together two volumes of gasoline and one volume of the "doctor solution" (10 cc. of gasoline and 5 cc. of "doctor solution" in an ordinary test tube; or proportional quantities in a 4-ounce oil-sample bottle may conveniently be used). After shaking for about 15 seconds, a small pinch of flowers of sulphur should be added and the tube again shaken for 15 seconds and allowed to settle. The quantity of sulphur used should be such that practically all of the sulphur floats on the surface separating the gasoline from the "doctor solution."

(C) *Interpretation of Results:*—If the gasoline is discolored, or if the sulphur film is so dark that its yellow color is noticeably masked, the test shall be reported as Positive and the gasoline condemned as "sour." If the liquid remains unchanged in color and if the sulphur film is bright yellow or only slightly discolored with gray or flecked with black the test shall be reported Negative and the gasoline considered "sweet."

**4. CORROSION AND GUMMING TEST:**—The gasoline when subjected to the corrosion test shall show no gray or black corrosion and no weighable amount of gum.

*Directions for Making Test:*—The apparatus used in this test consists of a freshly-polished hemispherical dish of spun copper, approximately 3½ in. in diameter.

Fill this dish to within ¼ in. of the top with the gasoline to be examined and place the dish upon a steam bath. Leave the dish on the steam bath until all volatile portions have disappeared.

If the gasoline contains any dissolved elementary sulphur, the bottom of the dish will be colored gray or black.

If the gasoline contains undesirable gum-forming constituents, there will be a weighable amount of gum deposited on the dish.

Acid residues will show as gum in this test.

*Interpretation of Results:*—**CORROSIONS:** It is specified that no gray or black deposit shall be formed. This wording is intended to admit gasolines that have so small a quantity of sulphur that the deposit is peacock colored.

**GUM:** It is specified that there shall be no weighable amount of gum. The intention is to refuse admittance to gasolines that show an amount that can be readily weighed in this style of dish.

The distillation method and apparatus shall conform to those outlined and described in Bureau of Mines Technical Paper No. 166, entitled "Motor Gasoline, Properties, Laboratory Methods of Testing and Practical Specifications."

### VOLATILITY AND DISTILLATION RANGE—EXPORT GRADE:

When 5 per cent of the sample has been recovered in the graduated receiver the thermometer shall not read more than 149 degrees Fahr. or less than 122 degrees Fahr.

When 50 per cent has been recovered in

the receiver the thermometer shall not read more than 203 degrees Fahr.

When 90 per cent has been recovered in the receiver the thermometer shall not read more than 257 degrees Fahr.

When 96 per cent has been recovered in the receiver the thermometer shall not read more than 302 degrees Fahr. and the end point shall not exceed this temperature by more than 27 degrees Fahr.

At least 96 per cent must be recovered in the receiver from the distillation.

The Distillation Loss shall not exceed 2 per cent when the residue in the flask is cooled and added to the distillate in the receiver.

### VOLATILITY AND DISTILLATION RANGE—FIGHTING GRADE:

When 5 per cent of the sample has been recovered in the graduated receiver the thermometer shall not read more than 158 degrees Fahr. or less than 140 degrees Fahr.

When 50 per cent has been recovered in the receiver the thermometer shall not read more than 203 degrees Fahr.

When 90 per cent has been recovered in the receiver the thermometer shall not read more than 235 degrees Fahr.

When 96 per cent has been recovered in the receiver the thermometer shall not read more than 257 degrees Fahr. and the end point shall not exceed this temperature by more than 27 degrees Fahr.

At least 96 per cent must be recovered in the receiver from the distillation.

The distillation loss shall not exceed 2 per cent when the residue in the flask is cooled and added to the distillate in the receiver.

The United States War Department requires the Fighting Grade to be colored Red after inspection and acceptance.

### VOLATILITY AND DISTILLATION RANGE—DOMESTIC GRADE:

When 5 per cent of the sample has been recovered in the graduated receiver the thermometer shall not read more than 167 degrees Fahr. or less than 122 degrees Fahr.

When 50 per cent has been recovered in the receiver the thermometer shall not read more than 221 degrees Fahr.

When 90 per cent has been recovered in the receiver the thermometer shall not read more than 311 degrees Fahr.

When 96 per cent has been recovered in the receiver the thermometer shall not read more than 347 degrees Fahr.

At least 96 per cent must be recovered in the receiver from the distillation.

The distillation loss shall not exceed 2 per cent when the residue in the flask is cooled and added to the distillate in the receiver.

### Canada Admits Tractor Radiators

OTTAWA, ONT., Oct. 19—Radiators imported with tractor attachments and furnished only to supply sufficient cooling when the attachments are placed on an automobile, may be admitted without duty under the terms of the order-in-council contained in Memo. 2166B.

### Overland Exports Handled from New York

TOLEDO, Oct. 18—Headquarters for export of the Willys-Overland Co. are to be removed to New York in anticipation of the greatly expanded business in prospect both now and after the war. R. T. Williams, export manager, will remove to the new location, while E. C. Morse, who has been handling Willys-Overland affairs at Washington, will also make his headquarters in New York.

## Navy Uses Libertys Exclusively

Now Has 900 Seaplanes So Equipped in Service—Whole Atlantic Coast Patrolled

WASHINGTON, Oct. 18—Using the Liberty engine almost exclusively and having received more than 1500 of them, the U. S. Navy has now over 500 seaplanes in service abroad and more than 400 seaplanes in service in this country, according to a statement made in Congress this week by Congressman Padgett.

Beginning the war, said the Congressman, with one air station at Pensacola, Fla., and with 30 officers and 300 enlisted men, the flying service has increased and now comprises stations in France, England, Ireland, Canada and all along the Atlantic coast, using 40,383 officers and men, of whom 16,621 are actively engaged in operations against the enemy. Schools for training aviators have been established in the Central West and near the Pacific coast. For training dirigible pilots a school was established in Ohio and another will soon be constructed elsewhere.

Practically the entire Atlantic coast, stated the Congressman, is now patrolled by American seaplanes and several cases have been reported of enemy submarines sunk by our flying boats.

During the month of September, 1918, aircraft of the U. S. Navy engaged in patrol flights covered 404,775 miles and at the same time training flying boats traveled 1,317,460 miles. Actual figures of the work abroad are withheld, as it is considered most wise to keep this from the public for the present.

On April 27, 1918, an American dirigible abroad made a continuous flight for 25 hr. and 43 min., during the course of which three convoys were escorted for 13 hr. and 50 min. in a zone mined and patrolled. The French Government praised this feat highly.

The Navy flying forces have also been exceedingly active in destroying enemy submarine and naval bases, and since Aug. 15 have been engaged steadily in bombing enemy bases in Belgium.

When war was declared, says the statement, 93 heavier-than-air seaplanes had been previously delivered to the Navy and 135 were on order. Of the 93, only 21 were in use, the remainder having been worn out or lost. These seaplanes were of the N-9 and R-6 types, now used solely as training planes.

After eliminating types tried and found unsuited, the Department fixed on two sizes as standard and adopted the Liberty engine for the entire program. Owing, however, to some little delay 700 other engines were purchased.

### New Commission Plan

WASHINGTON, Oct. 21—Applications for commissions in the Motor Transport Corps, Division of Military Aeronautics,

Bureau of Aircraft Production or other divisions of the Army, will hereafter be handled directly by the Military Training Camps Association offices as established throughout the country. Applications sent directly to any Army corps will be referred to the association. Journeys to Washington for commissions will be useless, as the applicant will in turn be referred to the association office nearest his home.

The proper procedure for securing a commission, states the new order containing the above rules, is for an applicant to watch the press until the division he is interested in is reported to require officers, and then he may file his application, applying to the nearest association office, where he will be given complete information and later examined and interviewed. Men who are particularly qualified for some special service in the Army and who desire commissions may make application in advance of any definite statement of a need for such officers. Following is a list of the offices of the Military Training Camps Association to which applicants for commissions can apply:

New York	.....19 W. Forty-fourth St.
Boston	.....Room 330, 84 State St.
Philadelphia	.....117 Commercial Trust Bldg.
Atlanta, Ga.	.....78 S. Pryor St.
Chicago	.....Consumers Bldg.
Cleveland	.....37 Wade Bldg.
St. Paul, Minn.	.....1013 Pioneer Bldg.
Dallas, Tex.	.....420 Interurban Bldg.
Kansas City, Mo.	.....New England National Bank Bldg.
Portland, Ore.	.....Corbett Bldg.
San Francisco	.....1020 Mills Bldg.
Los Angeles	.....Van Nuys Bldg., 210 W. Seventh St.
Washington, D. C.	.....War Service Exchange, State War and Navy Bldg.

### Bids on Chains Sought

WASHINGTON, Oct. 21—The Post-office Department requests bids on non-skid chains to be used on 36 x 6 pneumatic tires, in lots of 10 pairs or sets or in lots of 25 pairs or sets. Bids are also invited on cross chains for these, and bids will be considered on other non-skid devices to fit these size tires. Bids will be received up to 2 o'clock Nov. 4. Bidders are required to submit samples and descriptions of any device other than "Weed" chains. Prices are to include delivery to any postoffice operating Government-owned trucks, and are also to be quoted as f.o.b. factory. The price bid can also be stated as for one pair of chains instead of in lots as above. Bidders should specify if the prices quoted will hold good for the balance of the present fiscal year or the period of time they will remain in effect.

### Plenty of Chrome Ore

WASHINGTON, Oct. 18—The chrome ore supply in the United States is sufficient, the situation is in hand and additional investments for production are not necessary for the present, according to the War Industries Board. This has come about because the consumption of chrome has been reduced by alterations in the war program and through the production of largely increased supplies of chrome in the United States.

## Demand in Australia Excellent

Lack of European Cars Creates Boom for American Products —Roads are Good

MELBOURNE, AUSTRALIA, Aug. 22 —The demand for automobiles in this part of Australia continues far in advance of the supply. The entire lack of European cars during the past 3 years has created a boon for American cars but the majority of these fit tires far too small for the kind of country the car must be operated in here.

While the farm tractor is practically unknown in this part of Australia there is a wonderful opportunity for some type that will not become bogged in soft ground. This is a country where huge tracts of land are cultivated, quite a large number of agriculturists harvesting 3000 acres annually. In such areas a light tractor that can be put to a great many jobs will have a very great sale. At present farm tractors are being experimented with in some of the highlands in the Straits Settlements on plantation work but little development work has been done in Australia.

The motor truck was not taken in the manner it should have, as many of our merchants experimented with trucks with rather unsatisfactory results. This was very largely due to lack of good mechanics and the sentiment is gaining ground that the most efficient method of operating trucks is to own a fleet and have a first class mechanic to look after them.

Roads within a 10-mile radius of Melbourne are good and well suited for truck work. Further in the country districts during the winter months the roads are of little use.

At present everybody in Australia appears to be prosperous, which should be the case, as Australia is one of the largest producers of food stuffs, wool and meats. As soon as the war is over and shipments of cars from America are permitted there will be a big movement in the industry.

### Propose Washington S. A. E. Section

WASHINGTON, Oct. 18—Consideration is being given the possibility of forming a Washington section of the Society of Automotive Engineers. In all probability final action will be taken at the meeting to be held Nov. 6. There are at present about 200 members of the society whose work keeps them continually in Washington.

### Investigate Foreign Coal Situation

WASHINGTON, Oct. 23—The U. S. Fuel Administration has appointed a special commission to inquire into conditions and Government regulations affecting the coal industry in foreign countries. The commission will consist of Walter E. Hope, S. Brinckerhoff Thorne and James H. Allport. They will sail soon for Europe.

## No More Gasless Sundays

Seven of Them Saved 1,000,000 Gal.—Priorities for Overseas Shipments

WASHINGTON, Oct. 19—The Fuel Administration has withdrawn its request for gasless Sundays, but the need for conservation still exists and in only a slightly lessened degree. So far, no other plan to take the place of gasless Sundays has been perfected, though plans are being made and it is expected that a substitute measure will be submitted very soon. It is likely that this will take the form of a voluntary pledge from motorists.

When the first gasless Sunday was inaugurated, Sept. 1, the idea was to conserve stocks of gasoline east of the Mississippi so that there might always be a sufficient supply on the Atlantic seaboard to insure prompt and plentiful shipments overseas. Now, however, the Fuel Administration has adopted another means of insuring the overseas supply and effective at once will issue priority orders for gasoline to go abroad to our fighting forces. In other words, overseas demands get first call on the supply available.

The seven gasless Sundays saved approximately 1,000,000 gal. of gasoline. No exact figures have been compiled. The Fuel Administration is working on such figures now and expects they will be ready about Nov. 1. The conservation measure has not materially affected the stocks of gasoline east of the Mississippi. Following are the figures:

STOCKS OF GASOLINE ON HAND			
September 16		October 14	
Motor Bbl.	Aviation Bbl.	Motor Bbl.	Aviation Bbl.
2,949,640	340,883	3,134,731	166,369

These figures represent the entire

gasoline reserve east of California and is not all available for export, as it is stored in territory as far west as Wyoming and includes all interior storage in the various oil producing localities.

The peak load of domestic consumption has now been passed and it is hoped that the new priority regulations for overseas shipments combined with a new conservation plan will make it possible to fill all requirements.

As a further measure to conserve gasoline, Chairman Bernard M. Baruch of the War Industries Board has ordered that the manufacture of all gasoline stoves be discontinued for the present.

It is pretty definitely established that motorists will be asked to restrict the use of gasoline by approximately 20 per cent. This will be done by a voluntary pledge system and it is likely that cards or coupon books for rationing fuel will be adopted.

One such system at present under consideration contemplates the issuance of coupon books with coupons of various colors for the different months. Such coupons would vary in value in proportion to the quality of gasoline produced and the quantity used.

For example, a blue coupon for October might be given a value that would permit the holder to purchase two gallons of gasoline on that coupon in October. If stocks of gasoline were considerably depleted in October, leaving not a great amount for November, the yellow or pink or green November coupon might have a value of only one gallon of gasoline. Similarly, the orange coupon for January might have a value of three gallons of gasoline if production and stocks on hand were sufficient to warrant motorists using gasoline in such quantities.

Such a plan is favored because of its elasticity. It would permit the government authorities to ration gasoline in exact proportion to production and consumption.

Another idea of the manner in which the conservation program may be arranged is indicated by a plan of the Division of Transportation of the Governmental Emergency Commission. Under this war workers in the city of Washington are to be carried to their work by private cars. War workers may halt any car not already filled going in the direction of their work between 7 and 9.30 a. m. and returning home from 4.30 to 6.30 p. m. It is

## Oil Production Down Slightly

Gasoline Output, Too, Falls Off—First Eight Months Ahead of Last Year

	PRODUCTION	
	August, 1918	July, 1918
	28,534,275	29,170,718
Crude oil (bbl.)	330,335,046	332,022,095
Gasoline (gal.)	Stocks on Hand	
	Aug. 31, 1918	July 31, 1918
Crude oil (bbl.)	13,946,595	14,026,525
Oils purchased to be re-run (bbl.)	1,082,892	1,548,971
Gasoline (gal.)	285,446,538	349,928,604
Kerosene (gal.)	424,281,481	432,807,129
Gas and fuel (gal.)	569,016,413	519,012,839
Lube. (gal.)	137,496,986	136,460,207
Wax (lb.)	176,197,680	176,539,564
Coke (ton)	19,912	17,943
Asphalt (ton)	88,446	92,597
Miscellaneous (gal.)	459,891,496	450,086,589

NEW YORK, Oct. 23—The production of both gasoline and crude oil dropped slightly during August as compared with July; but the total production for the first 8 months of 1918 is considerably ahead of the first 8 months of 1917. Stocks of both gasoline and oil have decreased slightly.

During August the daily average production of gasoline was 10,655,969 gal., as against 10,710,390 in July, which is a loss of 54,421 gal. Stocks of gasoline on hand as of Aug. 31 are 64,482,066 gal. less than the quantity on hand July 31. During July the production of crude oil fell off 636,443 bbl., the output for August being 28,534,275 bbl. as compared with 29,170,718 bbl. for July. Stocks of oil on hand decreased 1,079,930 bbl. during the month.

The gain in the production of oil and gasoline during the first 8 months is a substantial one. The output of crude

felt that the action of this committee may have considerable influence in having similar suggestions adopted in other cities where considerable numbers of cars continually carry but one or two passengers.

### Total Output of Refineries in U. S. for First Eight Months of 1917

	Crude (bbl.)	Other Oils (bbl.)	Gasoline (gallons)	Kerosene (gallons)	Gas and Fuel (gallons)	Lubricating (gallons)	Wax (pounds)	Coke (tons)	Asphaltum (tons)	Miscellaneous (gallons)	Losses (bbls.)
1917											
January	24,839,772		203,618,724	137,248,370	469,596,208	60,941,062	39,558,627	44,627	49,894	27,331,019	941,924
February	23,083,433	no account	184,602,595	129,074,504	446,964,925	54,631,765	36,370,297	42,047	40,619	23,685,686	941,110
March	26,230,188	1st 6 mo.	220,523,571	159,028,978	494,855,838	64,345,221	40,868,930	48,839	52,823	26,977,334	870,380
April	25,994,938	1917	228,945,164	157,826,945	462,846,339	63,218,215	41,037,511	46,099	62,849	30,959,901	957,533
May	27,253,391		238,816,209	147,894,846	504,859,695	65,926,007	38,686,364	48,535	67,612	31,086,377	979,245
June	26,453,210		233,671,746	151,477,333	496,742,434	61,045,757	38,075,280	42,513	67,931	30,205,172	1,011,568
July	26,776,856	2,435,533	244,145,292	161,679,053	599,454,966	64,335,905	40,158,033	42,641	65,272	32,959,401	1,111,511
August	27,900,623	2,376,580	254,464,491	149,528,513	632,151,971	64,107,817	38,999,341	46,240	73,878	32,708,312	1,286,141
Total	208,532,361	4,812,113	1,808,787,792	1,193,758,542	4,107,472,376	498,551,749	313,754,383	356,541	470,878	355,313,202	8,099,412

### Total Output of Refineries in U. S. for First Eight Months of 1918

1918	Crude	Other Oils	Gasoline	Kerosene	Gas and Fuel	Lubricating	Wax	Coke	Asphaltum	Miscellaneous	Losses
January	23,842,587	2,300,334	242,632,044	119,358,184	547,866,248	56,625,425	39,238,858	41,216	54,854	70,995,829	1,078,181
February	23,386,676	2,298,333	234,324,619	121,218,320	510,165,397	58,300,914	35,087,337	42,371	42,033	75,134,088	983,992
March	26,239,662	3,696,872	269,647,968	151,228,007	587,985,804	69,308,351	43,597,019	44,248	56,901	94,865,148	1,097,489
April	26,201,544	3,956,244	293,398,162	153,703,682	578,255,341	71,022,204	40,173,524	45,674	51,242	89,242,012	1,182,020
May	28,510,698	4,112,023	319,391,202	160,590,760	631,586,209	79,589,755	42,544,633	48,864	60,449	88,627,491	1,269,281
June	28,140,479	3,483,270	315,023,445	151,840,252	628,842,033	74,420,996	41,317,794	46,605	50,321	81,110,922	1,282,177
July	29,170,718	5,951,537	332,022,095	156,828,826	658,439,682	79,308,107	41,691,551	48,914	58,433	159,374,139	1,338,304
August	28,534,275	6,376,353	330,335,046	149,678,850	671,113,871	72,892,879	41,829,516	51,759	59,715	168,355,034	1,337,327
Total	214,026,639	32,174,966	2,336,752,581	1,164,446,881	4,814,254,585	561,461,611	325,480,232	369,651	433,948	822,694,663	9,568,971



was 5,494,578 bbl. greater in the last 8 months than in the same period last year. And the gain in gasoline production for the period was 527,964,789 gal. The stock of kerosene on hand decreased slightly, but the stock of fuel oil increased by approximately 50,000,000 gal. There was also a slight increase in stock of lubricating oil.

On page 730 is a table of the total output of refineries in the United States for the first eight months of 1917 and 1918.

#### French Delco Company

PARIS, Oct. 4—A French Delco company has just been formed here, with exclusive rights from the Dayton concern, to manufacture electric lighting and starting apparatus in France and in French colonies. The company, which is known as the Société Française des Appareils Delco, has the following prominent men on its board of directors: Clement-Bayard, Tomine, Ballot, Barbaroux, Continsouza, Nicaise, Patin and Repusseau. Mr. Clement-Bayard is the president of the automobile company bearing his name; Mr. Tomine was business manager for the Delage company prior to the war; Ballot is the biggest motor specialist in France; Mr. Barbaroux is chief engineer of the Lorraine-Dietrich company, after having been at the head of the Delaunay-Belleville company for many years; Mr. Nicaise is president of the same company; Mr. Repusseau is a body builder and Buick agent in France.

#### U. S. Rubber Sells \$6,000,000 Notes

NEW YORK, Oct. 23—For the purpose of paying off in part \$9,000,000 of 5 per cent debenture bonds of the General Rubber Co., the U. S. Rubber Co. has sold \$6,000,000 7 per cent five-year secured notes to Kuhn, Loeb & Co., New York. The General Rubber Co. is a subsidiary of the U. S. company. The remainder of the maturing General bonds will be paid off in cash.

#### Liberty Engine Output 150 Daily

DETROIT, Oct. 21—Liberty engine production is steadily increasing and each of the five representative manufacturers in this district is running far ahead of the quota up to date. The total output of all the plants averages 150 engines a day. The present daily production of the individual plants is as follows: Ford, 42; Buick, 20; Nordyke & Marmon, 10; Packard, 35; Lincoln, 35.

## Costs and Speed in Tractor Tests

### Eight Tractors Plow Heavy Soil at Hempstead—Ravine Worries Operators at First

HEMPSTEAD, L. I., Oct. 19—Eight tractors participated in a demonstration held on a field just outside of this town this afternoon. The event was held under the auspices of the Nassau County Farm Bureau and the fuel consumption was recorded by the Bureau of Weights and Measures.

The tractors each plowed a plot 4 rods wide and 40 rods long, making 1 acre, and disked the ground afterward. Fuel consumption was taken for the plowing only. The ground was damp prairie sod that was very sticky and not easy to turn up, yet the tractors did themselves credit both in the time consumed and the amount of fuel used. A ravine that averaged 3 to 4 ft. in depth crossed the line of the furrows and added considerably to the difficulty of plowing, as gears had to be changed in nearly every case as the banks of the ravine were quite steep.

Observers accompanied the tractors and made records of stops and kept tabs on the furrow depth. The performance of the machines was not marred by any more serious difficulties than a couple of dropped plow parts and the failure of several of the plows to scour in the sticky soil.

The cause of the failure to scour was carelessness in allowing the shares to get rusted. The operators deemed it sufficient to polish them off with emery cloth, whereas they should have been put through sandy soil for at least 4 hr. before being put in sticky soil.

One of the features of the demonstration was the driving of the Maxim tractor by Katherine Freeman from the New York State School of Agriculture. She had come to witness the event and was invited to drive the tractor, which she did in a most creditable manner, making the turns at the headlands and operating the plows herself.

#### May Move Government Departments

WASHINGTON, Oct. 23—There has been some little agitation of late for the removal of certain government departments and bureaus from Washington to other less congested and more central

locations. The heads of several departments have been asked to submit opinions on the subject, these departments including food, fuel, war industries, war trade and war risk. There has also been some talk of the Aircraft Production Board removing lock, stock and barrel to New York.

#### Trade Commission Halts Unfair Methods

WASHINGTON, Oct. 24—The Federal Trade Commission has ordered the Wayne Oil Tank and Pump Co. of Fort Wayne to discontinue unfair trade practices admitted by the concern, including misrepresentation to customers, price-discrimination, and efforts to discredit and hamper competitors. The commission's order was issued in agreement with the concern which waived right to introduce testimony in support of its practices.

#### Specialists in Foreign Advertising Open New York Office

NEW YORK, Oct. 21—The J. Roland Kay Co., Chicago, handling the foreign advertising of a number of firms, including the Willys-Overland Co., the U. S. Rubber Co. and the Remington Arms U.M.C. Co., has opened a New York office at 18 East Forty-first Street. The company also has offices at London, England; Tokyo, Japan; Sydney, Australia; Capetown, South Africa, and Buenos Aires, Argentina.

#### International Harvester Suit Dismissed

WASHINGTON, Oct. 23—The anti-trust suit brought against the International Harvester Co. has been dismissed. This is in accordance with arrangements made for the dissolution of the company approved by the Department of Justice.

#### Trego Has Small Fire

NEW HAVEN, Oct. 23—The Trego Motors Corp. was visited by a small fire last week. A frame building was burned and no great damage done. Production will be delayed slightly for a few days.

#### Production Not Affected by Influenza

DETROIT, Oct. 21—As a result of an investigation made by the regional industrial commission of Michigan at the request of the Government it was found that the production of war work has hardly been affected on account of the epidemic of Spanish influenza. Output has fallen off only slightly less than 1 per cent and in the Jackson and Lansing district a trifle less than 5 per cent. It is reported this is very favorable compared to other states.

#### American Steel Tube Doubles Capital

TOLEDO, Oct. 22—The American Steel Tube Co. has increased its capital stock from \$50,000 to \$100,000. The company has contracts to furnish several million steel tubes to the Government, and recently doubled its output by purchasing the old Landers Brothers Co. plant, Buckeye Street and the Terminal Railway.

### Results of Hempstead Tractor Demonstration

Name	Rating	Fuel	Fuel per Acre		Cost per Acre*	Time Plowing One Acre	Acres per Hour	Depth of Plowing	No. and Size of Plows
			Gasoline	Kerosene					
Moline	9-18	Gasoline..	3.5	...	\$.945	1:31	.769	8 in.	2-14
Cleveland	12-20	Gasoline..	3.5	...	.945	1:18	.769	7 in.	2-14
Case	9-18	Kerosene..	...	4.0	.600	1:44	.577	7 in.	2-14
Fordson	...	Kerosene..	...	4.75	.713	1:28	.682	7 in.	2-14
Knickerbocker	Form-A-Tractor	Gasoline..	3.37	...	.911	1:37	.617	7 in.	2-12
Titan	10-20	Kerosene..	...	2.75	.413	1:13	.822	8 in.	3-14
Parrett	12-25	Kerosene..	...	2.75	.413	1:11	.845	7 in.	3-14
Maxim	12-24	Gasoline..	6.75	...	1.553	1:27	.681	7 in.	2-14

\*Gasoline figured at 27 cents per gal., kerosene, 15 cents.

## Airplane Observers Needed

### U. S. Air Service Opened to Civilians and Men in the Ranks—3 Months' Training

WASHINGTON, Oct. 18—The United States Air Service is urgently in need of observers. The service has been thrown open for the induction of draftees, registrants and civilians, and an opportunity is given men in the ranks to become connected with this service.

The call for war observers has come directly from General Pershing and has been emphasized by Major General Kenly. Pilots and observers are trained in reserve brigades and sent overseas in squadrons as rapidly as possible, fully organized and equipped. The first reserve brigade, which is to consist of 36 squadrons, is located on Long Island on 9 different flying fields. The second reserve brigade, consisting of 4 squadrons, is located at Park Place, Tex. The third will probably be located in New Jersey or in some other district within close proximity to the Atlantic Coast.

The number to be trained in these brigades, however, will be inadequate in view of the greatly increased activities of the American air force, and it is for this reason that civilians and men in the ranks are urged to get into this service.

It is pointed out by the Division of Military Aeronautics that the training of an observer requires 3 months, when the candidate is immediately commissioned a second lieutenant and sent overseas. The training of a pilot, on the other hand, requires 8 months, with the ultimate result of the same grade of commission. Observers are required to pass the same physical tests as pilots and must have certain flying training to enable them to bring down a plane in the event the pilot is injured.

Striking evidence of the importance of airplane observers is given by the fact that in the Continental armies these men invariably are recruited from line officers of experience and are always commissioned, whereas pilots very frequently are not commissioned. The best pilots are men who have qualified first as observers.

At present there is a shortage of advanced training planes, and this is tending to hold back the training of pilots. There are plenty of primary training planes. The situation with regard to advanced training planes is improving.

Civilians or men in the ranks who desire to enter the air service should apply to any recruiting board or examining board for training as observers in the Division of Military Aeronautics.

### U. S. Motor Vehicles Not Subject to License Tax

WASHINGTON, Oct. 21—Motor vehicles owned by the Government or operated exclusively for official purposes do

not require licenses from states, territories or municipalities, according to a ruling issued by the Engineers Corps, United States Army. The use of public funds for the purchase of such licenses is prohibited. If local authorities are willing to issue the various tags or plates without charge and for the convenience of Government-owned vehicles, they can be accepted and used.

Instructions to army officers, issued with the ruling, call for the use of metal plates on Government-owned vehicles stating the name of the department owning and operating the machine, together with the department number for that particular car, truck or motorcycle. These signs are to be 7 in. high and 12 in. wide and to conform generally with the regulations of the community in which they are used. The commanding officer for the Army in that district is ordered to notify the civil authorities of the kind and numbers of machines which it is expected the Army will operate. Rules demand that the Army drivers obey all speed and other regulations, and if stopped while on official business by civil authorities because of failure to carry a license tag the drivers are ordered to give full information regarding the ownership and use of the machine.

These rules do not apply to machines owned privately by Army officers who must in all cases abide strictly by the law and regulations as established by the civil authorities. And the use of any metal signs on vehicles reading U. S. A. or U. S. Army is prohibited.

### Form Munitions Patent Board

WASHINGTON, Oct. 18—A Munitions Patent Board has been formed for the purpose of co-ordinating the policies of the War and Navy Departments in patent matters. The membership will consist of Thomas Ewing, Max Thelen, representing the War Department, and Pickens Neagle, representing the Navy Department. The board has been formed for the following purposes:

1—To consider clauses in contracts of the respective departments dealing with patents.

2—Questions as to the validity or infringement of patents and the patentability of inventions.

3—Questions as to the amount of compensation to be paid for patents or for their use.

The board is empowered to recommend suitable actions or policies in regard to all patent matters brought before it for consideration.

### Coal Production Maintained

WASHINGTON, Oct. 18—Bituminous coal production for the week ending Oct. 5 was 12,585,000 tons, an increase of 1,774,000 tons over the corresponding week of 1917, and a decrease of 462,000 tons as compared with the week ended Sept. 28, which was the second highest week in coal history. Anthracite coal production amounted to 2,052,000 tons for the week ending Oct. 5; the same tonnage was produced in the corresponding week of 1917.

## Truck Repair Depots in 6 Cities

### Country Divided Into Sections for Motor Transport Maintenance Operations

WASHINGTON, Oct. 21—There will be six great repair bases for army motor trucks in the United States. These are to be located at Camp Holabird, Baltimore, Md.; Atlanta, Ga.; Fort Sam Houston, Tex.; El Paso, Tex.; Chicago, Ill.; San Francisco, Cal. The most important one is that at Camp Holabird, because it serves the largest district and the one that contains nearly all the important truck factories and all the principal ports of embarkation for France. The states in this district are: Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, Virginia, Kentucky, Ohio, Indiana, Michigan (lower peninsular) and the District of Columbia.

New machines only are sent to the American Expeditionary Forces, but, in order that the steady flow of them may be maintained at a maximum, the old trucks that serve the army's needs here must be kept in service as long as the repairman's skill can make it possible. The new district system will greatly facilitate repairs and reconstruction, and it will be the policy of the Motor Transport Corps to discourage major repairs at any points other than the central units.

### Officers Assigned to Each District

Each district is to be commanded by a District Motor Transport Officer, to be appointed by the chief of the corps, and who will have, under the authority of the chief, control and supervision of all matters pertaining to the operations, maintenance and repair of all Class 1 vehicles and a technical supervision of all Class 2 vehicles. Class 2 vehicles are those assigned to various units outside of the Motor Transport Corps, according to the Tables of Organization. The Motor Transport Corps is responsible for the repair and maintenance of these vehicles. Class 1 consists of all vehicles operated directly by the corps.

Under the latter heading come the new trucks that are moved from the factories to the seaboard in convoy. Not only do these vehicles relieve the railroads by moving, under their own power, but they help out by taking, each, a load of government freight. Thousands of tons of freight are being moved in this way all the time. The officers and men who handle these convoys are mostly recent graduates of the corps training schools, who are sent out to complete their training by practical road work, done under the same rules that apply to the American Expeditionary Forces and with conditions duplicated as nearly as possible. Men are drawn largely from the motor trades, although mechanics of

other lines may be inducted into the service. Material for officers must combine motor or mechanical knowledge with executive ability. Both officers and enlisted men are sent overseas soon after completing their training.

#### Canada Adopting Rural Express

TORONTO, Ont., Oct. 19—Rural motor express and freight lines are likely to become a prominent feature of rural life in Canada in the near future. Already one Canadian company, with headquarters in Toronto, has established such a line, and has a fleet of twenty-five motor trucks in operation. No doubt this is merely the precursor of many similar lines throughout eastern Canada. With the railways devoted almost entirely to the winning of the war and the consequent preference given to the haulage of war materials and fuel for the munition factories and the transportation of the finished products to the seaports, the small shipper is subjected to unusual hardships to get his product to the purchaser, and this is particularly true where but comparatively short hauls are required.

#### Investigating Parts Stocks

BOSTON, Oct. 19—John H. Johnson, a director of the N. A. D. A., returned from Washington yesterday, where he was in conference with other officers of the organization and also with some of the members of the War Industries Board relative to the work of conservation being carried on in the New England territory.

He reported that a committee had been formed of accessory men to secure information for the board on the amount of stock that the dealers had on hand at the present time. He told the men he talked to that he found the accessory men willing to co-operate in every way with the officials at Washington, and that within a short time it would be possible to let them know where Boston stood in the way of supplies.

#### Government Wants Boston Buildings

BOSTON, Oct. 19—A number of the big motor dealers in Boston have been asked by the Federal Government to submit bids for leasing their buildings to the Navy Department to house the sailors who are being trained in the Boston Naval District.

The request came as a surprise and found the dealers unprepared to make a quick response. The section proposed to be taken over by the Government comprises the buildings on Commonwealth Avenue from Lawton Street to the Jewish Temple.

The Government asked bids for eight months' occupancy, with a privilege of another year if needed.

The offers have been taken to Washington by a naval officer, and the department there will pass upon them. If the plan goes through that part of motor row on Commonwealth Avenue will be wiped out for the present, and some of the dealers think they may not go back again.

## Trucks Important at Chateau-Thierry

### In 3 Hours 580 Trucks Were Put in Condition to Help the Americans Beat the Hun

WASHINGTON, Oct. 18—Motor trucks played a vital part at Chateau-Thierry. When the Germans were rushing toward Paris in June there was an overhaul park south of Chateau-Thierry where disabled cars and trucks were sent for repairs. The park employed 1500 soldiers. It was filled with trucks at this particular time, trucks wrecked and shell smashed, others jolted beyond usefulness by driving over the shell-torn roads. On July 8, when the situation at the front was particularly bad and the French needed aid, General Foch ordered the Americans into the lines. They were needed quickly. The overhaul park was ordered to have every truck ready for service in 3 hours.

There were 610 trucks in the park, many of them fully repaired, a large number on which work had not yet started, others in process of repair. The commandant ordered every man at work. Officers donned overalls and joined with the privates. Only the essential parts were repaired, those that would carry the trucks over the roads. At the end of the 3 hours 580 trucks were in condition and ready to move.

#### Officers Volunteer as Drivers

With a shortage of drivers volunteers were called for. Many of the officers seized the opportunity to get to the front, although this was the usual work of corporals. They got the chance and together with the master mechanics and other skilled men with the grades of sergeants, whose usual duties kept them at the park, rolled out to their assigned destinations with an array of captains and lieutenants on the drivers' seats such as has never before been seen during the war.

A 3-ton truck usually carries 25 men with their packs. The 580 trucks had a capacity of 14,500 men. When troops move under normal conditions seats are put into the trucks and the speed is limited by the governors to 14 m.p.h. These trucks had no seats. The troops stood. The governors were taken off. The vehicles hit a 25 mile gait toward the front firing lines.

This event, stated a returned officer, was one of the many that served to emphasize the fact that armies cannot make sweeping advances without motor-propelled vehicles. It is only recently, despite earlier proof of this, that systematic use of huge numbers of motor trucks has been engaged in the moving of large bodies of troops. General Foch and General Pershing have recognized the importance of motor trucks in conjunction with their general ability of moving troops rapidly. They have, it was stated, realized the mobility that results from the use of motor trucks. They are moving whole divisions across wide

areas, infantry, artillery and airmen, by motor trucks.

#### Ask Dealers for Parts Inventories

BOSTON, Oct. 19—Some Boston dealers have been asked by factories to send in a complete inventory of what they have in the way of parts. The intimation is that some of these parts may be requisitioned to complete cars that are nearly all assembled but for which various things like axles or springs may be shy.

#### Merge Defense and Labor Sections

WASHINGTON, Oct. 18—The Section on Industrial Training for the War Emergency, Committee on Labor, Council of National Defense, which is under H. E. Miles, chairman, has been merged with the Training and Dilution Service of the United States Department of Labor, which is under C. T. Clayton. Under the merger Mr. Clayton will become the director and Mr. Miles the chief of training.

Employers interested in the training and dilution of workers, in the installation of training vestibules in factories, in factory organization and so forth, can secure much valuable information through the Training and Dilution Service, Department of Labor, to which communications can be addressed.

Heretofore the section under Mr. Miles working through the Council of National Defense has done valuable work in inaugurating vestibule schools, as has been testified to by numerous employers who by this means have overcome their labor problems. Mr. Clayton's department, an enlargement upon that of Mr. Miles, will be ready to extend similar aid to employers, according to Mr. Clayton.

#### Further Curtail Road Machinery

WASHINGTON, Oct. 19—Road making machinery has been further curtailed in manufacture for the 6 months following Oct. 1, 1918, by the War Industries Board, and is limited to the manufacture of 15 per cent of six-twelfths of 1917 production for civilian uses, but in no event to exceed, with the total production, 5 per cent of six-twelfths of the 1917 tonnage. This means that not more than 15 per cent of the road machinery made in the half of 1917 can be devoted to civilian uses, while in no event can road machinery manufacturers produce more than 50 per cent of 6 months' 1917 production for all purposes, including civilian, army, municipal, state or township uses.

#### Chicago-St. Louis Barge Service

ST. LOUIS, Oct. 18—It has been announced officially here that a dependable barge service between this city and Chicago will open soon. The freight rates will be about 80 per cent of the railroad rate and the bill of lading will be as useful as commercial paper. The service will be under direction of the Government, and will be through the Illinois and Michigan Canal, the Illinois River and the Mississippi.



# Increased Storage of Coal

All Consumers Except Those in Class I Get More—Move Up One Class

WASHINGTON, Oct. 18—The United States Fuel Administration has authorized slightly increased coal storage for all classes of consumers except those in Class 1. Consumers not on the Preference List are authorized to lay in additional reserve supplies and consumers in Class 2 may store coal up to the limits now imposed on Class 1. Consumers in Classes 3 and 4 have both been moved up one class. Following are the regulations:

## Consumers in Classes 1 and 2.

Maine, 135 days.  
Massachusetts, Vermont, New Hampshire, Northern New York, 105 days.  
Connecticut, Rhode Island, Southwestern New York, 90 days.  
Southeastern New York and New Jersey, 60 days.  
Delaware, East Pennsylvania, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, Georgia, Florida and Western Ohio, 35 days.  
Western Pennsylvania, West Virginia, Eastern Kentucky, Eastern Ohio, 35 days.  
Lower Michigan, 90 days.

## Consumers in Class 3.

Maine, 120 days.  
Massachusetts, Vermont, New Hampshire, Northern New York, 90 days.  
Connecticut, Rhode Island, Southwestern New York, 75 days.  
Southeastern New York and New Jersey, 50 days.  
Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, Georgia, Florida, Western Ohio, 40 days.  
Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 30 days.  
Lower Michigan, 75 days.

## Consumers in Class 4

Maine, 105 days.  
Massachusetts, Vermont, New Hampshire, Northern New York, 75 days.  
Connecticut, Rhode Island, Southwestern New York, 60 days.  
Southeastern New York and New Jersey, 40 days.  
Delaware, Eastern Pennsylvania, Maryland, District of Columbia, North Carolina, South Carolina, Georgia, Virginia, Florida, Western Ohio, 35 days.  
Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 25 days.  
Lower Michigan, 60 days.

Consumers Not on the Preference List are Limited to the Following Stocks:

Maine, 90 days.  
Massachusetts, Vermont, New Hampshire, and Northern New York, 60 days.  
Connecticut, Rhode Island, Southwestern New York, 45 days.  
Southeastern New York and New Jersey, 30 days.  
Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, Georgia, Florida and Western Ohio, 30 days.  
Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 20 days.  
Lower Michigan, 45 days.

There is no restriction on the stocks of screenings which may be accumulated by either preference or non-preference consumers, nor is there any restriction on the stocks of Indiana, Illinois, or western coal, which consumers in any class may obtain.

Supervision of the accumulation of stocks in accordance with these limits will be exercised by the several State Fuel Administrators who are authorized to make exceptions where special conditions make it necessary.

## Detroit Subscribes \$29,868,935

(Continued from page 726)

Sewell Cushion Wheel Co. employees	6,500
King Motor Car Co. employees	6,400
General Mfg. Co.	5,000
General Mfg. Co. employees	2,950
Peninsular Machine Co.	20,000
Fisher Body Corp.	500,000
Detroit Copper & Brass Co.	250,000
Pittsburg Shafting Co. and employees	150,000
Michigan Malleable Iron Works	100,000
Michigan Stamping Co.	100,000
Michigan Smelting & Refining Co.	100,000
Paige-Detroit Motor Car Co.	100,000
Detroit Lubricator Co. and employees	84,000
Michigan Steel Casting Co. employees	71,000
Michigan Malleable Iron Works employees	50,000
Northway Motor Mfg. Co.	50,000
Buhl Stamping Co.	50,000
Russel Wheel & Foundry Co.	50,000
Michigan Steel Castings Co.	40,000
Jeffery-DeWitt Co.	40,000
Michigan Smelting & Refining Co. employees	31,750
Sherwood Brass Mfg. employees	25,400
Detroit Lubricator Co.	25,000
Commerce Motor Car Co. employees	10,600
Parish Mfg. Co.	18,150
Freuhauf Trailer Co.	1,000
Freuhauf Trailer Co. employees	2,450
Willard Storage Battery Co.	1,000
Detroit Foundry Co.	10,000
Detroit Foundry Co. employees	7,100
Sherwood Brass Co.	24,600
Sewell Cushion Wheel Co.	10,000
Detroit Motor Castings Co.	5,000
Howard E. Coffin	15,000
Detroit Iron & Steel Co.	100,000
Acme White Lead & Color Works and employees	80,000
Gemmer Mfg. Co. employees	32,600
Swedish Crucible Steel Co.	30,550
Stroh Castings Co. employees	30,000
Orval N. Hawkins	5,000
Edmund & Jones Corp.	62,500
Enterprise Foundry Co.	10,000
Enterprise Foundry Co. employees	15,000
Shuler Axle Co. employees	2,400
International Harvester Co.	15,000
Detroit Stamping Co.	1,500
Johns-Manville Co.	15,000
B. F. Goodrich Rubber Co.	21,700
Gemmer Mfg. Co.	12,800
Puritan Machine Co.	2,500
Henry Ford interests	12,000,000
Packard Motor Car Co. employees	863,650
Detroit Copper Brass Co. employees	130,000
Hupp Motor Car Co.	50,000
Detroit Seamless Steel Tube Co.	50,000
Zenith Carburetor Co. employees	46,000
Detroit Twist Drill Co.	36,000
Detroit Brass Co. employees	25,500
R. V. Chaplin	25,000
Detroit Valve & Fitting Co. employees	13,300
McCord Mfg. Co. Wyandotte plant employees	9,100
Motor Truck Body Co.	1,000
Briggs Mfg. Co.	24,700
Hugh Chalmers	10,000
National Can Co.	20,000
National Can Co. employees	20,000
Alvin McCauley	20,000
Detroit Trailer Co.	6,000
Sewell Cushion Wheel Co. employees	6,500
National Twist Drill Co. and employees	150,000
Michigan Copper & Brass Co.	100,000
National Twist Drill Co. employees	50,600
General Aluminum & Brass Mfg. Co.	116,200
General Aluminum & Brass Mfg. Co. employees	66,200
McCord Mfg. Co.	50,000
Detroit Gear Machine Co.	38,750
J. W. Murray Mfg. Co. employees	41,600
Walter E. Flanders	25,000
Detroit Auto Trimming Co.	25,000
Monarch Steel Casting Co. employees	7,000
American Lubricator Co. and employees	6,000
Michigan Gray Iron Castings Co. employees	5,000
Standard Brass Works	10,000
Standard Brass Works employees	8,500
Liberty Motor Car Co. and employees	18,000
M. & S. Gear Co. and employees	12,000
Detroit Accessories Corp. and employees	11,100
Imperial Bearing Co. and employees	8,000
American Brass & Iron Co. and employees	9,350
C. M. Hall Lamp Co.	5,550
Detroit White Lead Works	5,450
Detroit Foundry Co. employees	7,100
James Couzens	200,000
Lewis Hall Iron Works employees	8,550
Accessories Forgings Co.	2,000
Premier Cushion Spring Co.	5,750
Denby Motor Truck Co. employees	17,800
Detroit Piston Ring Co. employees	4,300
Signal Motor Truck Co.	1,550
Standard Motor Parts Co. and employees	3,650
Detroit Accessories Corp. and employees	20,100
Timken-Detroit Axle Co. employees	446,200
Continental Motor Co. employees	235,000
Northway Motor Mfg. Co. employees	113,700
Federal Motor Truck Co. employees	101,200
Detroit Pressed Steel Co.	75,000
Detroit Twist Drill Co. and employees	85,000
Hupp Motor Car Co. employees	46,500
Automatic Motor Product Co. employees	45,650
Detroit Gear Machine Co.	33,750
Puritan Machine Co. employees	4,600
Swartz Foundry Co. and employees	6,150
Michigan Tool Co. and employees	16,000
Ohio Rubber Co. and employees	6,100
United States Tire Co. branch employees	3,900
B. F. Goodrich Rubber Co.	17,000
Detroit Forging Co. employees	15,150
Detroit Pressed Steel Co. and employees	26,900
Horace Dodge	500,000
Aluminum Castings Co. employees	160,000
Russel Motor Axle Co. and employees	43,000
Fisher Body Corp. Ross plant employees	38,250
Law Mfg. Co. and employees	40,000
Anderson Electric Car Co.	45,000
Bower Roller Bearing Co. employees	27,350
Federal Brass Works and employees	16,000
Bower Roller Bearing Co.	15,000
Hinkley Motors Corp. employees	20,000
Kelsey Wheel Co. and employees	139,000
Wilson Body Co. employees	75,000
Dodge Brothers	1,000,000
John F. Dodge	500,000
Horace Dodge	500,000
Mrs. Horace Dodge	100,000
Mrs. John F. Dodge	100,000
Cadillac Motor Car Co. employees	987,250
American Car & Foundry	1,500,000
Firestone Tire & Rubber Co., Detroit branch	25,000
Lincoln Motor Co.	1,000,000
Lincoln Motor Co. employees	471,300
Maxwell Motor Co. Highland Park plant	158,200
Total	\$29,868,935

## Elgin Revises Its Line

CHICAGO, Oct. 19—The Elgin Motor Car Corp. has adopted an engine with cylinders  $\frac{1}{2}$  in. larger in bore— $3\frac{1}{4} \times 4\frac{1}{4}$ —for its new models, deliveries of which will start in October, and has made a number of other minor improvements. There is a slight change in the shape of the valve lifters, the fan adjustment has been made more convenient; the motor of the Wagner two-unit electric system has been raised to increase the accessibility and a steel generator coupling replaces the former leather disk. The lubrication system has been changed, and it is now pressure to the bearings with circulating splash to other parts. The bodies are now larger and the lines have been improved. The various types include a touring model at \$1,395, a four-passenger military scout and a convertible sedan.

## Ford Surplus Totals \$175,242,728

Company Has Biggest Year in Its History—Cash Receivables Increase \$26,852,084

ASSETS		
	1918	1917
Real estate.....	\$37,117,363	\$28,180,582
Machinery and equip.	29,335,982	25,637,959
Material in process....	44,522,562	46,762,467
Cash and receivables.	91,471,851	64,619,767
Patent rights.....	67,981	66,637
Inventories .....	1,231,906	706,286
Investments .....	1,815	1,314
Totals.....	\$203,749,460	\$165,975,002

LIABILITIES		
	1918	1917
Capital stock.....	\$2,000,000	\$2,000,000
Accounts payable.....	10,653,327	19,983,256
Accrued expenses.....	5,950,564	5,952,903
Depreciation reserve....	9,902,841	6,433,936
Surplus .....	175,242,728	131,604,907
Totals.....	\$203,749,460	\$165,975,002

DETROIT, Oct. 21—Notwithstanding the curtailment in automobile production during the greater part of the year, the financial statement of the Ford Motor Co. for its fiscal year which ended July 31, 1918, shows that it was the biggest year in the history of the company. Its total assets and liabilities amounted to \$203,749,360, which is an increase of \$37,774,458, compared with total resources of \$165,975,002 at the end of the preceding fiscal period and contrasts with \$132,088,219 July 31, 1916, and \$88,535,840 July 31, 1915.

Current assets aggregate \$137,228,134 against \$112,089,824 July 31 last year, and current liabilities total \$16,603,891, in contrast with \$25,936,159 a year ago.

The statement shows a net working capital of \$120,624,243, compared with working capital of \$86,153,665 at the close of the previous year.

The surplus was \$175,242,728. This is an increase of \$43,637,821 for the fiscal period and compares with \$131,604,097 July 31 last year, with \$111,960,907 July 31, 1916, and with \$59,135,771 July 31, 1915. The amount added to the surplus during the year is equivalent to \$2-181.84 a share on the company's 20,000 shares of capital stock of the par value of \$100.

The most remarkable feature of the statement besides the enormous surplus is the large amount of cash receivables, which for 1918 totaled \$91,471,851, as compared with \$64,619,767, or an increase of \$26,852,084. The strength of the company's finances is further indicated by a reduction of \$9,329,929 in the total of accounts payable.

Fixed assets, comprising real estate, machinery and equipment, are appraised at \$66,453,345, against \$53,818,541 a year ago, an increase of \$12,634,804 in plant investment during the year.

### National Implement Association Meets

CHICAGO, Oct. 18—To retain his position in the implement trade and attain anything like the dominancy in the tractor and power farming equipment trade the old-time retail implement dealer will have to adopt the aggressive methods of the motor car dealer:

- 1—Put the tractor on his floor;
- 2—Demonstrate it;
- 3—Sell it for cash, and
- 4—Stand ready to take care of his customer in service and repairs.

This was the consensus of the twenty-fifth annual convention of the National Implement and Vehicle Association, as far as it concerned the automotive industry, which closed here to-day after a three-day meeting.

The retail implement dealer realizes that he will have to meet the motor car dealer on the field of salesmanship if he is to remain in business. He came to Chicago last week to meet with the sales managers' division of the N. I. & V. A., and the sales managers told him so—told him, in the words of R. B. Laurie, sales manager of the John Deere Plow Co., Moline, Ill., that to escape extinction it is necessary and vital for him to add tractors and power farm equipment to his line of horse-drawn equipment.

W. L. Derry, president of the National Federation of Retail Implement Dealers' Association, speaking for himself and other retail implement dealers, assured the tractor and power farming equipment makers at the meeting that the old-time implement dealer was going to sell the tractor and power farming machinery, that the tractor maker and the power farming equipment maker wanted the retail implement dealer to sell their goods, and that the old-time dealers stood ready with a line of repairs to do the business.

## Packard Surplus \$13,657,860

Securities and Reserve for Taxes Show Big Gains—Notes Payable Decreased

DETROIT, Oct. 24—The surplus of the Packard Motor Car Co. as of Aug. 31 and after deducting dividends on preferred and common stock and reserve for taxes, etc., was \$4,346,319 larger than for the previous fiscal year when the surplus amounted to \$9,311,541. The complete statement, which is given herewith, shows a number of increases which have been brought about almost entirely as a result of the war.

For example, securities held have increased from the very small amount of \$19,029 last year to the big total of \$4,514,853 this year, the gain being \$4,495,823. In the case of inventories the gain also has been large. The figure for last year was \$18,556,600 as against \$22,399,168 for this year, a net gain of \$3,842,568. The amount of cash on hand has shown a correspondingly large increase, the figure for last year being \$686,640 compared with \$3,158,509 for this year, a difference of \$2,471,869. Similarly, bills and accounts receivable show an increase of \$4,386,163.

### Notes Payable Decreased

On the liabilities side of the ledger, notes payable have decreased by nearly \$3,000,000. Under the head of reserves for taxes, etc., there is perhaps the biggest change of any. Last year the total reserve for this purpose was \$1,104,748, whereas this year the reserve amounts to \$8,698,254, an increase of \$7,593,506. It is largely because of this great reserve for taxes that the surplus is no bigger, for in normal times much of this reserve would be placed directly in the surplus account.

### Limousine Top to Make Seats

KALAMAZOO, Oct. 22—The Limousine Top Co. will start work immediately building 1500 seats for the Indiana and Service truck companies. These are for war trucks and carry priority numbers in the matter of material and labor. Work is being rushed on the completion of the addition to the plant.

Assets		
	1918	1917
Real estate, machinery, etc.....	\$12,034,315.98	\$11,792,606.00
Rights, franchises, etc.....	1.00	1.00
Investment in branch houses.....	4,058,666.66	5,741,123.00
Securities owned .....	4,514,853.72	19,029.00
Stock option contracts .....		199,000.00
Inventories .....	22,399,168.65	18,556,600.00
Cash .....	3,158,509.63	686,640.00
Vehicles in transit .....		2,334,367.00
Due by branch companies .....		2,798,295.00
Bills and accounts receivable .....	5,701,177.92	1,315,014.00
Advance payments .....		248,039.00
Deferred instalments on notes and bills receivable .....	720,871.19	
Total .....	\$52,879,084.65	\$43,690,714.00

### Consolidated Balance Sheet of Packard and Subsidiary Companies

Liabilities		
	1918	1917
Common stock .....	\$11,656,930.00	\$11,840,930.00
Preferred stock .....	8,000,000.00	8,000,000.00
Debtenture notes .....	5,000,000.00	5,000,000.00
Accounts payable .....	4,171,737.56	4,184,113.00
Notes payable .....	1,060,432.00	3,975,000.00
Deferred payments on real estate.....		274,382.00
Reserve for interest, taxes, etc.....	8,698,254.22	1,104,748.00
Deferred purchase money obligations...	633,870.26	
Surplus .....	13,657,860.60	9,311,541.00
Total .....	\$52,879,084.65	\$43,690,714.00

**Lippard-Stewart on the Block**

BUFFALO, Oct. 18—The business and plant of the Lippard-Stewart Motor Car Co. are to be put up at public auction by the Bankruptcy Court on Oct. 21. The property offered in the sale comprises the entire factory equipment, machine shop, stock in trade and tools and office equipment. The value of the stock, according to schedule filed with the report, is \$78,533.71, and the value of the machinery, tools, etc., is \$18,166.29.

**Manitowoc Foundry Sold**

MANITOWOC, Oct. 21—The Manitowoc Foundry & Machine Co., Manitowoc, Wis., has been acquired by David Balkansky, one of the owners of the Manitowoc Iron & Metal Co., and the corporate style is being changed to Manitowoc Foundry Co. The capital stock has been increased to \$50,000, and extensive enlargement of the casting shop will be undertaken at once. The company makes gas engine castings and also operates a commercial foundry and machining plant.

**Sell Killen-Straight Plant**

MILWAUKEE, Oct. 21—The property of the Killen-Straight Mfg. Co., Appleton, Wis., manufacturer of tractors, petitioned into receivership on Sept. 20, will be sold at public auction by Charles L. Marston, Appleton, receiver, on Wednesday, Dec. 11, at 10 a. m. The plant consists of two acres of land; a main brick machine shop and office building, 64 x 200; a foundry, pattern works, blacksmith, tin and woodworking shops, and a warehouse, 30 x 100. The machinery includes three lathes, two radial drills, two drill presses, a gear cutter, milling machine and drop forge press, and other items. The plant is equipped with electrical power and is suitable for the manufacture of farm tractors and farm machinery.

**Chief Gets Engine Contract**

PORT HURON, MICH., Oct. 16—The Chief Motor Co., which occupies the plant formerly owned by the Monroe Motor Co. and Port Huron Construction Co., has been awarded a contract to build 4000 military truck engines for the United States Government. Production will begin at once and the work is to be completed within 6 months.

**Bargaining Collectively Outside or Inside?**

(Continued from page 713)

Even where the employees of a concern are not members of a labor organization, wage difficulties will speedily bring into being in that factory a labor organization for the purpose of getting collective action upon the question.

The manufacturer who objects to this method of action is merely contradicting his own operations when any general and outside interference threatens his industry, or when he thinks the industry should interfere in some outside matters.

**Current News of Factories**

*Notes of New Plants—Old Ones Enlarged*

It is quite usual for him through his industrial association to bargain for or against legislation, against encroachments of other industries, against crooked buyers and other common "enemies."

The laborer in his plant has just the same desire and necessity for collective action and has just as much right to assert himself in that collective way.

The matter of right is not the question; the matter of necessity or advisability is the important part of it, and how the machinery shall be worked out.

The question before the manufacturer to-day—the important decision he must make—is whether he will continue to bargain collectively with the labor organization of which he knows little and with which he does not come into contact save occasionally, or whether he will create the machinery in his own factory which will permanently exercise jurisdiction upon these matters, recognizing in the formation of that body the workers' right to be considered in the questions affecting his remuneration and his conditions of work.

**Collective Bargaining Not New**

He should remember that collective action upon wage systems is not a new thing, nor is it the original idea of a labor union; by legislation in favor of the employer it was for centuries the subject of national collective action; when the right of private contract was restored it was the subject of action by the manufacturer who saw no use in paying different wages for the same operation.

It has been adopted by the labor organization as the only way in which to make its power felt, and the manufacturer's objection to it is not an objection to principle of collective bargaining *per se*, but to the labor organization's very effective and embarrassing use of the weapon.

It is obvious that for a long time to come the system of payment based upon time will be the one most generally employed, and that for a given operation in any shop 75 per cent of the workers will turn out about the same amount of finished work and secure about the same pay.

This is the majority which governs the action of the labor organization, and it is the majority which will govern the necessities of the individual factory.

These are the conditions and requirements which must be met by some form of collective bargaining and also by some system of payment which will at the same time offer recognition to the individual.

**New Northwestern Chemical Plant**

MILWAUKEE, Oct. 21—The Northwestern Chemical Co., Milwaukee, which lost its plant at Sixty-first and State Streets, town of Wauwatosa, by fire in September, will erect a new plant costing about \$35,000. The building will be 50 x 150 ft., fireproof throughout.

**Milwaukee Brass Enlarges**

MILWAUKEE, Oct. 21—The Milwaukee Brass Mfg. Co., 249-251 Lapham Street, is enlarging its facilities in order to be better equipped to handle direct and indirect war work.

**Raybestos Molded Facing Replaces Woven Facing**

BRIDGEPORT, CONN., Oct. 19—The Raybestos Co. has discontinued the production of Raybestos woven clutch facing, and upon the completion of orders now in hand will manufacture only the new Raybestos molded clutch facing. The price is said to be no higher than the woven facing.

**Ford Employs 46,050**

DETROIT, Oct. 19—At a recent checking up of the new payrolls of the Henry Ford interests it was found that Henry Ford employs 46,050 persons. This number includes every man working in the Highland Park plant, the shipyards at River Rouge and the tractor plant at Dearborn.

**Fulton Foundry Acquires Factory Site**

CLEVELAND, Oct. 18—The Fulton Foundry & Machine Co. has purchased 6¼ acres of land in the industrial section along the Nickel Plate Railroad in the northeastern part of the city. The property was purchased for future developments.

**New Canadian Denby Plant**

WINDSOR, ONT., Oct. 19—The Denby Motor Truck Co. of Canada has purchased a site at Chatham, Ont., and will erect a new factory.

**Steel Output Increases**

WASHINGTON, Oct. 18—Improvement in the steel situation of the country is shown in a survey just completed by the War Industries Board showing that pig iron is now being produced at the rate of over 42,000,000 tons and steel plates at the rate of 6,000,000 tons per year. Plate production is more than 40,000 tons a week higher than ever before. Production of all steel is at the rate of 33,000,000 tons per year. Despite these increases the war board states that the steel situation is still critical and that, for example, while we are producing 33,000,000 tons of steel a year, the demands of the Government and the Allies total 50,000,000 tons.



**Mack President Hoover Steel Ball**

ANN ARBOR, MICH., Oct. 19—Walter C. Mack was elected president of the Hoover Steel Ball Co. at the annual meeting of the stockholders. He takes the place of L. J. Hoover, who died recently. The other officers are: Vice-president, F. A. Stivers; treasurer, M. J. Fritz; secretary and manager, H. D. Run-ciman; assistant secretary, William Arnold, Jr. These officers and Dr. L. P. Hall, D. F. Zimmerman, H. A. Douglass and R. T. Dobson form the board of directors. The executive committee consists of R. T. Dobson, Dr. L. P. Hall, M. J. Fritz, F. A. Stivers and William Arnold, Jr.

William W. Mountain, president of the Flint Varnish & Color Works, Flint, Mich., has resigned. It is reported that after a brief vacation at French Lick Springs he will enter another line of business.

Lester W. Place has resigned as sales manager of the Allen Motor Co., Fostoria, Ohio, and will announce his future plans shortly.

William Ross, Detroit, the engineer who designed and completed the model truck of the Louisiana Motor Car Co., Shreveport, La., has been appointed chief engineer of production of the company.

Grover C. Farnsworth, at one time advertising manager of the former Metzger Motor Car Co., is now an ensign in the naval aviation corps, stationed on the eastern coast.

**H. F. Blanchard of Thermoid Co. a Victim of Influenza**

TRENTON, N. J., Oct. 21—H. F. Blanchard, sales manager for the Thermoid Rubber Co. for the past three years, died of influenza at his home in Trenton. Mr. Blanchard was about 31 years of age.

**New Tractor Plant in Ypsilanti**

YPSILANTI, MICH., Oct. 19—The controlling interest of the Michigan Press Co., manufacturer of the Perkins power presses, has been purchased by Theodore H. Millington and Charles W. Chapman. The company expects to bring out a four wheel drive tractor. About forty men will be employed. Millington, who was formerly with the General Motors Co., is president of the reorganized company; Chapman, secretary and treasurer, and C. A. Perkins, vice-president.

**Canada Adopts Gasoline Regulations**

OTTAWA, ONT., Oct. 18—Regulations have been approved by the Governor-General-in-Council to control the wholesale and retail sale of gasoline in Canada. The regulations provide for the licensing of all persons who deal in gasoline and certain fees are prescribed based on the volume of gasoline sold during the previous

## Men of the Industry

*Changes in Personnel and  
Position*

year. In cases where dealers fail to obey the provisions of the law, the Fuel Controller has absolute power to cancel or suspend license without notice. All persons who continue to deal in gasoline without making application for a permit to do so will be subject to a penalty of \$50 for each day such business is conducted in contravention of the regulations. Provision is also made for the keeping of certain sales records, and all retailers of gasoline are called upon to post in their places of business the wholesale as well as the retail cost of gasoline handled by them. One important provision of the regulations is that, for the duration of the war, the sale of gasoline on Sundays is absolutely prohibited. Retail maximum prices are prescribed for the establishments selling gasoline in quantities over a thousand gallons a month. Profits are based on a ten per cent advance over the wholesale cost delivered.

**Training and Dilution Labor Districts**

WASHINGTON, Oct. 19—The United States has been divided into districts by the Training and Dilution Service of the Department of Labor, and superintendents for each will be named who will explain the purposes of the Training and Dilution Service to employers in their respective localities. In the main this will comprise explanations of the establishment of factory training departments for the conversion of unskilled into skilled workers.

**New 24-Cylinder Aviation Engine in Production**

RACINE, Oct. 19—The Sieverkropp Engine Co. has started work on the construction of a 24-cylinder, two-cycle, rotary aviation engine, which is expected to develop 500 h.p. at 1400 r.p.m. The engine is of a new type recently developed by Henry Sieverkropp, president and chief engineer of the company. The 24-cylinder engine is being built at the suggestion of the technical division of the Government aircraft board, on the basis of the performance of a smaller experimental engine completed by Sieverkropp about two months ago and submitted for official tests. The engine already constructed is a 12-cylinder, two-cycle, rotary type, rated at 72 hp., but it has developed 140 hp. at 2800 r.p.m. without appreciable effort. Mr. Sieverkropp is confident that the 24-cylinder motor will weigh considerably less than 1.98 lb. per horsepower and by the use of aluminum cylinders and other economies in weight expects to reduce the ratio to practically 1 lb. per horsepower.

**Winningham Out of Oil Division**

WASHINGTON, Oct. 18—C. C. Winningham, who on Aug. 1 was appointed chief of the Gasoline Section and Director of Publicity of the Oil Division of the Fuel Administration, has left that division. He has taken up other work with the Department of Labor. Winningham's place is to be taken by George H. Pride, of the Heavy Haulage Co., New York, who is Regional Director for a number of eastern states for the Highways Transport Committee. Pride is giving up his work with the Highways Transport Committee.

Edwin E. Taylor, formerly advertising manager of the Acme Harvesting Machine Co., Peoria, Ill., has resigned this position to become director of advertising for the Turner Mfg. Co., Pt. Washington, Wis., manufacturer of farm tractors, gas engines and other power machinery.

J. G. Perrin, chief engineer of the old Lozier Motor Co., who took up government work in the aviation department directly after America's entry into war, is now manager of the Canadian plant of the Willys-Overland Co. at Toronto.

Louis Geer has been appointed assistant to John Squires, chief of the materials division of the Denby Motor Truck Co., Detroit.

O. E. Harmon has been placed in charge of the service department of Fuller & Sons Mfg. Co., Kalamazoo. M. E. Fuller has been appointed employment supervisor.

Ralph H. Ratliff, advertising manager of the Butler Mfg. Co., Indianapolis, has resigned and will take up farming.

J. S. Burdick, for the past six years body engineer of the Locomobile Co. of America, Bridgeport, has severed his connection with the company and enlisted in government work for overseas service as automotive engineer.

Douglas C. Halley, formerly connected with the wholesale selling staffs of Scripps-Booth and Studebaker, has been appointed a first lieutenant in the Motor Transport Corps, and is stationed at Camp Holabird, Baltimore.

Don Ferguson, chief engineer of the old Cartercar Co., and for some time a designing and consulting engineer in Detroit and Milwaukee, has become resident engineer of the ordnance department under Major James Guthrie, commanding the Detroit district.

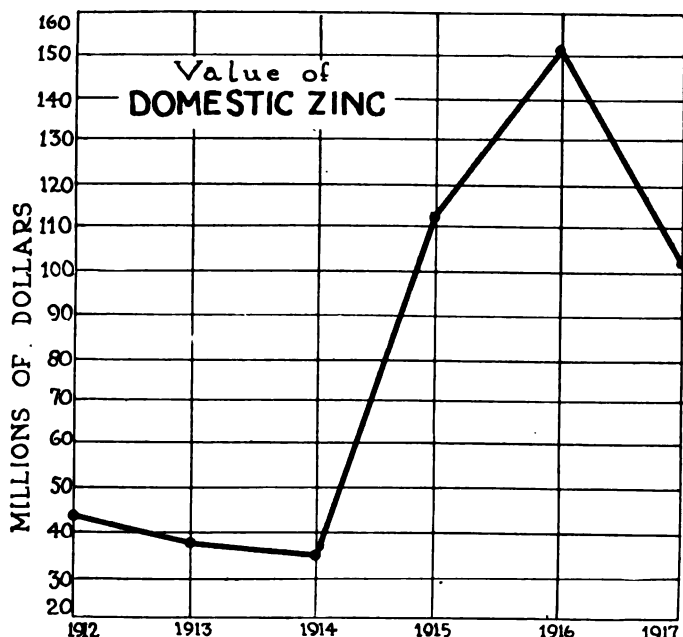
Florence Gardner, secretary to A. A. Gloetzner, sales manager of the Covert Gear Co., Detroit, has been appointed purchasing agent for the Louisiana Motor Car Co., Shreveport, La.

George Crittenden, sales manager of the old Krit company, has been commissioned a lieutenant in the navy.

# AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>		<b>Burlap:</b>	
Muriatic, lb.....	.02 -.03	8 oz., yd.....	12.4 -.15.85
Phosphoric (85%)..	.35 -.39	10½ oz., yd.....	14.6 -.18.6
Sulphuric (60), lb..	.008	<b>Copper:</b>	
<b>Aluminum:</b>		Elec., lb.....	.26
Ingot, lb.....	.33	Lake, lb.....	.26
Sheets, (18 gage or		<b>Fabric, Tire (17½ oz.):</b>	
more), lb.....	.40	Sea Is., combed, lb.	1.65-1.70
Antimony, lb.....	.13 -.13½	Egypt, combed, lb.	1.25-1.35
		Egypt, carded, lb.	1.20-1.30



Although the production of zinc from domestic ore was practically the same for the years 1916 and 1917 the value has dropped greatly

Peelers, combed, lb.	1.05-1.20
Peelers, carded, lb.	.95-1.05
Fibre (¾ in. sheet base), lb.....	.50
<b>Graphite:</b>	
Ceylon, lb.....	.07½-.25
Madagascar, lb.....	.10 -.15
Mexican, lb.....	.03½
<b>Lead, lb.....</b>	.08 -.09
<b>Leather:</b>	
Hides, lb.....	.18 -.35½
Nickel, lb.....	.40
<b>Oil:</b>	
Gasoline:	
Auto., gal.....	.24½
68 to 70 gal.....	.30½
<b>Lard:</b>	
Prime City, gal.....	.250
Ex. No. 1, gal.....	.170
Linseed, gal.....	1.60-1.65
Menhaden (Brown), gal.....	1.30-1.31
<b>Petroleum (crude),</b>	
Kansas, bbl.....	2.25
Pennsylvania, bbl.	4.00

<b>Rubber:</b>	
Ceylon:	
First latex pale crepe, lb.....	.60½
Brown crepe, thin, clear, lb.....	.53
Smoked, ribbed sheets, lb.....	.58½
<b>Para:</b>	
Up River, fine, lb.	.64
Up River, coarse, lb.....	.36½
Island, fine, lb.....	.74 -.75
<b>Shellac (orange), lb.</b>	.74 -.75
<b>Spelter</b> .....	.08½-.09
<b>Steel:</b>	
Angle beams and channels, lb.....	.03
Automobile sheet (see sp. table).	
Cold rolled, lb.....	.06½
Hot rolled, lb.....	.03½
<b>Tin</b> .....	.80½-.82½
<b>Tungsten, lb.....</b>	2.45-2.60
<b>Waste, (cotton), lb.</b>	.12½-.17

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping.....	6.20	6.10
Automobile body stock, extra deep stamping.....	6.45	6.35
Hood, flat tender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
<b>Automobile Sheet Extras for Extreme Widths:</b>		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
<b>Black Sheet Extras to Apply to Narrow Widths:</b>		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Truck Sales Managers Meet

CLEVELAND, Oct. 19—The National Association of Motor Truck Sales Managers, which was formed about two months ago, held its third meeting yesterday and to-day at the Statler Hotel and outlined plans of action for future work.

It has a permanent office at 1344 Wells Building, Milwaukee, where Executive Secretary J. M. Carney will conduct the organization's business.

One of the first things to be taken up is the contract with dealers, which exists to-day in many varieties. The sales managers believe they can work out a contract which will be acceptable to all the manufacturers.

It is also believed much can be done to make uniform the methods of handling time payments, and that the trading of used trucks can be made a real business and free from the abuses that grew up with passenger car trading.

An interchange of information is also planned, one of the matters to be covered being the records of shifting sales-

men who go from plant to plant and work for short periods.

The next meeting will be held Nov. 15-16 at the Lafayette Hotel, Buffalo.

The directors, elected some time ago, chose the following officers: J. E. Tracey, Sterling Motor Truck Co., president; H. T. Boulden, Selden Truck Sales Co., first vice-president; W. D. Wrightmire, Winther Motor Truck Co., second vice-president; E. T. Herbig, Service Motor Truck Co., secretary; A. R. Fernald, Willys-Overland, Inc., treasurer; J. M. Carney, executive secretary.

The directors, in addition to Tracey, Boulden, Wrightmire, Herbig and Fernald, are: F. J. Pardee, Diamond-T Motor Co.; F. L. Pierce, Federal Motor Truck Co.; A. C. Burch, Clyde Cars Co.

The membership includes in addition W. B. Morse, Brockway Motor Truck Co.; B. D. Jones, Republic Motor Truck Co.; W. S. Stevenson, Bethlehem Motor Corp.; F. J. Alvin, United States Motor Truck Co.; G. W. Weller, Indiana Truck Corp.; F. R. Mitchell, Gramm-Bernstein Motor Truck Co.; C. H. Woodruff, O. Armleder Co.; J. D. Potter, American

Motor Truck Co.; D. F. Wittaker, Acason Motor Truck Co.; C. H. Roberts, Bessemer Motor Truck Co.; L. Lynch, Columbia Motor Truck & Trailer Co.; W. J. Dietrich, Harvey Motor Truck Co.; C. A. Wales, Locomobile Co. of America; E. F. King, Available Truck Co.

## What Langley Did for the Science of Aviation

(Continued from page 718)

of 4600 ft. in 1¼ min. While the distance from the houseboat in a straight line to the point at which the aerodrome descended was only about 1600 ft., yet it was estimated by those present that this straight line distance was certainly not greater than one-third of the total length of past travels, which would mean a distance of something like 4800 ft. The length of the course as painted on a coast surveyor map and afterward measured was 4200 ft., and it, therefore, seems safe to say that the total distance traveled was about three-quarters of a mile, and the speed was, therefore, about 30 miles an hour."

## Extracts From Senate Aircraft Report

(Continued from page 701)

and had an affirmative reply, following which he delved deeply into Mr. Hunt's experience as an engineer. Senator Reed asked Henry Ford his opinion of the Delco system and if it were as good as any and heard him say "I think it is." Senator Chamberlain questioned R. H. Collins of the Cadillac Motor Co.: "What do you think of the Delco ignition system?" and had the answer: "It cannot be better."

Senator Reed asked W. C. Leland: "What is the best ignition, in your opinion, to use with the Liberty engine?" and secured the answer: "My belief on this is very pronounced, that the type of ignition now being used, which is the Delco ignition system, is the best ignition system that we know of for this high-speed, multiple-cylinder work. We base that on our experience with the Cadillac company. We have used the Delco system since 1911."

Later in gathering testimony Senator Reed encountered an army officer who had once had trouble with the generator on the Liberty engine and he spent some time trying to get the officer to admit that it was the Delco system that had failed, but the officer insisted that it was the generator.

Many other interesting facts are revealed in the reading of the testimony. The opening inquiry was with Col. C. G. Edgar, who was in charge of aviation field construction. In the course of the interrogation the Colonel admitted that he had had no previous experience in this work and had been in the sugar business, besides being "interested in navy beans." He also testified that at the outset we attempted to match the British training fields, established four years, and tried to float 300 cadets with 600 enlisted men and 72 officers at each field, but found that we required 750 men to float 150 cadets. The reason for numerous fatalities from sickness at flying fields in 1917-1918 he showed were due to over-crowding. At Camp Kelly No. 2, where accommodations had been erected for 2100 men, 4700 soldiers had been housed.

J. E. Kepperly, vice-president of the Curtiss corporation, told how production had been hampered by frequent separate investigation by the numerous agencies, the Department of Justice, Navy Intelligence, Army Intelligence, Niagara Frontier League and the company's secret service. Often, he said, each of these agencies would make its appearance and demand to be taken through the plant and shown books and so forth, always creating a confusion and delay.

At the Packard plant Senator Reed by questioning O. E. Hunt developed that the Packard twelve-cylinder motor car engine was designed in December, 1914, and not ready for production before August, 1915, from which he drew comparisons in the time between the design and production of the Liberty airplane engine. Mr. Hunt also told of the Bugatti engine made in France, which has

a cannon mounted in the crankcase and which shoots seven or eight shots, alternating incendiary and explosive shells automatically. The shooting, he said, is aimed by the control of the plane.

An interesting conversation ensued when in the testimony of George W. Houston, general manager of the Wright Martin Aircraft Corp., he mentioned George W. Goethals, and Senator Frelinghuysen inquired: "Is this George W. Goethals, General Goethals?" Houston replied: "Yes, sir," and the inquiry was made by Senator Frelinghuysen: "I understand that General Goethals' connection with the company was prior to our entrance into the war?"

At this point, states the testimony, informal discussion occurred which the reporter was directed not to record. And this was followed by additional inquiries:

Senator Frelinghuysen: "Was General Goethals' connection with the company known to the Government at the time he was called into service as an officer?"

Mr. Houston: "It was. General Goethals at that time was president of the Wright Martin Aircraft Corp. and he resigned the presidency shortly after he entered the Army as acting quartermaster general."

Senator Frelinghuysen: "Has General Goethals any interest in the stock of the company?"

Mr. Houston: "I cannot say as to his personal interests, but I do not think so."

Tests published in the testimony of the De Haviland plane equipped with a Liberty engine show that with fighter equipment it had an endurance at full throttle of 1 hr. 58 min., with half throttle 2 hr. 38 min., at 6500 ft. Its ceiling was 19,700 ft., speed in 10,000 ft. climb, 13 min., speed at ground level, 120 m.p.h., at 6500 ft., 118 m.p.h., at 10,000 ft., 114 m.p.h., and at 15,000 ft., 107 m.p.h.

Other testimony by Col. D. E. Clark of the Department of Military Aeronautics developed that he went abroad with the mission under Colonel Bolling, which investigated the merits of foreign planes, and that he recommended our adoption of:

De Haviland 9 for day bombing.

Bristol fighter for observation.

Martinsyde equipped with Liberty engine for single seater pursuit.

Spad with 150-hp. Gnome and 180-hp. Hispano Suiza engines for single seater combat.

Caproni triplane for night bombing.

The recommendations made no mention of the De Haviland 4 which we are now building. The Colonel also told that according to boasts by Lieutenant-Colonel Hall, formerly of the Hall-Scott Motor Co., 3600 changes had been made in the De Haviland 4. This was denied by the statement of another officer, Col. T. H. Bane, who stated in his testimony that the De Haviland 4 as made in this coun-

try was very similar to the British and had only very few and minor changes.

Complaints were filed by several officers in their testimony about the method used in this country of bending the cables, sustaining the planes, over the "eye" and wrapping and soldering them. It was stated that in many cases the solder does not soak through, with the result that the cable is hidden from view under a pipe-like shape formed by the solder, and is not only dangerous because it is not firmly held, but also because inspection is impossible. The British Government splices the cables after wrapping them about the "eye," and, said the various officers, the same custom should be followed here.

An interesting side-light on the failure of our Bristol airplane program was revealed in the testimony by Major H. S. Martin of the Department of Military Aeronautics, who explained that Col. D. E. Clark, who recommended the adoption of the Bristol and has been blamed for its failure, had been advised prior to his trip abroad that the Liberty engine would weigh 740 lb., and in consequence assumed that it could replace the Rolls Royce, which weighed 700 lb. In addition, said Major Martin, after the receipt of the Bristol plane in this country it was so "improved" that its weight was increased by 800 lb. and the combination of the heavier Liberty engine weighing 825 lb. instead of 740 plus the 800 lb. of added weight in the plane itself was the actual cause of the failure.

Testimony by Major G. H. Brett, Department of Military Aeronautics, supplied the committee with figures showing that 3129 airplanes had been furnished our Army in France by foreign sources up to July 31, 1918. Of these 1617 were school planes, chiefly Nieuports, and 1512 were combat planes, comprising mainly Sopwiths and Spads.

"Improvements," such as those on the Bristol mentioned above, were quite numerous. Col. H. H. Arnold, Assistant Director of Military Aeronautics, told that the compasses used in the De Haviland planes were worthless, that they had "died of improvements." "Our production people," he said, "improved on it to such an extent they made it worthless."

The English in mounting the compasses use agate to reduce the friction of the rotating member and because it is a non-conductor. We "improved" the compass, said Colonel Arnold, by putting steel on the agate, removing the non-conductor feature and making the compass worthless. In this connection it can be noted that many months ago Captain Fritt, British compass expert in this country, informed the authorities that as we used the compass it was of no value.

Examples of the worthlessness of much of the testimony are frequent. The instance of the inquiry of the cc



mittee with members of the French Mission is a confusion of replies that is typical of much that took place. Senator New inquired of the French officers if it would not be best to make all the planes we possibly can, and received the following replies:

Edouard De Billy: "Certainly, by all means."

Colonel Tulasne: "Certainly."

Lieutenant Marquisan: "Oh, no. It is better to have one plane of the very best type than ten of an obsolete type."

Again, many witnesses, it developed, were men with high-sounding titles and little experience. In the instance of W. K. Rider, called before the committee, it developed that he was in the production engineering department of the Signal Corps with the title of "Aeronautical Mechanical Engineer, Signal Corps Service at Large," and that he had no college education, was 20 years old and had worked three years for the Wright-Martin Aircraft Corp. He also told that he was not a flier.

Similarly Major Cushman A. Rice testified about British planes to the committee, the R. E., he said, was an experimental plane and very fast, and according to British experts here the R. E. is a two-seater artillery plane, neither fast nor experimental. He also told that Great Britain uses a 75-hp. Rolls Royce engine in certain planes, while the British authorities claim that no Rolls Royce of that horsepower has ever been made. Further confusing testimony was in the nature of that given by the French officers who told the committee that they did not like the De Haviland 4 because it was not a good fighting plane as well as an observation plane. Great Britain never intended the De Haviland for aught but observation work when it was designed, and such testimony tended only to confuse and mislead.

Discussing fatalities at flying fields in this country, Colonel Arnold told that after these commenced to increase a diagram was devised with curves, which showed that the majority of accidents occurred at 3 p. m., and he said: "I wish to state that as soon as we got that curve fixed up and found out that the majority of casualties occurred at about 3 o'clock in the afternoon, General Kenly said 'we will cut out flying at 3 o'clock' and so he stopped all flying between the hours of 11 a. m. and 3 p. m." The committee did not inquire if this stopped or reduced the casualties, nor why the greatest number of deaths occurred at 3 p. m. Since the greatest amount of flying took

place at that hour, which is commonly recognized as the best flight hour, it is not surprising that the greatest number of accidents resulted at that time. It would be interesting to learn if the greatest "casualty occurrence" has shifted to some other hour, and if that hour is not now the one when most flights are made.

Another point in the general testimony that emphasizes itself to the reader is the absence of any testimony from those men who were most particularly interested and who were so severely criticized. The 1200 pages contain no statements either by Col. E. A. Deeds, Howard E. Coffin or others who were criticized by various officers and in turn by the committee when it compiled its report. There are several instances during the testimony where single individuals made statements harmful to the original Aircraft Production Board, and there is at least one instance where the word of one individual was accepted by the committee and incorporated in the final report to the detriment of the members of the Aircraft Production Board. And in consequence the impression remains that the men thus criticized were tried without a hearing, while the army officers and others who testified were given the opportunity to make these men appear guilty possibly of their mistakes.

Praise of the Liberty engine is frequent and convincing throughout the testimony. Henry Ford, W. C. Leland, R. H. Collins, C. F. Kettering and others testified that it was the "best engine they knew of." Major R. S. Brown, asked by Senator Reed if he knew of any engine better than the Rolls Royce, replied: "Yes, sir, the Liberty engine." Captain D'Annunzio, asked by Senator Chamberlain: "How about the power of the Liberty engine as compared with the Fiat, pound for pound?" replied: "The Liberty engine is better."

#### Government Sulphuric Acid Plants

WASHINGTON, Oct. 19—Two sulphuric acid plants are to be erected in Pennsylvania under the supervision of the Construction Division of the Army, at a cost for both plants of \$3,000,000. These plants will be operated by the Government. One will be located at Emporium and the other at Mt. Union.

The Emporium plant will consist of 8 units on a site which has been selected upon Driftwood Creek, close to the plants of the Aetna Explosive Company and the Emporium Iron Company. In the event that sufficient power cannot be ob-

tained from the plant of the iron company, a one-thousand kilowatt-power plant will be erected. The estimated cost of this plant is \$2,000,000.

The Mt. Union plant will be erected adjacent to the plant of the Aetna Explosive Company. Twenty acres of land have been purchased.

#### Michigan Press Co. Reorganized

YPSILANTI, MICH., Oct. 19—The Michigan Press Co. has been reorganized, Theodore H. Millington of Detroit becoming president; Charles W. Chapman, secretary-treasurer, and C. A. Perkins of Ypsilanti, vice-president. The first two named parties have a controlling interest in the company, Millington being an engineer who was formerly with the General Motors Co., and Chapman being a Detroit attorney. The company will continue to make the Perkins power presses and will bring out a new four-wheel drive tractor which Mr. Millington has perfected.

#### New Mail Export Rates

WASHINGTON, Oct. 19—Under new regulations by the War Trade Board, articles shipped by mail to the United Kingdom, France or Italy, when not composed of samples of merchandise, will require individual export licenses and applications will have to be made for them. Hereafter, however, shipments can be made without individual export licenses through the mails of any commodity not on the official export conservation list when such shipments are destined to:

Abyssinia, Afghanistan, Argentina, Belgium, Bolivia, Brazil, China, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt; the colonies, possessions, and protectorates of Great Britain; the colonies, possessions and protectorates of France; Guatemala, Haiti, Honduras; the colonies, possessions and protectorates of Italy; Japan, its possessions or protectorates; Liberia, Monaco, Nepal, Nicaragua; the colonies, possessions or protectorates of the Netherlands; Oman, Panama, Paraguay, Peru, Salvador, San Marino, Siam, Uruguay (excluding any portion of the foregoing occupied by the military forces of Germany or its allies), or shipments of samples of no commercial value, or any commodity, when such shipments are destined to the United Kingdom, France, Italy or Japan, their colonies, possessions and protectorates (excluding any portion thereof occupied by the military forces of Germany or its allies).

These shipments which can be made without the individual export license should have noted on the package the following:

"Shipped under export license RAC—52."

A statement of the contents.

Name and address of shipper.

Name and address of consignee.

## Calendar

#### CONVENTIONS

Oct. 22-24—Atlantic City, N. J. Annual, Automobile Accessories Branch, National Hardware Association of the United States, Marlborough-Blenheim Hotel.

#### ENGINEERING

\*4-15 New York. Society of

Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

#### SHOWS

Oct. 12-19—Atlanta. Tractor demonstrations. Eastern State Fair and Automotive Exhibition.

Oct. 14-27—Dallas, Tex., Seventh Annual Texas Automobile Show. Texas State Fair.

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration. State Fair.

Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.

Nov. 11-16—Pittsburgh, Pa. Fall Automobile Show. Motor Square Garden, Automobile Association of Pittsburgh.

Jan. 13-19—Des Moines, Ia. First Tractor Show. Des Moines Thresher & Tractor Club. H. J. Clark, Mgr.

# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

Vol. XXXIX  
Number 18

PUBLISHED WEEKLY AT 239 WEST 39th STREET  
NEW YORK, OCTOBER 31, 1918

Fifteen cents a copy  
Three dollars a year

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### *Here's How Hudson Dealers Are Adjusting Themselves to Meet the New Conditions*

Service is fast becoming the chief and practically exclusive business of many Hudson dealers.

Sales Departments are being curtailed as the number of Hudsons still to be manufactured decreases.

Nevertheless, Hudson dealers have in many ways expressed their enthusiastic support of the Hudson policy and their faith in the Hudson future.

There are demands from a dozen sources for every Hudson Super-Six that the factory can still deliver.

This loyal adherence of Hudson dealers and this testimony to Hudson quality from owners, prospective and present, are naturally sources of great satisfaction at this time.

Yet the most satisfying feature of present abnormal conditions is the *optimism* of Hudson dealers.

They apparently look upon the approaching period of non-production as merely an interim for "taking stock", as it were, and getting ready for a period of Hudson achievement and success that will exceed even the wonderful years in which the Super-Six made automobile history.



## Hudson Motor Car Company

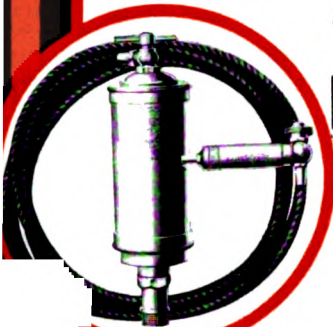
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Utility, Jr., Protected Heater for Fords and other small cars. Price \$9.00.

Utility De Luxe Protected Heater for 8-cylinder cars. Regulated by foot adjuster. Price \$25.00.

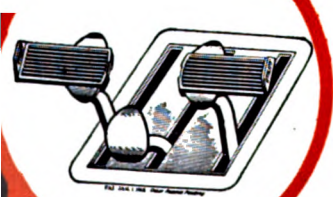
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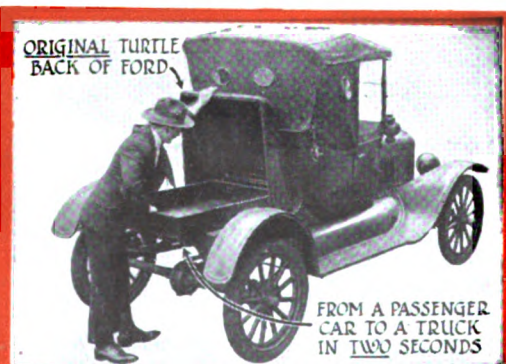
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# AUTOMOTIVE INDUSTRIES

## AUTOMOBILE

VOL. XXXIX

NEW YORK, THURSDAY, OCTOBER 31, 1918—CHICAGO

No. 18

## Hughes Aircraft Report a Vindication

Shows That There Has Been Some Incompetence and Stupidity  
But None of the Gross Irregularities Charged

Rumors of Enormous Waste Found Untrue—Automotive Industry Put in Favorable Light—Some Individuals Censured—Squier Called "Incompetent"  
—Deeds May Face Court Martial—Rebukes for Vincent,  
Mixer and Vrooman—Coffin Exonerated

By Allen Sinsheimer

**W**ASHINGTON, Oct. 31—There has been no graft in the American air program.

There has been no profiteering.

There have been no pro-German or disloyal attempts by authorities to hamper the work.

There have been no criminal activities by members of the air boards, no dishonesty, wholesale or retail.

There are of course in this report some points that reflect seriously upon a few individuals. This was to be expected. Also there are points upon which there will be many diverse opinions, and this could have been anticipated.

*But viewed in contrast with the Borglum charges of thievery and disloyalty and the later Senate denunciations, the Hughes Aircraft Report, issued here to-day, together with a brief statement of concurrence by Attorney General Gregory, is a complete vindication of the members of the aircraft boards, military and naval, of the engineers of the automobile industry AND OF THE INDUSTRY ITSELF.*

*It is particularly an exoneration of Howard E. Coffin, former chairman of the Aircraft Production Board, and establishes thoroughly the earlier claims that anti-administration influences were much too eager to heed the Borglum accusations.*

In fact, with the background of extravagant charges of waste, traitorism and criminal activities that were spread broadcast last spring and dragged many good names in the mire, the few findings conveying censure in the Hughes report appear trivial, and the report must be regarded as being *practically a clean bill of health* for those in charge, both in the past and present.

The report is thorough. It is conservative. It savors of the work of a man who has quietly and exhaustively handled his job and made the sanest results from it. And it stands a complete contrast from the sensational and somewhat unreliable reports of the past that seemed bent more to establish delays than to understand or dispell them.

Careful perusal, while it may leave the impression that in some instances Mr. Hughes may have been too harsh, will at the same time leave the reader with the knowledge that *it is the work of a conscientious man.*

The charges made many times in Congress and the press and heard frequently that the \$650,000,000 appropriations have been wasted and thrown away are completely refuted at the outset by a statement that tells that, of the appropriations of \$691,851,866.47 made for the air program, only \$134,044,395.27 was disbursed to June 30, 1918, the end of the fiscal year, while at the same time 6171 planes and 12,633 engines had been produced.

## High Lights of the Hughes Report

No graft; no profiteering; no disloyalty.

Col. Deeds charged with issuing false publicity, and improper official conduct.

Col. Vincent accused of violating criminal code, but without intent to defraud.

Cost-plus profits too liberal.

Signal Corps responsible for delays.

Some enemy alien employees found.

Little waste in aircraft appropriations.

Extravagant labor costs found.

Delays due to lack of knowledge and experience.



*Lt. Col. Jesse G. Vincent, prior to the war, was vice-president in charge of engineering for the Packard company at a salary of \$25,000 per year which he gave up to take up army aircraft work. He was the important designer in the work of designing the Liberty engine.*

*Charges of criminal action by members of the aircraft boards are shown to have been mere "gossip" by the statement that no member of the boards was found guilty of a criminal act.*

It might naturally be expected that, among the many men taken from industrial life to fulfill positions as civil servants, some might follow their life-long industrial practices and, although actuated solely by altruistic motives, yet violate their positions, and this appears to be what has been done in some cases.

And, says the report in reply to the accusations that pro-Germanism prevailed, *there is no evidence to substan-*

*tiate the belief that work was hampered by disloyal authorities.*

The most serious accusations made as a result of the investigation are against Col. E. A. Deeds, formerly in charge of the Equipment Division, Signal Corps; Lt.-Col. Jesse G. Vincent, who designed the Liberty engine; Lt.-Col. G. W. Mixer, formerly of the Signal Corps, and 2d Lt. S. B. Vrooman, formerly propeller inspector.

Col. Deeds, upon whom much of the charge of dishonesty fell last spring, was found by Mr. Hughes to be in no instance guilty of a criminal act. He did, however, says the report, act as a confidential adviser to a former business partner while in the service of the United States and was also guilty of issuing untrue publicity, and as a result the attention of the Secretary of War is demanded by the report and a recommendation for trial by court martial made.

The other officers named are charged with violations of a criminal code that prohibits army officers from engaging in official business transactions with concerns in which they are financially interested. In the case of Lt.-Col. Vincent, who was formerly vice-president in charge of engineering for the Packard Motor Car Co., Mr. Hughes, while discovering no fraud or intent to defraud, found that Vincent owned stock in the Packard company while at the same time he engaged in transactions with that company as an officer in the U. S. Army.

It is in connection with the recommendation that Vincent be prosecuted under the criminal code, violated because "officers fail to show proper appreciation of the impropriety" of violating this code, that the report may seem harsh to some. Vincent, as vice-president of Packard, earning a salary of \$25,000 a year, gave up that position to become a major in the army earning less than 20 per cent of that amount. He and C. V. Hall were the designers of the Liberty engine, America's greatest aeronautical achievement.

The report, which embodies a summary of 17,000 pages of testimony taken from 280 witnesses, deals principally with appropriations and expenditures, responsibilities, possible criminal activities, causes for delay in the program, contractors' profits, labor, the cross license agreement and forms of contracts.

### What Deeds Said

Col. Deeds when interviewed by a representative of AUTOMOTIVE INDUSTRIES stated that he could not at this time make a public statement, and that in view of the possible trial by court martial he intends to refrain from all public discussion and make his reply to the charges to the War Department at the proper time.

### Baker Considers Court Martial

Secretary of War Baker is considering the charges against Col. Deeds and the possibility of placing him on trial to face a court martial. Last Spring, when very serious charges were made, both General Squier and Col. Deeds requested the Secretary to institute a military court to investigate them. At that time, however, the Secretary preferred to await the outcome of the Hughes inquiry. Whether or not he will order the trial now of Col. Deeds will be decided following full consideration of the report.



Col. Edward A. Deeds, formerly Chief of the Equipment Division of the Signal Corps, was one of the founders of the Dayton Engineering Laboratories Co., manufacturers of the Delco ignition system. In addition he has been interested in other Dayton enterprises. He came to Washington in 1917 first as a member of the Aircraft Production Board and later with a commission in the Signal Corps of the U. S. Army.

It does not enter into the present status of aircraft production other than to state recent production figures and to give praise to the present authorities, and it does not tell future aircraft plans, regarding these as "military secrets."

Of the \$691,851,866.47 appropriated for aircraft, it is told in the accounts of expenditures that the obligations incurred during the fiscal year ending June 30, 1918, including not only production but also field construction, truck purchases, planting of castor beans, etc., amounted to \$474,910,706.55. This again contrasts strongly with the frequently heard remarks that the appropriations have been wasted. As a matter of fact, but \$24,000,000 has possibly been wasted, according to the report, and this in a manner that could be expected in an industry as new and untried as aviation.

This sum was expended for 1600 SJ-1 planes and Hall-Scott A7a engines costing \$11,027,733.61 and for the Bristol fighters that cost \$2,500,000 to date and will cost more when the charge for cancellation of the contract is presented. The SJ-1 planes were condemned as dangerous. The Bristol was an English plane in which our authorities attempted to place too heavy an engine.

*Every nation in this war has expended many millions in similar manner—expenditures classed as for experimental work.*

Full authority for the establishment of the air program and for the control and administration of all matters pertaining to aircraft production—a question that has confused many and to a degree forced the resignation of Howard Coffin—has definitely been placed upon Brig. Gen. George O. Squier, Chief Signal Officer, and in turn upon his assistants, Col. E. A. Deeds and Col. R. L. Montgomery.

The Aircraft Production Board, which was headed by Howard E. Coffin, and which, it will be recalled, was the center of the storm prior to the Senate investigation, was found by Mr. Hughes to be solely advisory, and from August, 1917, on gradually became less important. "It will be observed that the order creating this board," says the report, "had the

## The Hughes Report Recommends:

**Trial by court-martial of Col. Deeds.**

**Enforcement of statutory conditions against Vincent, Mixter and Vrooman.**

**Investigation by Federal Trade Commission of proper costs of mahogany for propellers.**

**Supervision by Department of Justice of the re-audit of accounts.**

**Assignment of Bureau of Investigation, Department of Justice to follow up suggested delinquencies.**

**Investigation of spruce production on Pacific Coast.**

*effect of greatly limiting its authority and that it was even denied the right to hold direct communication with manufacturing plants."*

Commenting upon personal interests, Mr. Hughes stated that John D. Ryan, W. C. Potter and Howard E. Coffin were found to have taken no part in Government transactions with any concerns in which they had personal interests. Major H. C. Marmon was reported as having engaged in a trivial transaction but one that was in no way to be considered as seriously wrong and which was entirely without intent. All other members of the naval and military air boards were likewise exonerated of any criminal activities.

The findings against Col. Deeds followed exhaustive investigation. *No substantiation was found of the claim that Deeds was earlier named "Dietz," and it was said, according to the report, that he had had four generations of ancestors in this country.*

The inquiry developed that Deeds, together with Charles

## Ryan Gratified with Report

"I have just hastily read the report of the aircraft investigation made by Judge Hughes," stated John D. Ryan, Director of Aircraft Production, "and I am gratified of course to know that the investigation has resulted in finding no such conditions existed last spring in the work of aircraft production as was indicated by charges made at that time. I have long been satisfied that the men who preceded me did a very great patriotic service and did not use their position with the Government to make personal profit."



F. Kettering, vice-president of the Dayton Engineering Laboratories Co., and H. E. Talbott, associated with Deeds in business, have a common agent, George B. Smith, who looks after their financial affairs jointly. A letter from Deeds to the Aircraft Board, stating that he had given up all interests in the United Motors Co., Dayton Engineering Laboratories Co., Dayton Metal Products Co. and the Domestic Building Co., was introduced in the report as bearing the date Aug. 28, 1917. Mr. Hughes reported that he found that Deeds retained his stock in the United Motors Corp. and the Domestic Building Co. for some time beyond that date, and further had made a transfer of his United Motors shares at a later time to Mrs. Deeds. But despite these conflicting conditions, he found no evidence that would indicate criminal activities on the part of the colonel.

Regarding the orders placed for Delco ignition systems for 20,000 Liberty engines, Mr. Hughes found that Deeds had made no recommendations for the placing of these orders and further that "while there had been a question as to whether the magneto or Delco system was preferable" it has lately developed that the use of the Delco is growing in favor.

The charges that Deeds acted as adviser to his ex-partner Talbott are based on correspondence showing that Deeds gave opinions of the Judge Advocate General to Talbott to guide him in the selection of appraisers of plants at the expiration of contracts and also informed him of the character of his superior officer, General Squier.

*The claim that he gave out false publicity developed through the issuance of an erroneous statement about airplane production by Deeds to the Committee on Public Information. The statement was to the effect that the first American-built battle planes were shipped to France Feb. 1, 1918. Secretary of War Baker, who authorized the statement, it was found, gave his authority for its publication, relying upon Deeds for its accuracy. These actions on the part of Deeds were termed "highly improper" by Mr. Hughes and in consequence of them he demanded the attention of the military authorities.*

The report deals at length with the earlier plans for airplane production, telling much that was told in the Senate report, but explaining in greater detail that many contradictory telegrams, signed "Pershing," but frequently sent by various other officers in France, delayed production in this country and caused much confusion.

For example, one cablegram on April 19, 1918, urged large production of single-seaters while another on May 4 disapproved single-seater production in the United States. As a result of the confusion, after much cabling, the authorities on this side were forced completely to disregard advices from abroad and make their own decisions in many cases.

There is considerable and strong censure in the report for the delay in the production of Handley-Page, Caproni and DeHaviland-9 planes. It is shown that as early as Feb. 20, 1918, Howard Coffin urged immediate quantity production of Capronis here to be assembled in Italy. On March 26 production of Capronis was again taken up, discussed and referred to the Chief Signal Officer for consideration. On April 2 the Italian Ambassador inquired if there was any plan for producing Capronis. On April 23 a verbal order was given the Fisher Body Corporation for 250 of these planes. On May 9 other arrangements were made with the Fisher company, and in June they received a contract for 500 planes.

"There appears to be no adequate reason," says the report, "for this long delay in putting the Caproni planes into production." As a result of the delays "nothing is left of last fall's program for service planes, save the DeH-4s."

*The Liberty engine is given high praise in the report, and foreign experts are quoted in substantiation of its success.*

In discussing the selection of contractors and the distribution of work, the report tells of many investigations, inspections and conferences between the aircraft authorities and the Singer Mfg. Co., of the excellent facilities of this concern and of the fact that it never received Government contracts, stating "in the light of the correspondence, no explanation has been given of the failure to enlist the important resources of the Singer company for the purposes of aircraft production."

CAUSES OF DELAY IN PRODUCTION WERE DUE, SAYS THE REPORT, TO LACK OF KNOWLEDGE AND

EXPERIENCE, DEFECTIVE ORGANIZATION IN THE SIGNAL CORPS, LACK OF INFORMATION AS TO EQUIPMENT FOR SERVICE PLANES, CHANGES IN DESIGN AND EQUIPMENT, CONDITIONS IN MANUFACTURING PLANES AND THE CHANGES IN THE LIBERTY ENGINE. "IT IS QUITE CLEAR," IT IS STATED, "THAT THE DUTY OF PROVIDING AN ADEQUATE ORGANIZATION FOR AIRCRAFT PRODUCTION WAS BEYOND THE COMPETENCY OF THE CHIEF SIGNAL OFFICER, WHO HAD NEITHER TRAINING NOR EXPERIENCE FOR SUCH A LARGE INDUSTRIAL ENTERPRISE."

The lack of airplane engineers was another serious obstacle, and the lack of organization and responsibility is pointed out. A letter from Archer A. Landon, Mr. Coffin's assistant, and at present in charge of aircraft production, is introduced in the report and tells of the various situations created by the "dilly-dallying" caused by the fact that *no one would assume the responsibility for the work he undertook.*

Complaints against the profits paid on both engine and plane manufacture under the cost-plus contract plan are frequent in the report. It is pointed out that the Dayton Wright Airplane Co. in a contract for DeH-4s was given a fixed profit of \$875 per plane, based on 12½ per cent of the bogey cost of \$7,000 while these planes actually cost under \$4,400, on which a fixed profit of 12½ per cent would have been about \$550. In addition, it is stated that the profits are not always based, as they should be, on the actual investments of the companies. The first bogey cost on the Liberty engines was fixed at \$6,087 and later reduced to \$5,000, on which basis a fixed profit of \$625 was arranged in contracts with the Packard, Lincoln and Nordyke & Marmon companies, and "even at this reduced bogey and percentage," says the report, "the profits allowed were very large." The Packard company, for example, delivered 3100 engines by Sept. 6, 1918, with profits amounting to \$1,937,500. In addition to the \$625 profit per engine, the actual cost of the engines at the Packard plant amounted to \$3,873 per engine for the first 600 and \$3,442 for the first 1200, making an additional profit of \$450 per engine through the contractor's percentage of saving.

The Ford Motor Co., it is expected, will be able to turn out these engines at \$3,200 per engine, and on its contract for 5000 engines will have received profits of \$625 per engine, plus \$450 per engine allowed by the saving clause, making a total of \$5,375,000 profits which can be earned on the complete contract. The Lincoln Motor Co. is mentioned as having a special feature in that it was a new organization with a newly established plant, devoted exclusively to Liberty engine manufacture, and its contract contains a clause allowing for depreciation of the company's heat-treating plant equal to the difference between its cost and value to the company at the termination of the contract, and that cost of its testing plant will be allowed as a part of the production cost of the engines to be manufactured, while the machinery and equipment used in the performance of the contract will be depreciated 40 per cent.

The Lincoln company received financial advances from the Government amounting to \$10,800,000 up to August, 1918. The cost of production on the first 600 engines was \$3,583, making it a reasonable assumption, says the report, that the average cost for the 6000 engines contracted for would be \$3,000; but on the basis of an actual cost of \$3,200 per engine, the report estimated the Lincoln company would have earned by January, 1919, on the delivery of 6000 engines, \$6,450,000, not including profits on spare parts of \$1,500,000, making a total of \$8,000,000. This is exclusive of the depreciations allowed, which in the testing and inspection facilities and special tools amounts to 100 per cent. The entire paid-in capital of the company, it is pointed out, in contrast to the estimated \$8,000,000 profit and depreciation allowances, amounts to \$850,000.

"It is pointed out very clearly," says the report, "that the company has provided an excellent plant for the manufacture of Liberty engines, and that ultimately its profit, after paying taxes, will represent only an equity in its plant, without any assured business, as it has been devoted to Government work. On the other hand, it may be said that there is a very liberal flat depreciation allowance on machinery, tools and equipment,

(Continued on page 750—40)

# Complete Text of Hughes Aircraft Report

Washington, D. C., Oct. 25, 1918.

## The Attorney General:

I have the honor to submit the following report of the Aircraft Inquiry:

The investigation has been concerned with aircraft production. Other activities relating to aviation, but not to production, have been touched upon incidentally. Thus, upward of thirty training or flying fields with numerous structures have been provided, and to meet other aviation needs a great variety of construction has been required, here and abroad. These enterprises, being aside from aircraft production itself, have not been the subject of this inquiry, save as transactions relating to Wilbur Wright Field and McCook Field have invited scrutiny by reason of the aircraft enterprises centered at Dayton, Ohio, and the activities of Edward A. Deeds and his former business associates.

Another governmental activity which does relate to aircraft production, but is conducted separately from the orders for airplanes and engines, is known as the sales department. The Government itself purchases large quantities of lumber, fabric, chemicals, etc., which it resells.

When these commodities are supplied by the Government to contractors, the sales department is credited and the items are transferred to the other appropriate accounts. The largest item of this sort is for spruce. The account of the sales department for the fiscal year ending June 30, 1918, shows that spruce orders amounted to \$76,211,360.35, on which there had been deliveries and payments aggregating \$6,357,853.83, leaving unfilled orders of \$69,853,506.52; and of the spruce delivered the Government had resold to the extent of \$3,679,155.95.

It appears that the Government had also (to June 30, 1918) invested in its cut-up plant at Vancouver, Wash., the sum of \$1,487,237.81. While to some extent testimony has been taken bearing on the spruce contracts, it became evident as the inquiry proceeded that it would be impossible to reach any satisfactory conclusion with respect to the transactions of the Spruce Production Division without a special inquiry on the Pacific Coast, which in view of the extent and character of the activities involved would probably take several months.

It has not been practicable to undertake this as yet, in view of the magnitude of the work involved in other branches of the investigation, and accordingly it has been left to be undertaken hereafter by the Department of Justice as it may be advised. For this reason, a report on the operations of the Spruce Production Division or of the Sales Department will not now be attempted. Also, in view of the importance of the present inquiry in its special relation to airplanes and airplane engines, transactions of the Balloon Division have not been examined.

Aside from these limitations, the inquiry has taken a wide range. It has been prosecuted without pause since it was begun in the latter part of May last. About 280 witnesses have been examined and over 17,000 pages of testimony have been taken.

The more important plants have been visited, and a large part of the testimony has been taken at these plants where books, records, employees and Government representatives have been available. To compass all the activities involved in aircraft production, reaching into a great variety of contracts and operations involving numerous plants and the expenditure of many millions of dollars, would require the constant efforts of a force of investigators for a year or more longer and also the services of an army of accountants charged with the responsibility of checking and auditing the work of the hundreds of Government representatives now supervising the contractors' accounts.

It is impossible, of course, to say what irregularities or offenses such a protracted inquiry would bring to light, but

the investigation has been sufficiently comprehensive to give, it is believed, a survey of the field as a whole and to disclose the facts bearing upon the serious charges which have been made.

In addition, and as a result of information received through this inquiry, there have been special proceedings before grand juries. Thus, on information of violations of the Sabotage Act at the Hammondsport (N. Y.) plant of the Curtiss Aeroplane & Motor Corp., the matter was examined by the Grand Jury and indictments were returned in the Western District of New York and there have also been indictments in the same district for violations of this Act at the North Elmwood plant, Buffalo, of the same corporation. There also has been a special investigation by the Grand Jury at Sacramento, with respect to conditions at the Liberty Iron Works.

It is manifestly impracticable to state the details of even the more important evidence, but the salient and controlling facts which have been elicited will be set forth, so far as this is deemed to be compatible with military exigency.

## FIRST APPROPRIATIONS AND EXPENDITURES

At the time of the time of the declaration of a state of war with Germany, April 6, 1917, the appropriations available for aircraft production were those applicable to the fiscal year ending June 30, 1917. By the Act of Aug. 29, 1916, the sum of \$14,281,766 was appropriated for the expenses of the Signal Service, with the proviso that not more than \$13,281,666 should be used for the purchase, manufacture, maintenance and operation of aircraft and of described vehicles necessary for the Aviation Section.

It was further provided that not to exceed \$50,000 should be used for the payment of all expenses in connection with the development of a suitable type of aviation motor and not more than \$500 should be used for the cost of special technical instruction of officers of the Aviation Section.

Of the total appropriation above mentioned the sum of \$4,500,000 was later (Act of May 12, 1917) made available for the establishment of aviation schools and experimental stations, and it was under this appropriation that Langley Field, Virginia, was acquired and developed.

The Act of Feb. 14, 1917, appropriated \$3,600,000 for aircraft, buildings for equipment, and other accessories necessary in the Aviation Section, for use in connection with sea-coast defenses.

The Act of May 12, 1917, appropriated for the expenses of the Signal Service, for the fiscal year ending June 30, 1918, the sum of \$11,800,000, with the proviso that not more than \$10,800,000 should be used for aircraft production, including experimentation, and for the buildings for equipment and personnel, and necessary accessories. The sum of \$43,450,000 was appropriated by the deficiency appropriation Act of June 15, 1917, of which \$31,846,067.16 became available, under the terms of the Act, for the fiscal year 1917-18.

Provision for an adequate aircraft program for the Army was not made until the passage of the Act of July 24, 1917, appropriating for aeronautical purposes the sum of \$640,000,000.

## STATEMENT FOR FISCAL YEAR JUNE 30, 1917, TO JUNE 30, 1918

The aggregate of all aeronautical appropriations which were available for the Army for the fiscal year ending June 30, 1918, were as follows:

Act of July 24, 1917.....	\$640,000,000.00
Other aeronautical appropriations.....	51,851,866.47

Total .....	\$691,851,866.47
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The estimated obligations charged against these appro-

priations during the fiscal year amounted to \$933,948,959.03. To the extent of \$176,924,903.42, this excess represented obligations of the Sales Department already described, for which it was contemplated there would be reimbursement by resales. (Of this last-mentioned amount, there were reported as disbursed in the Sales Department (to June 30, 1918) that is, for deliveries of materials, \$25,966,739.95\* the resales amounting to \$19,008,150.26, and the balance representing assets on hand.) Exclusive of the obligations of the Sales Department, the estimated aeronautical obligations of the Government for the fiscal year 1917-1918 amounted to \$757,024,055.61. These obligations were calculated on estimated costs, and the excess over the total aeronautical appropriations (that is, over \$691,851,866.47) will largely be offset by savings on the estimated costs and by cancellations of orders.

#### Obligations Other Than for Airplanes and Engines

The estimated obligations for the Aviation Equipment Division covered not only Airplanes and Engines, but a variety of equipment and other essentials. Thus, the estimated obligations, charged against the \$640,000,000 appropriation, for Transportation including motor trucks, chassis, motor cycles, bicycles, etc., amounted to \$42,938,630.73; for General Equipment including various sorts of apparatus and supplies \$34,979,741.53; for Maintenance including maintenance of supply depots, planting of castor beans, etc., \$17,948,955.60; for Special Clothing for aviators, mechanics, etc., \$2,520,512.63; for Machine Guns, Ammunition and Bombs, \$29,249,033.29; for Acquisition of Plants, \$2,595,599.83 and for Miscellaneous Equipment, including various incidental expenses of officers, stations and schools, \$7,748,617.75.

There were also charged against the \$640,000,000 appropriation the estimated obligations of the Construction Division, embracing training fields and construction here and abroad, amounting to \$62,232,664.55; of the Balloon Division (covering balloons and accessories), \$16,910,891.20; of the Schools Division, \$1,016,223.48, and of the Finance Division (including the pay of Reserve Corps and of civilian employees, and the reserve for foreign expenditures), \$35,963,417.55. The various estimated obligations for similar purposes, other than for airplanes and engines, which were charged against the other aeronautical appropriations for the fiscal year 1917-1918, aggregated \$28,009,060.92.

Thus, out of the total estimated obligations (\$757,024,055.61) for all aeronautical purposes (exclusive of the Sales Department) the estimated obligations for purposes other than airplanes and engines aggregated \$282,113,349.06.

#### Obligations for Airplanes and Engines

The amount of the estimated obligations for airplanes and engines and spare parts of both (including experimental and development work) charged, to June 30, 1918, against the aeronautical appropriations for the fiscal year 1917-1918 was as follows:

Charged to the \$640,000,000 appropriation.....	\$457,379,122.15
Charged to other appropriations .....	17,531,584.40
Total .....	\$474,910,706.55

#### Actual Disbursements for All Aeronautical Purposes

It should be noted that the amounts above stated represent estimated obligations, not actual disbursements. Although obligations were incurred, payments were to be made only as payments were earned by performance of contracts. Payments prior to June 30, 1918, were made on vouchers for amounts represented as earned, but such payments were only a part of the estimated obligations, by reason of delays in production. Further payments should be made only as production goes forward and contracts are duly performed.

Thus, as against the total estimated obligations for aeronautical purposes aggregating \$933,948,959.03 (including the sales department), the disbursements reported down to June 30, 1918, amounted to the sum of \$430,234,316.99. Out of the \$640,000,000 appropriation, the total disbursements for the fiscal year for all aeronautical purposes (that is, embracing those apart from airplanes and engines, as well as for the latter) amounted to \$363,818,014.87;† and, according to the accounts of the Bureau of Aircraft Production there remained of this appropriation in the Treasury of the United States on June 30, 1918, the sum of \$276,181,985.13. According to the books of the Treasury Department, the unexpended

balance of the \$640,000,000 appropriation amounted on June 29, 1917, to \$304,478,211.70. The difference of \$28,296,226.57 is explained by the existence of unwithdrawn balances which had been allotted to the Quartermaster Corps and the Ordnance Department and by various credits pertaining to the month of June which were not received in the Bureau of Aircraft Production until July.

#### Actual Disbursements for Airplanes and Engines

The actual payments for the fiscal year 1917-1918 against the estimated obligations for airplanes and engines, and spare parts of both (including payments for experimental and development work) are reported by the Finance Division of the Bureau of Aircraft Production as amounting to \$155,535,946.41, as follows:

Disbursed from the \$640,000,000 appropriation.....	\$142,908,398.95
Disbursed from other appropriations.....	12,627,547.46

Total .....

These disbursements included not only payments to contractors for articles delivered or on account of work and materials, but also advances in the nature of loans to contractors, upon security, made by the War Credits Board, and, in addition, the payments which had been made for the manufacture of planes and engines overseas.

The payments for manufacture overseas amounted to \$25,605,074.31, as follows:

Cash remittances to overseas disbursing officers for payment on overseas contracts for airplanes and engines .....	\$16,600,000.00
Paid on purchase of materials, supplies, etc. purchased by United States for shipment abroad to be used in overseas manufacture of airplanes and engines .....	*9,005,074.31
Total .....	\$25,605,074.31

The unpaid balances of advances to contractors (whose contracts are embraced in the obligations for airplanes and engines above described), these advances being repayable to the Government, amounted on June 30, 1918 (exclusive of interest) to \$21,491,551.14. The principal contractors who have received these advances are specified below:

Contractor	Advances Authorized	Advances Made	Balance Unpaid June 30, 1918 (Without Interest)
Curtiss Aeroplane & Motor Corp. ....	\$8,000,000	\$8,000,000	\$5,561,645.94
Dayton Wright Airplane Co. ....	2,500,000	2,000,000	1,405,222.57
Duesenberg Motors Corp. ....	1,650,000	1,650,000	1,632,447.97
Fisher Body Corp. ....	2,000,000	2,000,000	1,944,933.33
Lincoln Motor Co. ....	6,500,000	6,500,000	6,255,392.00
Nordyke & Marmon Co. ....	2,000,000	2,000,000	2,000,000.00
Packard Motor Car Co. ....	5,000,000	5,000,000	1,731,232.00
Trego Motors Corp. ....	315,000	285,000	281,696.75
Willys-Overland Co. ....	2,500,000	2,500,000	451,861.25
Various other contractors.....			227,120.88
Total .....			\$21,491,551.14

The amounts paid, to June 30, 1918, on account of experimental and development work on airplanes and engines, amounted to \$1,697,830.19, of which the principal items are these:

Expenditures of Experimental Station at McCook Field	\$974,300.20
Director, Bureau of Standards.....	64,077.33
Department of Agriculture.....	34,540.82
Packard Motor Car Co.....	249,159.10
†Dayton Wright Airplane Co.....	48,120.39
Dayton Metal Products Co.....	66,097.14
Miscellaneous payments .....	261,535.21
Total .....	\$1,697,830.19

Deducting these advances, and the payments of experimental and development work, the disbursements to the end of the fiscal year, June 30, 1918, for airplanes and engines, and their parts, manufactured or in process of manufacture in the United States amounted to \$106,741,490.77, as follows:

Total disbursed for airplanes and engines.....	\$155,535,946.41
Less—	
For overseas manufacture.....	\$25,605,074.31
For advances to contractors.....	21,491,551.14
For experimental and development work .....	1,697,830.19
Disbursed on account of production in United States.....	\$106,741,490.77

\*Corrections on further accounting raised this amount to \$26,557,706.87.

†Subject to correction by addition of \$590,966.62 for Sales Department.

\*This includes the compensation of the purchasing agent, The J. G. White Engineering Corporation, amounting to 3 per cent of the purchases, or \$262,662.02.

†Other vouchers allowed before June 30, 1918, but not paid until later, \$89,630.52.



AIRPLANES AND ENGINES DELIVERED DURING  
FISCAL YEAR ENDING JUNE 30, 1918

The reported deliveries of airplanes and engines made prior to June 30, 1918, are as follows:

## Airplanes

Elementary Training Planes		
JN4-D .....	2972	
SJ-1 .....	1600	4572
Advanced Training Planes		
JN4-H .....		
Training .....	402	
Gunnery .....	321	
JN6-HB .....	100	
S4-B .....	100	
S4-C .....	78	
Penguin .....	50	1046
Combat and Bombing Planes		
DeH-4 .....	529	
Bristol Fighter .....	24	558
Total planes .....		6171

## Engines

Elementary Training		
OX-5 .....	5474	
A7a .....	2188	7662
Advanced Training		
Hispano 150 hp. ....	2188	
Gnome 100 hp. ....	209	
Le Rhone 80 hp. ....	68	
Lawrence 28 hp. ....	114	2579
Combat and Bombing		
U. S. 12 Cylinder (Army Type) .....	1615	
U. S. 12 Cylinder (Navy Type) .....	775	
Hispano 300 hp. ....	2	2392
Total engines .....		12633

For some of the units thus delivered, payments had not yet been made at the close of the fiscal year. The payments to June 30, 1918, covered about 5530 of the airplanes delivered and about 9750 of the engines delivered. In addition, there had been deliveries of various planes and engine parts, and the greater part of these were also covered by the payments above mentioned. And there were also large payments to contractors under cost-plus contracts for labor, materials and overhead charges in connection with work in process.

## Allocation of Payments to June 30, 1918

The payments for the production of airplanes and engines, and parts, were made under two classes of contracts, (1) fixed-price and (2) cost-plus contracts:

Payments under fixed-price contracts .....	\$57,193,621.06
Payments under cost-plus contracts .....	49,547,869.71
	<u>\$106,741,490.77</u>

## Fixed-Price Contracts

In the case of payments under fixed-price contracts, the payments presupposed delivery to and acceptance by the Government of the articles contracted for. Most of the JN training planes, 150 of the Standard J-1 training planes, metal parts for Handley-Page planes, all the engines for the elementary training planes, and 1500 of the Hispano-Suiza 150-hp. engines are embraced in the orders placed on a fixed-price basis. Large numbers of parts of planes and engines were ordered on the same basis.

The payments under fixed-price contracts are shown to have been distributed as follows:

For engines and their parts .....	\$23,216,930.28
For airplanes and their parts .....	33,976,690.78
	<u>\$57,193,621.06</u>

## Cost-Plus Contracts

The cost-plus contracts for engines and parts related to the Liberty engines (U. S. 12s), most of the Hispano-Suiza, and the Le Rhone, Gnome and Bugatti engines. Among airplanes, 1450 of the Standard J-1 elementary training planes, the De Havilland 4 and Bristol service planes, and the Handley-Page wood parts, were under cost-plus contracts. The following is the distribution of payments under cost-plus contracts to June 30, 1918:

For engines and their parts .....	\$28,348,487.44
For airplanes and their parts .....	21,199,382.27
	<u>\$49,547,869.71</u>

These payments (being exclusive of advances in the nature of loans) embraced (1) cost of special tools and "increased facilities" owned by the Government but located in contractors' plants, (2) fixed profits on completed units delivered, (3) royalties on completed units delivered, (4) cost of manufacture of completed units delivered, and (5) payments for

work in process, that is, for materials, labor and overhead expense applicable to units in course of production. The distribution of these payments to June 30, 1918, is:

Special tools and increased facilities owned by Government .....	\$6,840,971.70
Fixed profits on completed units delivered .....	3,279,028.18
Royalties on completed units delivered .....	374,986.40
Payments to June 30, 1918, under cost-plus contracts for labor, materials and overhead charges applicable to delivered units and to work in process .....	<u>39,052,883.43</u>
	<u>\$49,547,869.71</u>

It is impossible at this time, by reason of the state of the accounts, to divide the last item covering cost of manufacture so as to give separately the manufacturing cost (exclusive of fixed profits and royalties) of the units which had been delivered and the cost of work in process at the close of the fiscal year.

APPROPRIATIONS AND OBLIGATIONS FOR FISCAL  
YEAR JUNE 30, 1918, TO JUNE 30, 1919

## Continuance of Prior Appropriations

The Act of July 9, 1918, making appropriations for the fiscal year 1918-1919, continued the prior appropriation of \$640,000,000, and other aeronautical appropriations, thus making them available for the present fiscal year and for the payment of obligations incurred prior to the passage of the Act. Under this provision the production orders given in the last fiscal year, which remain uncanceled, will be continued and payments will be made in accordance with the terms of the existing contracts as production progresses.

## New Appropriations

The Act of July 9, 1918, also made a new appropriation for the Air Service of \$884,304,758. This appropriation is available for the purchase, manufacture, maintenance, repair and operation of airships, war balloons and other aerial machines, with equipment, aviation stations, schools and fields; for the expenses of officers, enlisted men and civilian employees; and also for training, experimental work, creation, expansion, acquisition and development of plants, etc. Of this amount, there has been apportioned for Air Service Production the sum of \$760,000,000, of which \$200,000,000 has been set aside for airplanes, their spare parts, instruments and accessories, \$250,000,000 for engines, their repair parts, instruments and accessories, and \$200,000,000 for foreign expenditures. Various items for balloons, oils, gases and chemicals, transportation, plants, miscellaneous equipment and supplies, experimentation, and pay of Reserve Corps and civilians make up the remainder.

Against this new appropriation, thus apportioned, the obligations incurred to Sept. 30, 1918 (exclusive of the Sales Department) amounted to \$151,580,503.35, of which \$21,603,470.90 is for airplanes, their spare parts, etc., and \$102,746,372.91 is for engines, their repair parts, etc. The total payments against the new obligations amounted, to Sept. 30, 1918, to \$3,670,707.66 (exclusive of foreign expenditures and transfers to other departments), leaving then unexpended of the new appropriation of \$760,000,000, apportioned to Air Service Production, the sum of \$756,329,292.34.

## Payments Since June 30, 1918, and Total Payments to Date

The last financial reports available are of Sept. 30, 1918. The disbursements to that date which were made after June 30, 1918, for all aeronautical purposes and were chargeable to the appropriations for the prior fiscal year (continued as above stated) are as follows:

Disbursed from the \$640,000,000 appropriation (Act of June 24, 1917) .....	\$128,265,038.31
Disbursed from other aeronautical appropriations .....	<u>7,250,916.36</u>

Total disbursed since June 30, 1918, under prior appropriations for aeronautical purposes .....

\$135,515,953.67

The total disbursements for aeronautical purposes from June 30, 1918, to September 30, 1918, are in the aggregate:

Under appropriations prior to June 30, 1918 .....	\$135,515,953.67
Under appropriations after that date, as above .....	<u>3,670,707.66</u>

Total .....

\$139,186,661.33

These disbursements for all aeronautical purposes can not at present be apportioned so as to show separately the amounts disbursed since June 30, 1918, for airplanes and engines and parts.

## Deliveries to October 11, 1918

The total deliveries of airplanes and engines (exclusive of spare parts) to Oct. 11, 1918, appear, by the Government's reports, to be as follows:

**Training Planes**

	Since June 30, 1918	Total to Oct. 11, 1918
JN-4D .....	615	3587
SJ-1 .....		1600
JN-4H and JN-6H .....	609	1432
S4-B .....		100
S4-C .....	225	298
Penguin .....	245	295
E-1 .....	12	12
	1706	7324

**Engines for Training Planes.**

OX-5 .....	2532	8006
A-7a (Hall-Scott) .....	62	2250
Gnome 100 H.P. ....	69	278
LeRhône 80 H.P. ....	679	747
Hispano 150 H.P. ....	824	3012
Lawrence .....	328	442
	4494	14,735

**Service Planes.**

DeHaviland-4s .....	1821	2350†
Handley - Page (parts 85% complete) .....	100*	100
Le Pere .....	5	5
SE-5 .....	2	2
	1928	2457

**Engines for Service Planes**

Liberty (U.S.)-12s .....	7299	9689†
Hispano 180 H.P. ....	242	242
Hispano 300 H.P. ....	3	5
Bugatti .....	1	1
	7545	9937

\*25 sets of wooden parts and no metal parts delivered to June 30, 1918.

†Since the above was prepared information has been received that, to Oct. 18, 1918, 2556 DeHaviland-4s and 10,568 Liberty (U.S.)-12s have been delivered.

**PAYMENTS FOR AIRPLANES CONDEMNED****Standard J-1 Training Planes**

This type of plane was condemned as dangerous, in June, 1918, because of the unsuitability of the motor (Hall-Scott, A7a) used with it. There were 1600 of these SJ-1 planes ordered and delivered, and all deliveries had been made prior to June 30, 1918. The entire amount disbursed for these planes and their spare parts to Sept. 30, 1918, the date of the last financial statement, is \$11,027,733.61, of which \$8,593,576.11 was under cost-plus contracts.

There were 2250 A7a engines ordered for these planes all of which, with parts, have been delivered. The amount disbursed for these engines, and parts (exclusively under fixed-price contracts) to Sept. 30, 1918, amounted to \$6,487,134.75.

The aggregate cost of the SJ-1 planes with the A7a engines with spare parts, to Sept. 30, 1918, amounted to \$17,514,868.36.

There appears to have been no defect in the SJ-1 plane itself, and there is an expectation that it may be utilized by the installation of another engine. The cost of adapting these planes to such an installation may amount to \$2,000 a plane.

What salvage may ultimately be gained in this way, or on the A7a engines, cannot now be determined.

**Bristol Fighters**

The Bristol Fighter was condemned as unsafe in July, 1918. A contract for 2000 of these planes and for 1200 sets of spare parts had been placed with the Curtiss Aeroplane & Motor Corp. on a cost-plus basis at an estimated cost of \$19,190,100. Orders were also given to the Hayes-Ionia Co. and to the Lewis Spring & Axle Co., each for 400 sets of spare parts, at the estimated cost of \$1,890,000, or \$3,780,000 in all. The estimated cost of the Bristol planes and spares was thus \$22,970,100.

Only 27 had been delivered prior to cancellation, but there was a large amount of work in process. The amount shown by the accounts of the Bureau of Aircraft Production to have been paid on these contracts to Sept. 30, 1918 (exclusive of "increased facilities" owned by the Government), is about \$2,350,000. Taking the materials purchased for the Bristols, the labor and estimated overhead charges, it would appear that the total amount expended by the Curtiss Co. in the course of the production of the Bristols was about \$3,000,000. This does not include any claim for damages for the cancellation of the contract. The Finance Division of the Bureau of Aircraft Production makes a general estimate (which includes unpaid vouchers and possible claims for damages growing out of the cancellation of contracts) that the aggregate cost of the Bristol will amount to about \$6,500,000. What salvage there may be on the materials cannot now be determined.

The Liberty engines intended to be used in the Bristols can be utilized in other planes.

On this estimate, the cost to the Government of the SJ-1

planes (with engines), and on the Bristol planes, subject to reduction by whatever salvage there may be, amounts to \$24,000,000.\*

\*Further information has been received that a contract is contemplated under which about \$3,500,000 of Bristol parts may be used in a new type of plane, which, if successful, would reduce the estimated loss on the Bristols to \$3,000,000 and the total loss on SJ-1s and Bristols, subject to salvage on the SJ-1s, to \$20,500,000.

**SECOND. RESPONSIBLE OFFICERS AND ADVISORY BOARDS**

By the Act of July 24, 1917, full authority was given to the President to provide, through the War Department, for the purchase, manufacture, maintenance and operation of all types of aircraft, with all necessary equipment.

**Signal Corps**

Under the Secretary of War, the authority to establish the aircraft program and the control and administration of matters relating to aircraft production for the Army were vested in the Chief Signal Officer, Brigadier-General George O. Squier. It was under his direction that the organization of the Aviation Section of the Signal Corps, with its various departments of production, supply, inspection and accounting, was effected. The matter of aircraft production was intrusted to the Equipment Division, which was organized on Aug. 2, 1917.

Edward A. Deeds was made Chief of this Division with Sydney D. Waldon as his assistant. At the same time Robert L. Montgomery was made Chief of the Finance and Supply Division. There was a reorganization on Aug. 29, 1917, by which these two divisions were abolished and the functions of both were transferred to a new Equipment Division with Edward A. Deeds in charge.

Robert L. Montgomery was made the head of the Finance Department of the Equipment Division. Deeds, Montgomery and Waldon had been members of the Aircraft Production Board and in or about August, 1917, they were commissioned with the rank of Colonel.

Thus, Colonel Deeds as the head of the Equipment Division had direct charge, under the Chief Signal Officer, of all matters relating to aircraft production. On Jan. 14, 1918, Colonel Deeds became Industrial Executive in the Executive Division of the Signal Corps and was succeeded by Colonel Montgomery as head of the Equipment Division, but despite the change in technical relation it is apparent that Colonel Deeds remained in practical charge, under the Chief Signal Officer, of production. In February, 1918, William C. Potter became the head of the Equipment Division and remained in this position until the passage of the Act of May 20, 1918.

**Bureau of Aircraft Production**

By order of the President, dated May 20, 1918 (promulgated May 24, 1918) the Chief Signal Officer was put in charge of military signal duties, not connected with the Aviation Section; General W. L. Kenly was appointed Director of Military Aeronautics and charged with the duties which had formerly pertained to the Aviation Section, except so far as they related to aircraft production, and for the latter purpose the executive agency known as the Bureau of Aircraft Production was established. John D. Ryan was appointed head of this Bureau and thus became Director of Aircraft Production, Mr. Potter taking the post of Assistant Director.

**ADVISORY BODIES****National Advisory Committee for Aeronautics**

By the Act of March 3, 1915, an Advisory Committee for Aeronautics was established to consist of two members from the War Department, two from the Navy Department, a representative each of the Smithsonian Institution, of the United States Weather Bureau, and of the United States Bureau of Standards, together with not more than five additional persons qualified as experts. The prescribed duty of the Committee was to supervise and direct the scientific study of the problems of flying with a view to their practical solution. This body has been continuously maintained; it has examined numerous inventions and has been engaged in scientific study. But it has had nothing to do with the formulation of the aircraft program or with decisions as to the types of planes or engines selected for production.

The Committee was also active in securing the adjustment reflected in what is known as the cross-license agreement for the payment of royalties for the use of patented inventions pertaining to aircraft.

**Joint Army and Navy Technical Aircraft Board**

This Board was constituted in the early part of May, 1917. It was composed of officers of special qualifications by reason

of scientific study and experience, who were designated by the Secretary of War and the Secretary of the Navy respectively. The declared purpose was to "standardize, so far as possible, the designs and general specifications of aircraft except Zeppelins." The Board has been in continuous existence and has made various recommendations. These, however, have not been controlling and the Board has had no authority to enforce its views.

#### Aircraft Production Board

The Aircraft Production Board was created in May, 1917, pursuant to a resolution of the Council of National Defense. Its function was solely advisory. The initial steps in organization were taken under the authority of the Council of National Defense by Howard E. Coffin, who became Chairman of the Board and selected the civilian personnel consisting of Edward A. Deeds, Sidney D. Waldon and Robert L. Montgomery. Mr. Coffin—Vice-President of the Hudson Motor Car Company—was a member of the Advisory Commission of the Council of National Defense. Mr. Deeds had been engaged in manufacturing enterprises at Dayton; in April, 1917, he had been appointed a member of the Munitions Standards Board and placed on the Sub-Committee on Fuses and Detonators. Mr. Waldon had formerly been a Vice-President of the Packard Motor Car Company. Mr. Montgomery was a member of the firm of Montgomery, Clothier & Tyler, bankers and brokers, of Philadelphia. In addition to the four civilian members, the Chief Signal Officer and Rear Admiral D. W. Taylor, Chief of the Bureau of Construction, were appointed members of the Board representing the Army and Navy respectively.

While the Aircraft Production Board had no authority to commit the Government, the Board was continuously active in the formulation of programs and the adoption of resolutions of advice. Numerous contracts for airplanes and engines were placed upon its recommendation. When the Equipment Division of the Aviation Section of the Signal Corps was organized in August, 1917, the work of the Board became of less actual importance, though it was still conspicuous in routine. Colonel Deeds, Colonel Waldon and Colonel Montgomery now had executive duties in the Equipment Division under the Chief Signal Officer and for the most part the recommendations relating to the Army aircraft program naturally followed the views of the Army officers who were in actual control. Similarly, the recommendations relating to the Navy reflected Navy proposals. The Board, however, afforded a valuable opportunity for the interchange of opinion and the unification of effort.

#### Aircraft Board

The Aircraft Board, superseding the former organization, was established by the Act of Oct. 1, 1917. This was composed of nine members, including the Chief Signal Officer (Major-General Squier) and two other representatives of the Army, and the Chief Constructor of the Navy (Rear Admiral Irwin) and two other naval officers. For the Army, the Secretary of War designated Colonel Deeds and Colonel Montgomery; and for the Navy, the Secretary of the Navy designated Captain N. E. Irwin and Lieut.-Com. A. K. Atkins. The civilian members, appointed by the President with the advice and consent of the Senate, were Mr. Coffin (Chairman), Richard F. Howe (who had been connected with the International Harvester Company) and Harry B. Thayer (President of the Western Electric Company),—the last-named being appointed in February, 1918.

The Act creating the Aircraft Board empowered it under the direction and control of the Secretary of War and the Secretary of the Navy.

to supervise and direct, in accordance with the requirements prescribed or approved by the respective departments, the purchase, production, and manufacture of aircraft, engines and all ordnance and instruments used in connection therewith, and accessories and materials therefor, including the purchase, lease, acquisition or construction of plants for the manufacture of aircraft, engines and accessories; provided, that the Board may make recommendations as to contracts and their distribution in connection with the foregoing, but every contract shall be made by the already constituted authorities of the respective departments.

It was also provided that

except upon the joint and concurrent approval of the Secretary of War and the Secretary of the Navy there shall not be established or maintained under the Board any office or organization duplicating or replacing, in whole or in part, any office or organization now existing that can be properly established or maintained by appropriations made for or available for the military or naval service.

In February, 1918, Acting Judge Advocate General S. T. Ansell gave an opinion to the effect that the provisions of the Act should be construed to contemplate "only advisory or recommendatory functions". Thereupon, the Chief Signal Officer, in an order approved by the Secretary of War and the Sec-

retary of the Navy, defined the duties of the Aircraft Board as follows:

- a. To act as a clearing house between the General Staff and the Signal Corps for all matters pertaining to raw materials for foreign governments for the production of aircraft, the Equipment Division of the Signal Corps to act as purchasing agency.
- b. To act as a clearing house between the General Staff and the Signal Corps for all information in relation to requirements of foreign governments for aircraft to be manufactured in the United States.
- c. To act as a clearing house for all information as to requirements as between the army and navy for aircraft and raw materials.
- d. To study the requirements of the army and navy as regards combat and training planes. To study types with the Technical Divisions of the army and navy to the end that recommendations be made that given types be placed with industrial plants best fitted to undertake their manufacture. The Aircraft Board shall have no direct communication with manufacturing plants, except through the medium of the procurement divisions.
- e. As a result of above studies the Aircraft Board may recommend that preparations be made for production before actual contracts are made.
- f. To recommend the placing of experimental contract.
- g. All programs should be made up by the Board from information which shall be furnished by the proper army and navy military and naval branches, on the one hand, and the Equipment and Production Divisions of the army and navy on the other. All foreign cables respecting aircraft production should be cleared through the Board.
- h. The Aircraft Board should be the instrumentality through which contact is made on matters of large policy with other bodies such as Shipping Board, Allied representatives, etc.

Despite the broad language of the Act of Congress as to the power which might be committed to the Board under the direction of the Secretary of War and the Secretary of the Navy, it will be observed that this executive order had the effect of greatly limiting the authority of the Board and that it was denied even the right to hold "direct communication with manufacturing plants". It was further provided that all programs should be made up by the Board "from information which shall be furnished by the proper Army and Navy Military and Naval Branches on the one hand and the Equipment and Production Divisions of the Army and Navy on the other". The manifest purpose was to leave no question that the actual control of aircraft production rested with the Military and Naval officers.

The Aircraft Board held frequent sessions, and continuously made recommendations upon which action was taken and contracts placed, the service of the Board being virtually that of a clearing house for proposals which generally emanated from the responsible authorities and in all cases were dependent upon the action of these authorities for their final approval and execution.

#### THIRD. PERSONAL INTERESTS

There are no common law offenses against the United States, and a charge of crime under Federal law must rest exclusively upon the violation of a Federal criminal statute (United States vs. Eaton, 144 U. S. 677, 687; United States vs. George, 228 U. S. 422).

The applicable statutes of the United States, dealing with the question of personal interest of officers and agents of the Government in Government contracts are the following:

(1) Section 41 of the Criminal Code of the United States, formerly Section 1783 of the Revised Statutes, provides:

Sec. 41. No officer or agent of any corporation, joint stock company or association and no member or agent of any firm or person directly or indirectly interested in the pecuniary profits or contracts of such corporation, joint stock company, association, or firm shall be employed or shall act as an officer or agent of the United States for the transaction of business with such corporation, joint stock company, association, or firm. Whoever shall violate the provision of this section shall be fined not more than two thousand dollars and imprisoned not more than two years.

Under this statute, it is not enough that an interested person merely recommends or advises transactions with the Government. To constitute a violation of the statute, the interested person must "be employed" or "act as an officer or agent of the United States for the transaction of business with such corporations," etc.

(2) Section 3 of the Act of Aug. 10, 1917 (Food and Fuel Control Act) provides:

Sec. 3. That no person acting either as a voluntary or paid agent or employee of the United States in any capacity, including an advisory capacity, shall solicit, induce, or attempt to induce any person or officer authorized to execute or to direct the execution of contracts on behalf of the United States to make any contract or give any order for the furnishing to the United States of work, labor, or services, or of materials, supplies, or other property of any kind or character, if such agent or employee has any pecuniary interest in such contract or order, or if he or any firm of which he is a member, or corporation, joint-stock company, or association of which he is an officer or stockholder, or in the pecuniary profits of which he is directly or indirectly interested, shall be a party thereto. Nor shall any agent or employee make, or permit any committee or other body of which he is a member, to make, or participate in making any recommendation concerning such contract or order to any council, board, or commission of the United States, or any member or subordinate thereof, without making to the best of



his knowledge and belief a full and complete disclosure in writing to such council, board, commission, or subordinate of any and every pecuniary interest which he may have in such contract or order and of his interest in any firm, corporation, company, or association being a party thereto. Nor shall he participate in the awarding of such contract or giving such order. Any willful violation of any of the provisions of this section shall be punishable by a fine of not more than \$10,000, or by imprisonment of not more than five years, or both; *Provided*, That the provisions of this section shall not change, alter or repeal section forty-one of chapter three hundred and twenty-one, Thirty-fifth Statutes at Large.

This section covers those who act in an advisory capacity. It has no application to transactions occurring before its passage.

It is apparent that the section was guardedly drawn and its limitations should be noted. The first sentence of the section applies to interested persons only where they "solicit, induce, or attempt to induce" any person or officer, who is "authorized to execute, or to direct the execution of contracts," to make any contract or give any order for labor, services, materials, etc. The use of different expressions in the different clauses of the section suggests possible shades of meaning. The act of recommending does not come within the first sentence unless it is found to amount to "soliciting," "inducing" or "attempting to induce," nor does the first sentence cover solicitations addressed to others than the persons or officers duly authorized to make the contracts or give the orders.

The second sentence relates to "recommendations" by interested persons, but it is limited to recommendations made "to any council, board, or commission of the United States, or any member or subordinate thereof" in the absence of the disclosure described. Apparently this sentence does not cover recommendations made to individual officers acting under the authority conferred upon them by law, who are not members or subordinates of a "council, board, or commission."

The third sentence provides that the interested person shall not "participate in the awarding of such contract or giving such order." This would seem to relate to those who take part in the actual awarding of the contract or giving of the order and not to those who act in an advisory capacity only.

The section concludes with the proviso that its provisions shall not alter or repeal Section 41 of the Criminal Code above quoted.

To come within these statutes an interested person must either (1) act as an officer or agent of the Government for the transaction of business with the concern in which he is interested, or (2) solicit, induce or attempt to induce the person or officer, who is authorized to execute or direct the execution of contracts, to make a contract with or give an order to, the concern to which the interest relates, or (3) take part in a recommendation to a "council, board, or commission" or subordinate or members thereof, without the disclosure stated, or (4) participate in the award of the contract or giving of the order.

In connection with these statutes attention may be called to the following provision, which appears as a rider in the Appropriation Act of March 3, 1917, immediately following an appropriation for the distribution of documents (39 Stat. p. 1106):

*Provided*, That on and after July 1, 1919, no government official or employee shall receive any salary in connection with his services as such an official or employee from any source other than the Government of the United States, except as may be contributed out of the Treasury of any State, county or municipality, and no person, association or corporation shall make any contribution to, or in any way supplement the salary of, any government official or employee for the services performed by him for the Government of the United States. Any person violating any of the terms of this proviso shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than \$1000 or imprisonment for not less than six months, or by both such fine and imprisonment as the court may determine.

It will be noted that this provision, enacted in March, 1917, is not to be operative until July 1, 1919. It may be contended with force that this constitutes a legislative declaration, by implication, that the action described by the provision, that is, the mere supplementing of the pay of Government officials by private contributions, should not be deemed contrary to law prior to the date fixed.

## INDIVIDUAL RELATIONS OF OFFICIALS

### Present Bureau of Aircraft Production

John D. Ryan—William C. Potter

There is no suggestion, and no evidence, that either Mr. Ryan or Mr. Potter has taken any part in Government transactions with any concern in which he has a personal interest.

### Members of the Aircraft Board

The relations of the members of this board, who received commissions in the army are stated hereafter. As to Mr.

Coffin, and as to the naval officers who were members of this board, it should be said that there is no evidence that any one of them has taken any part in transactions or recommendations relating to any corporation, firm or association in which he has an interest. Disclosures of interest in particular corporations have been made from time to time by Mr. Howe and Mr. Thayer and with respect to such corporations it appears that they have abstained from participating in the recommendations made by the board; except that Mr. Howe in his disclosure of interest to the board on Feb. 12, 1918, stated that he was interested in a corporation holding preferred stock of the Willys-Overland Co., and that he was present at the meetings of the board on Dec. 7 and Dec. 18, when resolutions involving a contract with that company were passed, but that he was not aware of such financial interest at those times. As the board acts in an advisory capacity simply, Sec. 41 of the Criminal Code cannot be regarded as applicable, and the limitation of Section 3 of the Act of Aug. 10, 1917, with respect to mere recommendations, have already been pointed out.

### Officers of the Signal Corps Formerly in Control of Aircraft Production

#### (1) The Chief Signal Officer

It does not appear that General Squier had any interest in any corporations or concerns transacting business with the Signal Corps. The defects in the organization, which was created under his direction for the purpose of aircraft production, are matters distinct from any question of personal interest and will be considered in another division of this report.

#### (2) Colonel Edward A. Deeds

The charges pertaining to personal interest in Government contracts relate particularly to Colonel Edward A. Deeds and grow out of the highly suggestive transactions with his former business associates at Dayton. These transactions have been subjected to careful scrutiny.

Colonel Deeds was born near Granville, Ohio, on March 12, 1874. There is testimony that he once said that his name originally was "Dietz." No public record has been found to this effect. Colonel Deeds denies making the remark attributed to him and states that his family has borne the name of Deeds for at least four generations—his great-grandfather of that name coming from Pennsylvania.

For many years Colonel Deeds was an officer of the National Cash Register Co., and was one of several connected with that organization who were indicted in the Federal District Court for the Southern District of Ohio in 1912, for violation of the Sherman Anti-Trust Act. Upon the trial, Deeds, with other defendants, was convicted, but this conviction was set aside by the Circuit Court of Appeals (*Patterson v. United States*, 222 Fed. 599) and the prosecution went no further.

At the time of our entry into the war Mr. Deeds had large business interests at Dayton. His intimate business associates were Charles F. Kettering and H. E. Talbott. Mr. Deeds and Mr. Kettering (an inventor and engineer of ability) have been jointly associated in many enterprises with equal shares, it being their policy to organize corporations and to take their respective interests in stocks.

Mr. Deeds has supplied the financial talent and Mr. Kettering, who is without any aptitude for business details, the engineering skill. They have had, and still have, a common agent of a highly confidential sort, George B. Smith of Dayton, who holds the power of attorney of each, keeps their respective books, has charge of their bank accounts, signs their checks and generally looks after their financial affairs. They are still associated in various undertakings, and their relations are of the most intimate character.

In 1904 Kettering was employed in the National Cash Register Co. as a designer in the engineering department, and later he became associated with Deeds in the development of what is known as the Delco ignition system for automobiles. In the course of this development Deeds and Kettering organized the Dayton Engineering Laboratories Co., known as the Delco company. The enterprise was successful and the common stock was sold by Deeds and Kettering in 1916 to the United Motors Corp. for several million dollars in cash and certain shares of stock. Deeds and Kettering each retained a few shares of preferred stock; Deeds continued as president of the corporation, with a salary of \$60,000 a year, and Kettering as vice-president with a salary of \$50,000.

In April, 1915, Deeds, Kettering, H. E. Talbott, Sr., and his son, H. E. Talbott, Jr., organized the Dayton Metal Products Co. with a capital stock of \$200,000. The stock was held as follows: Talbott, Sr., 900 shares; Deeds, 500

shares; Kettering, 499 shares; Talbott, Jr., 99 shares; Charles H. Mead, 1 share, and George B. McCann, 1 share.

Prior to our entry into the war, this company had profitable fuse contracts with the British Government and had accumulated a considerable surplus. It appears that in the spring of 1917 both Deeds and Talbott were appointed on the Sub-Committee on Fuses and Detonators of the Munitions Standards Board. In 1916 the company had a contract with the Navy Department for fuses, and it received other fuse contracts from the Navy and the Ordnance Department of the Army in 1917.

As vice-president of this company Deeds had a salary of \$25,000 a year. The relation of the Dayton Metal Products Co. to aircraft production is that this company, in the latter part of the year 1917, acquired all the stock (save four qualifying shares) of the Dayton Wright Airplane Co., and also has sub-contracts for metal parts with contractors making airplanes and engines. The Dayton Metal Products Co. also subscribed and paid for 1000 shares (par value \$100,000) of the stock of the Lincoln Motor Co., which was organized to build Liberty engines, and has a paid-up capital stock of \$850,000.

In September, 1916, Deeds and Kettering organized the Domestic Building Co. of Dayton, for the purpose of erecting and financing plants for the use of various companies. The capital stock is now \$1,000,000, of which all but four qualifying shares are held by Deeds and Kettering in equal parts. This company owned the land and erected the building acquired by the Dayton Wright Airplane Co. for its principal airplane plant.

On April 9, 1917, the Dayton Wright Airplane Co. was incorporated with a capital stock of \$500,000 by Deeds, Kettering, H. E. Talbott and H. E. Talbott, Jr., in conjunction with Orville Wright. They had taken over the former Wright organization and thus had started an airplane enterprise at Dayton in a small way in the summer of 1916.

The larger enterprise of the Dayton Wright Airplane Co. was launched about the time of our entry into the war, manifestly with the expectation of obtaining Government contracts. While Deeds was one of the incorporators, he did not become a stockholder, the subscriptions for the first 5000 shares being as follows: H. E. Talbott 1990 shares, C. F. Kettering 2000 shares, H. E. Talbott, Jr., 990 shares, George H. Mead 10 shares, and C. A. Craighead 10 shares. In August, 1917, the capital stock was increased to \$1,000,000 (\$600,000 common and \$400,000 preferred).

The new common stock was taken by Messrs. Talbotts and Kettering in the proportion of two-fifths, two-fifths and one-fifth. There were early negotiations for a Government contract and as early as June 12, 1917, a contract with the company was recommended by the Aircraft Production Board. The contract was executed on Aug. 17, 1917 (under date of Aug. 1, 1917) and was for 400 Standard J-1 training planes at the fixed price of \$6,500 each.

For this, there was substituted the contract dated Sept. 7, 1917, which was also recommended by the Aircraft Production Board and was approved by General Squier. This contract was for 400 Standard-J airplanes, 2000 DeHaviland-9s and 1500 Martinsydes with spare parts. By later modifications the Martinsydes and DeHaviland-9s were omitted and provision was made for 4000 DeHaviland-4s.

These contracts were on a cost-plus basis, the estimated amount involved being upward of \$30,000,000. There was to be a fixed profit of \$620 on each Standard-J plane and \$875 on each DeHaviland, making a total fixed profit of about \$3,750,000, exclusive of fixed profit on spare parts covered by the contract, thus expected to be earned, according to the contemplated deliveries, before the end of 1918.

The contract also provided for additional profits to the extent of 25 per cent of the saving under the bogey or estimated cost of the planes (\$7,000 on the DeHavilands) and it is estimated that the additional profit on this basis would have amounted to over \$2,600,000. When the bogey cost of \$7,000 was fixed, letters were obtained from the Dayton Wright Airplane Co., and from the Fisher Body Corp. (which also had a contract for DeHavilands), that after 250 machines had been produced there would be an equitable adjustment if the bogey cost was found to be "materially wrong." Accordingly, a contract is now about to be signed reducing the bogey cost to \$5,000 and the fixed profit to \$625 per plane.

Even at this rate, the fixed profit on the 4000 DeHavilands will be \$2,500,000, and it is believed that there will be an additional profit through saving under the bogey cost, and on spare parts, of not less than \$1,000,000.

In August and September, 1917, when the first Government contracts were awarded, the capital stock of the company (\$1,000,000) had not been paid in. It was not paid in until Dec. 1, 1917, when, in one transaction, the stock was paid for

and all the shares, preferred and common, save five qualifying shares were transferred to the Dayton Metal Products Co., which thus became and still remains the owner of the Dayton Wright Airplane Co.

As the latter company practically received nothing on the issue of its capital stock save the fixed property represented by its plants, it was lacking in working capital and this at the outset was supplied by various loans and advances of the interested parties. In December the Government agreed to advance the company \$2,500,000, of which \$1,500,000 was advanced at once.

The name of Orville Wright was used in this enterprise, but his chief activity has been as a consulting engineer in connection with experimental work. He has not been responsible for production. Mr. Kettering is an engineer of ability, but his work also has been that of experimental engineering; he is not a manufacturing or production expert.

Much emphasis is placed by the parties concerned upon the fact that they were able to avail themselves of the old Wright organization which had been continued as already stated. But this was a very slender basis for the prompt selection of this newly-organized company, which had not even completed its financial arrangements, as one of the few companies immediately admitted to the advantages of large and highly profitable Government contracts.

The promoters of this enterprise, not content with these profits which were to accrue to them either directly or through their ownership of the Dayton Metal Products Co. at once took advantage of the opportunity to increase their gains by salaries as executive officers of the Dayton Wright Airplane Company. Dating from Aug. 1, 1917, the salaries thus allowed were as follows: H. E. Talbott, Sr., \$35,000; C. F. Kettering, \$35,000, and H. E. Talbott, Jr. (thirty years old, who was made president of the company), \$30,000. Talbott, Sr., was at the time receiving, and continued to receive, \$60,000 a year as president of the Dayton Metal Products Co., Kettering received a salary of \$25,000 from the Dayton Metal Products Co. and \$50,000 from the Delco Co.; and Talbott, Jr. was also receiving a salary of \$18,000 from the Dayton Metal Products Co.

There would seem to be no question but that the members of the Aircraft Production Board in recommending contracts had confidence in the capacity of those undertaking the venture, and the previous success of this group, while Mr. Deeds had been associated with them, was well known.

But the fact remains that practically at the inception of the Government's aviation activity in connection with the War, and within the sphere of Colonel Deeds' important if not commanding influence, his former business associates were placed at once through Government contracts in a position where they had the assurance of very large profits upon a relatively small investment of their own money and in addition were able to secure generous salaries which they charged against the Government as part of the cost of manufacture.

That Deeds, Kettering and Talbott continued to be on the most intimate and confidential footing in connection with the prosecution of the Government work by the Dayton Wright Airplane Company is apparent from their correspondence, of which the following are excerpts:

Letter Deeds to Kettering, June 13, 1917:

Mr. C. F. Kettering, Washington, June 13, 1917.  
City National Bank Bldg.,  
Dayton, Ohio.

My dear C. F.:

You will be interested to know that the standard training machine is going to be called the U. S. primary training and will not be called the Curtiss J.N. This was decided last week and I forgot to tell you when in Dayton.

Provision will be made for either Mr. Coffin or myself to appear before the S. A. E., and as I am one of the Committee on Arrangements will see that the plans of the Aircraft Production Board get properly before the Association.

Relative to the design of planes, I do not care to write what is being done but will discuss it with you when I get home and you will see that we have already gone away down the pike in this matter. Everything is filling up now in pretty good shape.

Yours very truly, E. A.

\*Society of Automotive engineers.

Telegram Deeds to Talbott, July 3, 1917:

Mr. H. E. Talbott, July 3, 1917.  
Dayton, Ohio.

General Squier went direct to Detroit. Will probably spend fourth at his old home in Michigan. May be in Dayton Thursday or Friday, arriving there from Detroit or from Champagne, Illinois. Harold, Kettering and Wright can take care of him. He will be interested in the Dayton Wright factory and laboratory. Orville Wright laboratory and especially Mr. Kettering's views on scientific subjects. In general he is highly technical.

E. A. Deeds.

Telegram Kettering to Deeds, August 4, 1917:

E. A. Deeds, Dayton, Ohio, August 4, 1917.  
Room 527, Munsey Building,  
Washington, D. C.

We believe all confidential telegrams should be sent to Mr. H. E.

Talbott, Sr., City National Bank Building, or George B. Smith, instead of the Dayton Wright Airplane Company.  
C. F. Kettering.

#### Telegram Deeds to Kettering, August 4, 1917:

August 4, 1917.  
Mr. C. F. Kettering,  
City National Bank Building,  
Dayton, Ohio.  
Hereafter all confidential telegrams will be sent to H. E. Talbott, Sr., instead of to the Dayton Wright Airplane Company.  
E. A. Deeds.

#### Telegram Deeds to Talbott, September 16, 1917:

Old Point, Virginia, Sept. 16, 1917.  
H. E. Talbott,  
Dayton, Ohio.  
For your personal information as coming from your local attorney. Judge Advocate General has ruled it legal for government to select one, contractor one and the two a third, as appraisers of market value of plant at expiration of contract. If you care to raise the question the above will be found to be the final ruling.  
E. A. Deeds.

When this last telegram, which puts in a strong light the relations of the parties, was sent, Deeds was an officer in the Army. This highly improper conduct, in holding communication in this manner with his former business associate in a transaction pending between the Dayton Wright Company and the Government Department in Colonel Deeds' charge, demands the attention of the military authorities.

But evidence of favoritism, influence, or confidential communications of this sort, however otherwise reprehensible, do not make out criminal liability under the statutes above quoted, unless it appears that the representative of the Government has a pecuniary interest in the Government contract or order, or is an officer or stockholder of, or has a pecuniary interest in, a corporation, firm or association which is a party to the Government contract or order. And the question is whether Colonel Deeds had such an interest. His statement is that he had no such interest but on the contrary had given up large salaries to devote himself to the Government service.

About the time he received his commission as Colonel in the Army, Mr. Deeds addressed the following communications to the Secretary of War and to the Aircraft Production Board, under date of August 28, 1917:

Washington, D. C., Aug. 28, 1917.

Hon. Newton D. Baker,  
Secretary of War,  
Washington, D. C.

Dear Sir:

You have honored me by appointment temporarily as an officer in the Regular Army of the United States, and as a member of the Aircraft Production Board connected with your Department. It is possible that this Board in the development of the airplane work may wish to recommend a contract with some of the corporations in which I have had an interest. Following the advice of counsel, I have resigned my official relations with these corporations, and made bona fide transfers of my stock therein to other parties.

For your protection as well as my own, I desire to file with your Department a copy of a written disclosure of my relations, both past and present, to these corporations which I have this day filed with the Aircraft Production Board, and I enclose same herewith.

In serving in the positions to which you have appointed me, I desire to comply with both the spirit and letter of the law, and to do no act which might invite criticism upon myself or your Department.

I count it an honor and privilege to be thus called into the service of our country and am pleased to make whatever sacrifice of time and money that service may demand.

I enclose a second copy of my statement to be filed with you as Chairman of the Council of National Defense.

Yours very respectfully,  
(Signed) E. A. Deeds.

Washington, D. C.,  
August 28, 1917.

The Aircraft Production Board,  
Washington, D. C.  
Gentlemen:

As a member of your Board and interested in the letting of contracts on the recommendation of that Board on behalf of the Government, I desire at this time to make a full and complete disclosure of the interest I may have in any corporation which might be a party to any such contract, or which might furnish supplies to the Government through the instrumentalities of your Board.

I was a stockholder and officer in the following, to wit:

- (1) The United Motors Company of New York, being a union of several companies manufacturing automobile parts.
- (2) The Dayton Engineering Laboratories Company, of Dayton, Ohio, manufacturers of ignition and starting devices for automobiles.
- (3) The Dayton Metal Products Company, of Dayton, Ohio, engaged among other things in the manufacture of munitions.
- (4) The Domestic Building Company, of Dayton, Ohio, a corporation formed for the development of real estate and which now owns the land and buildings leased to The Dayton Wright Airplane Company.

In all of the foregoing corporations I have severed my official connection therewith by resignation and have made a bona fide transfer to other parties of all my stock therein.

In addition to the above corporations, I was an incorporator of The Dayton Wright Airplane Company, but never owned any stock therein. I am also the president of and a large stockholder in The Domestic Engineering Company, of Dayton, Ohio, makers of Delco Light Plants, and expect to retain my official connection therewith and my financial interest therein.

I also own the ground embraced in The Moraine Experimental

Flying Field near Dayton, Ohio, used for aviation purposes but out of which I receive no compensation.

I make this disclosure now so that your Board, as the representative of the Government, may be fully informed as to my relations, past and present, with these corporations, and be thus enabled to act wisely on any order or contract involving any of these corporations either directly or indirectly. I desire that this written disclosure be recorded in the minutes of your Board for the mutual protection of all of us.

Yours very respectfully,  
(Signed) E. A. Deeds.

The facts with respect to the disposition of Colonel Deeds' interests (so far as pertinent to this inquiry), and the method of disposition, are as follows:

#### United Motors Corp.

#### Dayton Engineering Laboratories Co.

The significance of Colonel Deeds' statement with respect to the disposition of his interests in these corporations is that the Delco ignition system is used in the airplane engine known as the Liberty motor. In the planes manufactured abroad, the magneto ignition system had been used and prior to its use on the Liberty motor, it appears that the Delco system had not been employed on an airplane engine. In the specifications for the Liberty motor, the Delco system was required to be installed with the first 20,000 engines. As already stated, the Delco system is controlled by the Dayton Engineering Laboratories Co. (Delco company) and this company is owned by the United Motors Corp.

On the sale of his Delco stock to the United Motors Corp., Deeds had received, in addition to cash, 30,000 shares (no par value) of its stock. [The total issued stock amounted to 1,200,000 shares.] After certain distributions, he still held at the time in question, 17,500 of these shares. He also had an interest in a pool of certain shares, on which 3880 additional shares were received in November, 1917.

In his letter (above quoted) to the Aircraft Production Board, Deeds stated that he had severed his official connection with the United Motors Corp. and had made a bona fide transfer of his shares. He had resigned as Vice-President and director on Aug. 16, 1917.

The only transfer made by him of any of his shares in that company was by gift to his wife. He endorsed, for transfer, the certificates for 17,500 shares on October 13, 1917, and they were transferred to Mrs. Deeds' name on October 17, 1917.

Thereafter, it is testified, they were held by the confidential agent, George B. Smith, for her account. Entries of the transfer were made in Colonel Deeds' books by Smith not earlier than October, 1917, and were dated back to August 28, 1917. In the earlier statement of his assets on August 31, 1917, submitted to him by Smith, the shares appear as part of his property. Mrs. Deeds' name first appears in the statement of assets of October 31, 1917. The remaining shares (3880) received on the dissolution of the pool about November 22, 1917, were transferred from the pool manager directly to Mrs. Deeds, as Mr. Deeds' donee, and the certificates were received by Smith on her behalf. Prior to the transfer of the stock in October and at the time of Colonel Deeds' letter to the Aircraft Production Board, he had simply told his wife that it was to be her stock, and it does not appear that there had been an effective gift of the shares. The actual value of the 21,380 shares was approximately \$500,000.

In addition to these shares in the United Motors Corp., Deeds also held 38 shares of Delco preferred stock, which he had retained at the time of the sale of his common stock. These preferred shares he transferred to Kettering. It appears that the transfer was first entered by Smith in Colonel Deeds' private journal in December, 1917.

The date of the entry was afterwards changed to August 28, 1917 to correspond to the date when Smith was notified that Colonel Deeds had received his commission in the Army. The stock was transferred to Kettering on the books of the company on October 13, 1917. The payment was made by debits in Deeds' open account with Kettering.

If there were evidence that Colonel Deeds had acted as officer or agent of the Government in the transactions with the Delco Company, or with the United Motors Corp., prior to October 13, 1917, there would be ground by reason of his interest for charging a violation of the statute, and it may be doubted whether there was then or thereafter such a transfer as would avail to take the case out of the statutory prohibition.

But there is no evidence that Deeds acted for the Government in any transaction with either of these corporations. So far as appears, the Government made no contracts for Delco ignition either with the Delco company or with the United Motors Corp.

The contracts for the Delco system were made by the contractors who were manufacturing the engines under contracts



with the Government, and the dealings with the Delco company or with the United Motors Corp. in relation to the Delco system were had by these contractors.

It must also be said that, despite the natural inference from former business association and interests, the proof is lacking that the selection of the Delco system was due to the solicitation of Deeds. It can hardly be questioned that the design of the Liberty motor contemplated the use of the Delco system, and that the magneto system could be used only by a special adaptation.

The Delco system, however, had been extensively used for automobiles, notably by the Cadillac and Packard companies, and was in high favor with those who were developing the Liberty motor. While there has been a question as to which system was preferable, and it has been understood that foreign representatives at first did not approve the departure from foreign practice, and many may still be found to disapprove it, there is considerable evidence that the use of Delco ignition has been growing in favor, and there has been testimony in this investigation from impartial and competent sources commending its adoption.

Special attention has been given to the memorandum directing the use of the Delco system in the first 20,000 Liberty motors. In the first memorandum by Major Gray, Chief of the Specification Section, under date of October 6, 1916, the accessories recommended were so placed that the Delco ignition came last on the list. This was then rearranged, apparently to attract less attention to Delco in alphabetical order.

The recommendation, Major Gray testifies, for the use of the Delco system and the other accessories specified came from Major Vincent, one of the designers of the Liberty motor and then executive officer of the Airplane Experimental Department of the Equipment Division, who stated that he did not believe they would be justified "in specifying for quantity production any other accessories than those which had thus far been tested out satisfactorily."

The situation was a delicate one, says Major Gray, as Major Gray himself had been president of the Hess Bright Company (he had resigned his office and disposed of his holdings in June, 1917), whose ball-bearings were required as one of the accessories, and Colonel Deeds had developed the Delco system. Major Gray testifies that he brought the question to Colonel Deeds' attention, who said, "I do not like really to have anything to say about it, because in that list is the Delco ignition and if I authorize it it will look as though I have an axe to grind." The sum of the matter is that there is no satisfactory evidence that Colonel Deeds signed, prepared or directed the order for the use of the Delco ignition although it cannot be doubted that he desired the system to be used. Nor is there evidence that any recommendation was made by Colonel Deeds to the Aircraft Board or to any other council, board or commission regarding the matter.

His statement to the Aircraft Production Board on Aug. 28, 1917, that he had made a *bona fide* transfer of all his stock in the United Motors Corporation, when the stock had not in fact been transferred and at most he contemplated a gift of the stock to his wife, was neither candid nor truthful, and is certainly not to be regarded as a "full and complete disclosure." But in the absence of proof of solicitation, inducement or recommendation by him, or action on his part as an officer or agent of the Government in transactions with the United Motors Corp. or the Delco company, there are no facts bringing the case within the statutory prohibition.

#### Domestic Building Co.

In his letter of Aug. 28, 1917, to the Aircraft Production Board, Colonel Deeds stated that he had made a *bona fide* transfer of his stock in this company. This was not true. It appears that on that date he resigned the office of president of the company, but he did not dispose of his stock. The stock of that company is still held in equal portions by Deeds and Kettering.

Colonel Deeds was plainly led to make the statement in his letter by the fact that the Domestic Building Co. had acquired the land and had erected the building which was in course of completion, and was then occupied and intended to be used as the principal plant of the Dayton Wright Airplane Co. for the manufacture of airplanes.

It is said that in anticipation of a lease of the property to the Dayton Wright Airplane Co., it had been agreed prior to Aug. 28, 1917, that Deeds' stock in the Domestic Building Co. should be sold to Kettering.

But there is not sufficient evidence of a definite and binding agreement to that effect, or of anything more than a loose understanding between intimates, whose arrangements could at any time be adjusted to suit their mutual convenience.

Certainly, there had been no transfer of the stock. It was

not until November that there was an adjustment of accounts with this company, and then, instead of a sale of his stock by Deeds, he retained his stock in the Domestic Building Co. and the plant erected by that company was purchased by Talbott, Sr., Kettering and Talbott, Jr. who at once transferred it to the Dayton Wright Airplane Co.

On Feb. 4, 1918, the Domestic Building Co. made a direct conveyance to the Dayton Wright Airplane Co. of an additional tract of 8.34 acres, adjoining the first tract, at the price of \$13,344, or \$1,600 per acre.

However, there is no ground, so far as the retention of Deeds' stock interest in the Domestic Building Co. is concerned, for charging a violation of statute. It is not enough that the Dayton Wright Airplane Co. purchased these properties, or that certain advances by Deeds were taken into account in fixing the purchase price of the main plant, or that both parcels of land were sold at more than the amount they had cost the Domestic Building Co.

The Government has never had any contracts with the Domestic Building Co. and it does not appear that Colonel Deeds has acted as an officer or agent of the Government in any transactions between the Government and that company. The gratuitous statement contained in his letter to the Aircraft Production Board that he had made a transfer of all his stock in this company may be said to indicate a willingness to state, as an accomplished fact, a transaction which never took place but was merely in contemplation as a step to be taken if deemed to be necessary.

#### Dayton Wright Airplane Company.

Colonel Deeds' statement in his letter of August 28, 1917, that he had never been a stockholder in this company was true. The stock is owned by the Dayton Metal Products Co., and if Colonel Deeds had or has any interest through stock ownership in the profits on its contracts with the Government, this interest must be derived from an interest in the stock of the Dayton Metal Products Co.

His relation to the organization of the Dayton Wright Airplane Company is this: He was an incorporator, and while he did not subscribe for stock, and none was issued in his name, the payment of the stock of the company to the extent of upwards of four-fifths of its par value was made, in substance, by the transfer to the company of the plant built by the Domestic Building Co., owned by Deeds and Kettering, and this company received therefor unsecured notes of Talbott, Sr., Kettering and Talbott, Jr., only a small part of which has been paid. Thus, Deeds and Kettering through the Domestic Building Co., virtually furnished the main plant of the Dayton Wright Airplane Co., on a credit to the Talbotts and Kettering. The transaction was as follows:

The airplane factory was erected on a tract which the Domestic Building Company had acquired from the Moraine Development Company (a corporation in which Deeds and Kettering were largely interested) at a price a little over \$753 an acre. The building was intended for the use of the Domestic Engineering Company, another concern owned by Deeds and Kettering, which was engaged in the business of supplying Delco lights for general illuminating purposes.

It was later decided that it should be used by the Dayton Wright Airplane Co., which entered into possession. Still later, it was arranged that the syndicate composed of Talbott, Sr., Kettering and Talbott, Jr., should purchase the plant from the Domestic Building Company and convey it to the Dayton Wright Airplane Co.

In November, 1917 (while the building was still incomplete), Mr. Allan R. Smart, a public accountant (of Barrow, Wade, Guthrie & Company) made an adjustment of the accounts of Deeds, Kettering, Talbott, Sr., and Talbott, Jr., for various advances and a balance was struck of \$683,732.16 as owing to the Domestic Building Company.

In this adjustment, the land (25.55 acres) was taken at \$1200 an acre and the building at the amount of the expenditures upon it, making the price of the plant (called the Moraine plant) \$836,401.08. The balance of \$683,732.16 was covered by three individual notes of Talbott, Sr., Kettering and Talbott, Jr., in the proportion of two-fifths, two-fifths and one-fifth, as follows: H. E. Talbott, \$273,492.87, C. F. Kettering \$273,492.87, and H. E. Talbott, Jr., \$136,748.43.

All of the notes were dated November 4, 1917, and were payable to the Domestic Building Company one year after date with 6 per cent interest. The notes are unsecured. The makers of the notes have paid interest quarterly; and, in addition, Talbott, Sr., has paid \$3,492.87 on the principal of his note, reducing it to \$270,000, and Talbott, Jr., has paid \$26,746.43 on the principal of his note, reducing it to \$110,000.

It appears that Mr. Kettering has made payments of

\$6,000. This transaction left the Talbotts and Kettering as the owners of the Moraine plant, which the Dayton Wright Airplane Company was operating, and the stock of the Dayton Wright Airplane Company for which they had subscribed had not been paid in.

The payment of the subscriptions for the stock of the Dayton Wright Airplane Co., the concurrent payment by that company for two plants (the Moraine plant, already mentioned, and another at Miamisburg), and the transfer of its stock, thus paid for, to the Dayton Metal Products Co., were effected by an exchange of checks on Dec. 1, 1917.

Shortly before, the Miamisburg plant had been acquired by Talbott, Sr. (for the syndicate), for the sum of \$60,000 and was turned over to the Dayton Wright Airplane Co., at \$127,202, the profit being divided between himself, Kettering and Talbott, Jr., according to their respective interests in the syndicate. To accomplish the desired result, the following procedure was adopted:

The Dayton Wright Airplane Co., gave to the syndicate its check for the sum of \$955,071.25, made up of the purchase price of the Moraine and Miamisburg plants (\$836,401.08 less an item of interest (\$8,531.83) for the Moraine or main plant and \$127,202 for the Miamisburg plant).

The Dayton Metal Products Co., gave its checks to the syndicate for \$183,459.55, for various balances of accounts and for \$999,500, the purchase price at par of the stock of the Dayton Wright Airplane Co. (less five shares retained). The syndicate thus received checks to the aggregate amount of \$2,138,030.80.

The syndicate gave their check to the Dayton Wright Airplane Co., in payment of the capital stock of \$1,000,000 and another check to the Dayton Metal Products Co., for \$1,136,537.20 as the purchase price of certain securities which the Dayton Metal Products Co. sold to the syndicate, making the total of the syndicate's checks \$2,136,537.20.

The Dayton Wright Airplane Co. gave its check to the Dayton Metal Products Co., in re-payment of advances for \$44,928.75, the difference between the sum of \$955,071.25 paid by the company for the plants and the sum of \$1,000,000 received for its stock.

The transaction was accomplished with a minimum use of cash (less than \$1,500), and as a result the Dayton Metal Products Co., had all the stock (save five shares) of the Dayton Wright Airplane Co.; the Dayton Wright Airplane Co., had the Moraine and the Miamisburg plants; Messrs. Talbotts and Kettering had the securities which they had purchased from the Dayton Metal Products Co.; and the Domestic Building Co. (owned by Deeds and Kettering) continued to hold the notes which the Talbotts and Kettering had given to that company on the settlement in November.

In the transfer by the syndicate of the shares of the Dayton Wright Airplane Co. to the Dayton Metal Products Co., it was agreed that all dividends in excess of 7 per cent. per annum on the transferred stock, and in excess of 8 per cent. per annum on the common stock, should be paid to Talbott, Sr., Kettering and Talbott, Jr., in the proportion of two-fifths, two-fifths and one-fifth.

Why they should have desired these profits to be divided in the syndicate proportions instead of taking the profits through their dividends, in the proportions in which they held the stock of the Dayton Metal Products Co., the purchaser of the shares, has not been made clear. The Talbotts and Kettering also took an option from the Dayton Metal Products Co., to repurchase all the shares at any time within five years for the sum of \$999,500.

#### Dayton Metal Products Company.

Colonel Deeds originally held one-fourth of the stock of this company, or 500 shares. It appears from the minutes of the Board of Directors that at a meeting of the Board in Dayton, on May 21, 1917, President Talbott stated that the company had been advised by the Ordnance Department of the Army "that, in all probability, the entire facilities of the company would be utilized for munition work, and, in all probability, contracts would be given to the company as soon as appropriations were made by the Government."

It is further set forth "that Mr. E. A. Deeds explained that he had been called to Washington and requested to take place on some of the committees of the Council of National Defense; that he had been to Washington and that he had accepted the call, and he therefore desired it that he might act as uninterested, directly or indirectly, in any manufacturing plant which was contemplating business with the Government, and that he desired to offer his resignation as vice-president and as director of the company." The minutes show the acceptance of this resignation and that Mr. Kettering was elected vice-president. The minutes of the

meeting of May 21, 1917, conclude with the following statement:

At this meeting Mr. Deeds offered for sale and discussed probable purchasers for his stock in the Dayton Metal Products Co., and Mr. Deeds offered to the directors his entire holdings of stock at its book value less 15% to cover costs and probable losses in view of the possibility of no future Government contracts being secured and the business of the company would have to be readjusted into lines being developed by the Experimental Department.

Some time subsequently—in the early part of the year 1918—the accountant drew a line across the last-mentioned statement in the minutes. He explains that he did not consider it "a corporate record," but a matter between the stockholders.

The testimony of the parties concerned is that Talbott, Sr., Kettering and Talbott, Jr., purchased all Deeds' shares in the Dayton Metal Products Co., at their book value as of May 1, 1917, less 15 per cent. and gave in settlement of the purchase price their notes as follows:

H. E. Talbott.....	200 shares	\$207,706
C. F. Kettering.....	200 shares	207,706
H. E. Talbott, Jr.....	100 shares	103,853

The notes were dated May 22, 1917, were payable to Deeds' order one year after date, with interest at 4½ per cent, and were placed in the hands of George B. Smith, the confidential agent of Deeds and Kettering. The notes were wholly unsecured. According to the stock certificate book the old certificates were cancelled and new certificates issued to the Talbotts and Kettering under date of May 22, 1917.

It is not only open to doubt whether the transaction described in the minute book took place on May 21, 1917, but on all the evidence it is reasonably clear that it did not take place on that date. The minutes are typewritten and pasted in the minute book.

No one of the parties is willing to testify positively that the proceedings described in the minutes took place on that day. Mr. S. S. King, of the Dayton Lumber & Manufacturing Company, has testified that he and Deeds went to Washington on the same train on May 18, 1917, and that they were in communication every day in Washington, from May 19th to 23d.

Furthermore, it appears that on May 21, 1917, when Mr. Deeds is represented as making his statement at the meeting of directors in Dayton, he was making his first appearance, according to the minutes of the Aircraft Production Board, at a meeting held by that Board on that day in Washington. He himself testifies that he was in Washington on that day.

While Mr. Deeds is represented as resigning his office as vice-president of the Dayton Metal Products Co. in May, 1917, he continued to draw his salary until the end of June, 1917. The notes were placed in the custody of the confidential agent Smith, but he made no entry in Deeds' bills receivable book of these notes, until September.

It does not satisfactorily appear, in view of the nature of some of the items, that the adjustment of accounts in fixing the book value and the determination of the amounts of the notes could have been made before June 30, 1917.

There are stock certificates bearing the date of May 22, 1917, and purporting to have been issued after the issue of the new certificates to the Talbotts and Kettering for the Deeds' shares, but these certificates were issued to members of the Talbott family dividing the shares he had formerly held.

Upon all the evidence, it is not established that the stock was purchased as early as May 22, 1917, and there are many indications that the transaction was dated back to that date.

However, Colonel Deeds' stock was actually transferred on the books of the company, and the notes dated May 22, 1917, were given, apparently not later than September, 1917.

On Dec. 31, 1917, interest was paid by the makers on their respective notes to that date; and interest was paid quarterly thereafter. On Jan. 18, 1918, Talbott, Sr., paid \$7,706 on account of the principal, reducing his note to \$200,000; in February, 1918, Talbott, Jr., paid \$3,853 on account of the principal, reducing his note to \$100,000, and on Sept. 11, 1918, Kettering paid, on account of his note, the sum of \$10,000.

If the transaction was a *bona fide* sale of the stock Colonel Deeds thereby parted with all his stock interest in the Dayton Metal Products Co. and thus did not have, by virtue of an interest in that stock, an interest in the profits of the Dayton Wright Airplane Co. The parties all deny that there is any secret agreement or option or understanding of any sort for a retransfer of the shares to Colonel Deeds, or for a sharing of profits with him.

To conclude: The fact is that the transfer of the shares in the Dayton Metal Products Co., which owns the stock of the Dayton Wright Airplane Co., was made to Colonel Deeds' intimate business associates on their unsecured notes, which are overdue and unpaid save to a small extent. But there is

no proof upon which it can be charged that Colonel Deeds retained an interest in the Dayton Metal Products Co. and thereby in the Dayton Wright Airplane Co.

#### The Wilbur Wright Field

This is a tract of about 2245 acres leased to the Government by the Miami Conservancy District, of which Mr. Deeds was the head. It was a portion of the area selected by the Miami Conservancy District for the impounding of waters in the event of a serious flood. The property was acquired by the Government for a flying field and was developed by the erection of hangars, barracks, a storehouse and other structures. Upward of \$3,000,000 has been expended by the Government in this development.

On April 30, 1917, Major (now General) Foulois was directed to inspect land sites for aviation purposes at various places, including Dayton, and several tracts at Dayton were examined by him, and by Captain (now Colonel) Edgar, on May 8. These officers were met at Dayton by Mr. Deeds and both Deeds and Orville Wright accompanied them on their inspection of the tracts in the vicinity. As to these, on May 11, 1917, Major Foulois reported as follows:

The largest tract of land inspected is about ten miles from Dayton and contains about 4000 acres. This tract of land is admirably suited for aviation purposes, is under the control of the Conservancy directors and any portion of it can be acquired by the Government at a very low cost. The purpose for which this land has been set aside by the State of Ohio makes it extremely desirable for aviation purposes, in that it will be always used for agricultural purposes only and no buildings or other obstacles will ever be erected within the area set aside. Options on this tract of land, or any portion thereof, will be mailed to this office within the next few days.

On May 15, 1917, General Squier recommended that the approval of the Secretary of War be obtained for the rental of several aviation training sites, including the one at Dayton which was thus described:

Approximately 2500 acres in the vicinity of Dayton, Ohio, at the rate of \$17,500 per year with the privilege of renewal for three years, and the option of purchase at \$350,000, the cost of crop destruction being \$75,000. This will provide a four-squadron training field.

Mr. Coffin, as chairman, endorsed the proposal, stating that it was "in the judgment of the Committee a wise and necessary action," and the project was approved on behalf of the Secretary of War by the Acting Chief of Staff. On May 19, 1917, General Squier authorized Captain Edgar to lease this site, and others, and to proceed with the contracting for the necessary buildings.

The first lease was signed on May 22, 1917 (by Captain Edgar for the Government and Mr. Deeds for the Conservancy District) for 2075 acres for the period ending June 30, 1917, at the rental of \$2,000, the Government also agreeing to pay \$73,000 to cover damages to crops.

There was an option for renewal for the year beginning July 1, 1917, at the rental of \$17,660, and for a further renewal for the year beginning July 1, 1918, for a tract containing 2500 acres (including the 2075 acres first mentioned) at a rental of \$20,000, and for further annual periods ending July 1, 1922; and there was also an option to purchase the 2500 acres for \$350,000.

Of the proposed tract of 2500 acres, 505.27 acres were found to be marshy and were withdrawn and 250.47 acres, said to be of equal value, were added. This left a tract of 2245.20 acres, for which a new lease was executed on July 1, 1917, for the period ending June 30, 1918, at the rental of \$18,404.69, with annual options of renewal at a rental of \$20,000 until June 30, 1922, with the option to purchase at the same price.

The rental for the first year is explained by the fact that there were 210.47 acres of which possession could not be taken until March 1, 1918. Soon after that date the Commanding Officer at the field stated that 34.94 acres were in the possession of the Government, but that the remaining acres were available for occupancy but "were very low and swampy and in the present condition of no value to the Government." For the Miami Conservancy District it was stated that it had settled with the tenants at considerable expense in order to get possession and it was unwilling to take back the land from the Government.

There is an adjoining tract of 32 acres (part of the original 2500 acres) which with 8 acres additional were sold to the Government as a site for a warehouse.

It appears from the testimony of Ezra M. Kuhns, the secretary of the Miami Conservancy District, that at the time of our entry into the war the District had been able to secure options on only about 300 acres of the tract in question, but when negotiations with the Government began there was swift action. Mr. Deeds had brought the matter to the attention of Mr. Waldon as early as April 24, 1917, and had sent to

him one of the District's engineers with maps. The following telegrams show the activity of Deeds and Talbott:

Telegram Deeds to Kuhns, April 30, 1917:

Washington, D. C., April 30, 1917.

Ezra M. Kuhns,  
Miami Conservancy District,  
Dayton, Ohio.

Subject of our trip yesterday moving very rapidly and very satisfactorily. There is no doubt in my mind but what we will be successful. Avoidance of publicity very essential. Inspection will be made end of this week or first of next. You and Morgan\* must plan now as though it was decided.

E. A. DEEDS.

\*Morgan was the engineer of the Miami Conservancy District.

Telegram Deeds to Kuhns, April 30, 1917:

Washington, D. C., April 30, 1917.

Ezra M. Kuhns,  
Miami Conservancy District,  
Dayton, Ohio.

Options should be rushed in the vicinity of Fairfield raising the price if necessary.

E. A. DEEDS.

Telegram Deeds to Kuhns, April 30, 1917:

Washington, D. C., April 30, 1917.

Ezra M. Kuhns,  
Miami Conservancy District,  
Dayton, Ohio.

Ohio State University is ordered to-day to co-operate with the Dayton School and Magruder Lord and Knight instructed to report at Camp Borden Canada Monday to learn course of instruction. Publicity will follow these instructions, and no one outside of Signal Corps officers know of our plan for the larger school and so far as everyone is concerned Dayton School is the Wright field civilian school. Think you should advise Wright Morgan Harold Talbott and Kettering so that they will not disclose anything inadvertently. The civilian school will continue, regardless of what is done with the other plan and Ohio state will give the preliminary instruction in military tactics and all class room work while the Wright Field Company will give the instruction in aviation. Harold Talbott should be the channel through which publicity is given out, and there is no objection using the last statement if called upon.

E. A. D.

Telegram Deeds to Talbott, May 11, 1917:

Washington, D. C., May 11, 1917.

H. E. Talbott,  
Dayton, Ohio.

Think your whole plan ideal.

E. A. DEEDS.

Telegram Talbott to Deeds, May 11, 1917:

May 11, 1917.

E. A. Deeds,  
Care New Willard,  
Washington, D. C.

Contracts remaining secured to cover twenty-five hundred acres will be closed by to-morrow evening. Will start Monday on immediate possession of land so the fields will be ready when buildings are finished. This applies to central one thousand acres in front of building. Builders may retain use of buildings and barns for a few months and in some cases until winter, but main fields must be prepared without delay if they are to be used this fall. Think best to give no reason for immediate possession and feel sure we can arrange it. We can arrange financial matters as suggested. Wire if you approve.

H. E. TALBOTT.

Telegram Deeds to Talbott, May 11, 1917:

Washington, D. C., May 11, 1917.

H. E. Talbott,  
City National Bank Building,  
Dayton, Ohio.

With few exceptions owners can, if necessary, continue to live in their houses for a year thus avoiding necessity of moving this summer. Their teams will be employed, giving revenue to them. District wants to try out flying on large scale and wants to try experiment at once. This is only a suggestion. You doubtless may have a better one. May be necessary to exercise option at once, and if so I will gladly go on District's note for full amount.

E. A. DEEDS.

Telegram Deeds to Talbott, May 12, 1917:

Washington, D. C., May 12, 1917.

H. E. Talbott,  
City National Bank Building,  
Dayton, Ohio.

Suggest Kuhns Emmett Grant and Brown be here Monday morning for conference on conservancy bringing description of entire twenty-five hundred. Tax value and tax rate of property under discussion. Will be helpful. Publicity can be delayed at this end without difficulty. Everything moving nicely.

E. A. DEEDS

The partiality for this site does not appear to have been warranted by any advantages it can be said to possess. Indeed, no satisfactory reason appears for the securing of so large a tract, as apparently 1400 or 1500 acres would have answered the purpose.

Fields of about 650 acres were selected at Rantoul and Detroit for two-squadron fields, and the field at Dayton was for four squadrons. Both the leasehold interest and the option to purchase are subject to a flood easement. The evidence is that in case of a flood such as that of the year 1913, the impounded water (that is, after the completion of the dam which it is understood will be completed in two or three years) would cover the lowland to a depth of about forty feet; the lowest hangar would have twenty-four feet of water, that is over the eaves, and the highest hangar would have thirteen feet of water. The barracks and various buildings which stand on higher ground would not be seriously affected. The warehouse itself (a large structure) is in a dry place, and the suggestion that some of the property stored there during the past year has suffered from moisture is not supported. Aside from the consequences of flood in the Miami Valley and the use of the area as a detention basin, it should be added



that a considerable part of the tract consists of swamp land which is unsuitable for the use for which it was leased.

There is no evidence that Deeds himself had any interest in the land acquired. He was head of the Miami Conservancy District, but this was a public enterprise not organized for profit. Apparently, at an earlier period, advances had been made by the Dayton Metal Products Company (a portion of which had originally been charged to Deeds personally and later credited back to him and charged to the maintenance account of the company) which had been used for the purchase of options for the District.

The result of this transaction was to leave the Dayton Metal Products Company a creditor of the enterprise but without interest in the land. Mr. Deeds had been appointed on the Munitions Standards Board in March, 1917, and he accepted appointment on the Aircraft Production Board on May 11, 1917. At this time, however, he was acting only in an advisory capacity and it was before the passage of the Act of Aug. 10, 1917. He testifies that his only interest in this project was as a citizen of Dayton.

#### The Contract for Wilbur Wright Field

The next step was the placing of the contract for development. The contract was signed by Captain Edgar under the direction of the Chief Signal Officer and its terms were not unreasonable. It was on a cost-plus basis with a sliding scale, which as applied to the amount actually expended gives the contractor a commission of seven per cent with a maximum limit of \$140,000. The contractor, the Dayton Lumber and Mfg. Co., was recommended by Deeds.

This company had done nothing in an extensive way for several years, having been engaged since the year 1908 in selling material, and in operating a planing-mill and a lumber-yard. Its capital stock was \$75,000. Prior to April, 1917, one S. S. King had owned 117 of the 750 shares. King's holdings were then increased to 417 shares, and in acquiring these 300 shares King was backed by H. E. Talbott, who as president of the City National Bank of Dayton arranged for a loan of \$60,000 for the purpose. King wrote Talbott on April 25, 1917: "As to the ownership of the stock, if you see fit to back me up in it this can be determined in any manner that you see fit."

It was not long after the control of the Dayton Lumber and Manufacturing Company was thus acquired that the arrangement was made for giving to this company the contract to develop Wilbur Wright Field. King's narrative of the circumstances in which this contract was obtained is very illuminating, and affords a notable contrast to the difficulties of many who unavailingly sought contracts with the Government.

King was sent for by Talbott and informed that he (King) had been "recommended down at Washington to assume the responsibility of putting up some buildings for Wilbur Wright Field," and suggested that he immediately set about effecting an organization for the purpose. This was on Saturday, May 17, 1917, and on Sunday Talbott telephoned to King, asking him to leave immediately for Washington.

Accordingly King went to Washington on Sunday afternoon, taking the same train with Deeds. It was arranged that King should call the next day at Deeds' office, which he was informed was on the same floor with that of the contracting officer, Captain Edgar. Accordingly on the following day, May 19, Deeds introduced King to Captain Edgar and in two or three days, on May 23, the contract was signed. As Colonel Edgar testifies: "King was brought down here by Colonel Deeds and recommended to us as a proper contractor, the most available in Dayton for the work."

The following is a portion of the correspondence between Deeds and Talbott relating to this contract:

Telegram Deeds to Talbott, May 23, 1917:

Washington, D. C., May 23, 1917.

H. E. Talbott,  
City National Bank Building,  
Dayton, Ohio.

King probably returns to Dayton this evening. He is undertaking something which he alone is unable to get through with. It will be important that you give him a vision of this job and some very definite suggestions how to hit it in a big way. This is the biggest undertaking that has ever been put across in Dayton.

E. A. Deeds.

Telegram Deeds to Talbott, May 23, 1917:

H. E. Talbott,  
Dayton, Ohio.

Washington, D. C., May 23, 1917.

Suggest you personally direct publicity regarding contract to be given soon, so that it will avoid criticism and at the same time tell the story. This is particularly vital because of Captain Waring to start work Friday and the visitors whom I am bringing, who may read the papers. Your good judgment is needed on this.

E. A. Deeds.

Telegram Deeds to Talbott, May 24, 1917:

H. E. Talbott,  
City National Bank Building,  
Dayton, Ohio.

Washington, D. C., May 24, 1917.

—ranging for contract do not overlook a local contractor

and lumber man in Osborne. Ezra Kuhns knows his name. He has been friendly to us and I promised him something to do on this job.

E. A. Deeds.

Telegram Talbott to Deeds, May 28, 1917:

May 28, 1917.

E. A. Deeds,  
Care New Willard,  
Washington, D. C.

Just to remind you chartered accountants of Government selection, expense to be paid by contractor and charged to cost of work. Piece work for labor only on various unit sections in various classification of work, will do much towards speed and economy. Each individual transaction to have the approval of officer in charge before it is effected.

H. E. Talbott.

Telegram Deeds to Talbott, May 31, 1917:

May 31, 1917.

H. E. Talbott, Sr.,  
Dayton, Ohio.

Wire what progress has been made on Dayton field. This is for our report to the council. If foundations have been started, for instance, and how many men on the job. This only needs to be a rough estimate.

Deeds, Aircraft Production Board.

Telegram Talbott to Deeds, June 1, 1917:

Deeds,  
Aircraft Production Board,  
United States War Department,  
Washington, D. C.

June 1, 1917.

Steam shovel and large trench digging machine now in place. Three cutting gangs at work. Teams and tractors on ground. Carpenters finishing sheds and office for construction purposes. Foundation excavations in progress. Have plant and equipment for six concrete gangs which will be at work early in the week. Sidewalks progressing. Repairing highways to facilitate trucking operations from Dayton. Purchased five new Packard trucks to augment transportation over the existing available trucks. Next week will see everything booming along. All material, lumber, cement, planks, board, roofing, located and on the way. Wish you would think over method of authority which can be given me to rush transportation of railway cars. This looks like the main point of congestion. All departments of construction now organized with experienced and competent supervisors and foremen. All this in spite of the fact that it has rained every day since Waring has been here.

H. E. Talbott.

Despite the indication of these messages, and of his transactions with King, Mr. Talbott testifies positively that he had no interest in the enterprise, except as a citizen of Dayton, and got nothing out of it beyond 6 per cent interest received by the Dayton Metal Products Co. on money loaned.

King had no capital available for the enterprise, nor had the Dayton Lumber & Mfg. Co. King's testimony is:

Q. Did you have the capital to swing that? A. Not without assistance.

Q. Where did you expect to get the assistance? A. When I talked to Mr. Talbott he told me on the Saturday afternoon, I said, "Well, this will take a good deal of money." He said, "Yes, but," he said, "you need not worry about that. We will work out some way for that." He said, "I do not know how we will work it out, but we will work out some way for that."

The financial assistance that King needed was obtained upon the credit of the Dayton Metal Products Co., supported by the personal guaranties of H. E. Talbott and C. F. Kettering. Notes of the Dayton Lumber & Mfg. Co. to the extent of \$400,000 were discounted by the Dayton Metal Products Co. with the American Exchange National Bank of New York. It was originally contemplated that these notes should be endorsed by Deeds and Talbott, as is shown by the following extract of a letter to Mr. Talbott from W. H. Bennett, vice-president of the American Exchange National Bank, under date of June 25, 1917:

Referring to the conversation which the writer had with you on Thursday, I have conferred with Mr. Kenzel, Assistant Cashier of the Federal Reserve Bank, and upon your statement that the Dayton Lumber & Mfg. Co. is under contract with the United States Government for the preparation of the aviation field at Dayton, and that said company is to receive payments on the tenth of each month on the presentation of receipted vouchers for work completed in the previous month; and that it is the intention of the Dayton Metal Products Co. to make advances to said Dayton Lumber & Mfg. Co. of amounts necessary to carry on the work, he ruled that the paper executed by the Dayton Lumber & Mfg. Co. and endorsed by the Dayton Metal Products Co. to cover said funds so advanced will be eligible for rediscount with the Federal Reserve Bank.

Therefore, we feel that it will probably be of mutual advantage to provide for the advance of \$400,000 requested from us by a three months' note executed by the Dayton Lumber & Mfg. Co. to the order of the Dayton Metal Products Co. and endorsed to Mr. H. E. Talbott and Mr. E. A. Deeds. If you so desire, the endorsement of the individuals can be secured by an assignment from the Dayton Metal Products Co. of certain securities now in safe keeping with us to the individuals referred to.

It was subsequently arranged that the endorsements should be those of Talbott and Kettering, who also gave their separate agreement of guaranty. The avails of discounted paper were passed by the American Exchange Bank to the credit of the Dayton Metal Products Co.

It appears from the accounts between the Dayton Lumber & Mfg. Co. and the Dayton Metal Products Co. that, while the latter company ultimately paid the notes, their proceeds were used in large part from time to time for the benefit of the Dayton Metal Products Co.

The credit to the Dayton Lumber & Mfg. Co., thus extended to it upon its notes, was furnished without security, or, as Mr. Talbott put it, with "no further security except in the man (King). I trusted the man; I knew his contract." After the contract had been obtained, King increased his stockholdings in the Dayton Lumber & Mfg. Co. by the purchase of 104 additional shares, borrowing for the purpose \$20,000 from the Dayton National Bank.

It appears that the total amount paid by the Government under the contract with the Dayton Lumber & Mfg. Co., to Aug. 14, 1918, amounted to \$3,115,161.94. This represents the amount paid for the cost of the work, that is, for lumber, materials, etc. The commission or profits of the contractor, which had been paid to that date, amounted to \$102,436.04.

There has been considerable trouble in connection with the contract, and the accounts are far from being in satisfactory shape. An audit of the books of the company was made by Barrow, Wade, Guthrie & Co., to Nov. 30, 1917.

They reported that they found "the payrolls very incomplete, full of errors, corrections and erasures," and that there was "abundant evidence that great laxity and carelessness has been exhibited by the employees of the company, especially those in the paymaster's department."

These statements are amply confirmed by the evidence in this investigation, and the accounts are in course of being reaudited by Government accountants.

The consideration of the various irregularities in the accounts and of the questions to which they give rise must await the result of this examination. It will be observed that the Government has withheld a large part of the compensation of the contractor until a satisfactory adjustment has been made.

Of the profits received from the Government, it would appear that the moneys have been retained in the business of the company, except to the extent of a dividend of \$37,500, that is, 50 per cent on the capital stock.

Of this dividend, King was entitled, on the 251 shares acquired in his name, to \$26,050, and of this amount it appears that he had received 70 per cent, or \$18,235, to July 1, 1918. He had paid \$11,000 on account of his loan (\$21,000) to the Dayton National Bank.

He had paid nothing on the \$60,000 loan from the City National Bank. No agreement has been proved for a division of profits on this contract, and there is no proof that Colonel Deeds has had an interest in the contract or in the Dayton Lumber & Mfg. Co.

Even if it appeared that the Dayton Metal Products Co. was interested in the contract (which would explain transactions otherwise difficult to understand), this fact would not affect Colonel Deeds unless he were found to be interested in that company. The question would thus come back to the transfer of his stock in the Dayton Metal Products Co., which has already been considered.

#### McCook Field (formerly known as North Field)

This is a field of approximately 200 acres in and adjacent to Dayton, which was leased by the Government from the Dayton Metal Products Co., and has been used for the purpose of making various tests. Lieut.-Col. Vincent first suggested another field (South Field or Moraine Field), and brought the matter to the attention of Colonel Deeds, by whom that field was principally owned. On Sept. 27, 1917, Colonel Deeds sent the following telegram to Mr. Talbott:

Washington, D. C., Sept. 27, 1917.

Mr. H. E. Talbott,  
City National Bank Building,  
Dayton, Ohio.

Colonel Clark takes letter regarding Moraine flying field with him to Dayton to-night. George McCann has another letter, for Mr. Kettering. Government will lease land, put up buildings and operate experimental field. Lease will be for three years without privilege of purchase, as that is not necessary. Have complete description of property prepared, also statement of cost of buildings already erected and suggest monthly rent arrangement and have George McCann bring them to Washington to complete lease. Have him prepare deed for this property to Mr. Kettering, who in turn, will lease it to the Government.

DEEDS, Equipment Division.

Talbott and Kettering refused to consent to this use of South or Moraine Field, as it was said to be needed for experimentation in connection with the Dayton Wright Airplane Co., and they suggested North Field, or what afterward became known as McCook Field.

The latter tract had originally been purchased by Deeds and Kettering, each of them bearing one-half of the cost, and they had made some improvements, such as leveling, removing trees, etc., and had erected one or two small buildings. The object of their purchase had been to develop a training field for airplanes to be used by civilians, but this project could not be carried out.

The suggestion was that this parcel, with approximately

82 acres of land adjoining, which was owned by the Dayton Metal Products Company, would be suitable for the Government's use as an experimental station. Deeds did not wish to be a party to the lease, and conveyed to Kettering his undivided one-half interest in the parcel owned by them in common, and Kettering then conveyed that parcel to the Dayton Metal Products Co., which thereupon leased the entire tract to the Government.

The lease was dated Oct. 4, 1917. Colonel Deeds was present at the conference at which the terms were settled, and sent the following telegram to Talbott on Oct. 3:

Washington, D. C., Oct. 3, 1917.

Mr. H. E. Talbott,  
City National Bank Building,  
Dayton, Ohio.

Have worked out a lease for the North Dayton field twelve thousand eight hundred dollars a year without cash payment. It is the best thing that can be done under the circumstances and suggest its acceptance. Craighead will discuss it with you in detail when you see him.

DEEDS, Equipment Division.

Lieut.-Col. Edgar, under the authority of the Chief Signal Officer and the approval of the Chief of Staff and of the Assistant Secretary of War, signed the lease on behalf of the Government. The rental is at the rate of \$12,800 a year, with an option of renewal from year to year until June 30, 1921. There is no option to purchase; the lessor agrees that at the expiration of the lease the lessee may remove the structures and improvements erected by it upon the premises.

The contract for the development of the field was made with the Dayton Lumber and Manufacturing Company, notwithstanding the fact that the contractor had failed to give satisfaction in connection with the Wilbur Wright Field. This is explained by Colonel Edgar as follows:

We had an organization at the Wilbur Wright Field. We had practically reorganized King's force, and it was determined to take them over to McCook Field, which was brought to us by Colonel Deeds as a rush job which must be done immediately. He personally brought the proposition to me as a proposition that had to be put through immediately. They had no place to test the planes that were coming out. We did not pick out McCook Field; we had nothing to do with its location. A contract was made for the rental of the ground of the McCook Field, and we were importuned to take our organization over there with this contractor and finish this job up and it was done.

Q. Importuned by whom? A. By Colonel Deeds.

The total amount expended by the Government upon McCook Field to Aug. 14, 1918, amounts to \$949,085.35, and the contractor's compensation is 7 per cent of the cost with a maximum limit of \$46,200. The amount paid to that date as contractor's profit was \$26,667.65. The remaining portion of the total compensation has been withheld awaiting the audit of the contractor's accounts.

There is no proof that Colonel Deeds has had an interest in the contract for the development of this field. Nor does it appear that he had an interest in the lease executed by the Dayton Metal Products Company to the Government, or in the rent reserved. While Colonel Deeds originally owned a part of the tract leased to the Government, he conveyed—by what purported to be an absolute sale—his interest to Kettering, and was not interested in the lease by Kettering's grantee, the Dayton Metal Products Company, unless he was interested in the stock of that company, a question already considered.

It is understood that the amounts advanced by Deeds in connection with the development of that portion of the tract in which he had an undivided one-half interest were taken into account in the settlement that was made in November, 1917, when the amount to be paid (by notes) to the Domestic Building Company for the plant acquired by the Dayton Wright Airplane Company was determined; but this fact is not sufficient to establish an interest in the lease so as to bring the matter within the range of the Federal penal statute.

#### South Field or Moraine Field

This is a tract of about 110 acres lying south of the city of Dayton, and a short distance from the plant of the Dayton Wright Airplane Company. The greater portion of the land belongs to Colonel Deeds. It has been improved by the erection of a number of hangars and other buildings. This land was leased about Nov. 30, 1917, to the Dayton Wright Airplane Co. for a period of three years, at a rental of \$1 per year. It is used by that company as a place of experimentation. The expenditures for hangars and improvements upon South Field which had been made by Colonel Deeds had been taken into account in the settlement made with the Domestic Building Company.

#### Acceptance Field

This is a field lying close to the plant of the Dayton Wright Airplane Company, upon which the airplanes it manufac-

tures for the Government are taken out for trial. The greater part of this field belongs to the Moraine Development Company, and it appears that Deeds is interested in this field as a stockholder in that company. Deeds and Kettering each hold 2055 shares out of a total of 10,003 shares, the majority of the stock being held by Adam Schantz. This field is leased to the Dayton Wright Airplane Co. The transactions relating to South Field and Acceptance Field were with the Dayton Wright Airplane Company and not with the Government.

### (3) Colonel Sidney D. Waldon

During the period in question Colonel Waldon was a stockholder in the Packard Motor Car Company. This interest he retained, but he disclosed it to the Aircraft Production Board at its meeting of Aug. 27, 1917, and to the Secretary of War, and it does not appear that he took part at any time in any proceedings of the board or in any other transactions in relation to the Packard company. No interest on his part in any other concern having dealings with the Government is shown.

### (4) Colonel Robert L. Montgomery

At the time Colonel Montgomery entered the service of the Government he was one of the directors of the J. G. Brill Company of Philadelphia, holding one share of common stock.

Colonel Montgomery states that he resigned from the board of directors and sold his share of stock on Sept. 22, 1917, before any contract was made by that company with the Government, and that he did not negotiate the contracts in which that company is interested. Colonel Montgomery further states that at the time he entered the Government's service it was agreed with his partners that no member of the firm should have any interest in any concern connected with aircraft work.

It appears that the wife of one of his partners held for some time 200 shares of the stock of the Curtiss Aeroplane and Motor Corporation, which she had purchased in her own right, and then sold it, and that subsequently she bought some 500 shares of the stock of the Wright-Martin Aircraft Corporation. With these transactions Colonel Montgomery had no connection.

Colonel Montgomery's firm (Montgomery, Clothier & Tyler), in August, 1917, took an interest of \$250,000 in an underwriting syndicate through the National City Co., for the flotation of \$5,000,000 six per cent. notes of the Electric Auto-Lite Corporation. Later, Montgomery, Clothier & Tyler issued a circular offering the notes for sale to the public. These notes of the Electric Auto-Lite Corporation were secured, in part, as the circular states, by a specific pledge of collateral among which were shares, amounting to \$12,500,000 in par value, of the common stock of the Willys-Overland Co.

The Farmers' Loan and Trust Co., of New York was made trustee to receive the pledge. The sale of all the notes was completed by Sept. 12, 1917, \$116,000 being sold through Montgomery, Clothier & Tyler, who received \$8,500 in settlement of their interest in the underwriting. Colonel Montgomery states that this transaction, with others, was undoubtedly mentioned to him by his partners at or about that time, but that he never saw the circular or had the transaction fully explained to him until May of this year.

In August and September, 1917, at the time of this transaction, Colonel Montgomery on behalf of the Government was negotiating contracts with the Willys-Overland Co., for the manufacture of engines for training planes. The Willys-Overland Co., not only made these contracts, but also had a substantial interest in the Curtiss Aeroplane & Motor Corp., which at the time had contracts with the Government for airplane engines.

While the Electric Auto-Lite Corp. was affiliated with the Willys-Overland and Curtiss companies, the transaction in question concerned the flotation merely of notes of the Electric Auto-Lite Corp., and the interest of purchasers of these notes in the stock of companies having dealings with the Government was only through the pledge of the Willys-Overland stock as collateral security.

It appears that while Colonel Montgomery's firm took part in the sale of the notes as members of the underwriting syndicate, none of the notes were actually purchased by his firm, either for firm account or for any individual partner, and in these circumstances it is believed that there would be no sufficient ground for holding the above-quoted statutes to be applicable.

Apart from the above matter there is no evidence that Colonel Montgomery has had an interest in, any corporation,

association or firm with which he has dealt as an officer or agent of the Government.

## OTHER OFFICIALS

### Lt.-Col. Jesse G. Vincent.

In April, 1917, Mr. Vincent was vice-president of the Packard Motor Car Co., in charge of engineering, with a salary of \$25,000 a year. Under his contract with that company, made in 1912, he was entitled to subscribe for certain shares of its stock. On Aug. 15, 1917, having resigned his office, he made a settlement with the company, receiving his salary to that date and a bonus of \$5,000 for the preceding year's work, and at the same time, through the exercise of his option, he acquired \$15,000 of common stock at par which with the stock dividends previously declared thereon gave him approximately 347 shares.

He had purchased outside about 82 shares, so that he became a stockholder in the Packard Motor Car Co., to the extent of 429 shares of the common stock of the par value of \$42,900. This stock he has continued to hold since August, 1917; he has received dividends of 1% per cent. quarterly with the exception of one quarter for which a dividend was passed.

From about May 27, 1917, until Aug. 15, 1917, Mr. Vincent, while paid by the Packard Company, was actually at work for the Government in the development of the Liberty Motor. It is said that for this period he was 'loaned' by his company to the Government.

On Sept. 3, 1917, he received a commission in the Army with the rank of Major and later he was raised to the rank of Lieutenant-Colonel. About July 1, 1917, he was put in charge, as a civilian, of the Engine Design Section of the Signal Corps and he remained in this service after he was commissioned and until Oct. 1, 1917.

On the latter date, the Airplane Experimental Department of the Signal Corps was established in charge of Lt.-Col. Clark, with headquarters at McCook Field, Dayton, and Major Vincent was associated with this department as its executive officer with his office at the Lindsey Building, Dayton. On February 6, 1918, he was put in charge of the Airplane Engineering Department at Dayton and in command of McCook Field. He is now in charge of the Airplane Engineering Division of the Bureau of Aircraft Production.

Both before and after Major Vincent received his commission in the Army, he had transactions with the Packard Motor Car Co., in which he acted on behalf of the Government. On June 6, 1917, the Aircraft Production Board adopted a resolution which provides, after recitals, as follows:

Therefore, Be It Resolved, That the Board proceed immediately to secure space wherein to bring together sufficient draftsmen under a competent engineering organization to produce complete designs of 8 and 12 cylinder motors, to be known as the US-8A and US-12A respectively; that the design for the 4 and 6 cylinder motors follow as soon as practicable, these motors to be known as the US-4A and US-6A respectively. These designs and drawings to be made to include the designs and drawings for the special tools necessary to produce the parts of these motors. The Board should undertake to have the parts made wherever in its judgment they can be most quickly and advantageously done and have them sent to Washington and assembled here in space to be secured, parts to be made for Five (5) US-12A and five (5) US-8A.

And Be It Further Resolved, That the Board recommend to the Office of the Chief Signal Officer that the sum of \$250,000 be immediately set aside to carry on this work and that a disbursing officer be assigned to handle this fund.

This allotment, or \$249,159.10, was paid to the Packard Motor Car Co. for drawings, models, tests, etc., and for six US-8A's and five US-12A's which were to serve as standardized engines. No written contract for this work or written order for this work setting forth unit prices or specifying the terms on which the work was to be performed is found in the files of the Signal Corps, and in this respect the proceeding was very irregular. Instead of there being an appropriate agreement or written order, it appears that verbal orders were given from time to time by Mr. Vincent, which, it is testified, were confirmed in conversations with Mr. Deeds.

The first voucher presented by the Packard Company for this development work was for \$104,500, which was paid on Aug. 11, 1917, upon a certificate of Mr. Deeds, then a civilian in charge of the Equipment Division. While Mr. Deeds was familiar in a general way with the work, it does not appear that he or any one else acting for the Government, except Mr. Vincent, had detailed information as to what had been done or as to actual cost.

The exact amount of the outlays could not then be stated either by the company or by Mr. Vincent and, while definite amounts were placed opposite particular services and engines described in the voucher, these amounts were mere estimates.



The voucher did not so state, but the payments were virtually payments on account. Included in this first voucher (paid Aug. 11), were the salaries and traveling expenses, as estimated, of those in the engineering organization which Mr. Vincent had effected for this development work, including the salary of Mr. Vincent himself after he came to Washington as above stated. As he testified:

In other words, this item was intended to cover not only the making of drawings, but the moving of engineers here to date and also a lot of traveling expenses incident thereto . . . that was all lumped under original design work. Q. Was there any itemization of that anywhere? A. There was not, because it was impossible to make any such itemization. I knew roughly what it would cost. Q. How much of that amount of \$37,000 included in that voucher (that is, the voucher for \$104,500) was for salaries? A. I should say about one-third. Q. For what period were those salaries allowed? A. They were allowed for the period that the men were actually on the job.

Q. Is your salary included in the \$37,000? A. I think it is.

Another voucher in similar form for \$73,194.72 was presented by the Packard Co., on Nov. 20, 1917. It was accompanied by a letter from Major Vincent, representing the Engine Design Section of the Signal Corps, to Colonel Deeds which stated:

I have personally supervised this work and hereby certify that all of the above material has been delivered to the Government and is now being used for Government purposes.

The prices at which the engines are billed are only approximately correct and may be high or low, but this cannot be determined until a final checkup is made when the job is completed. There are several engines yet to be delivered and before we pay for the final ones, I will arrange to have a checkup made in order to insure that the total amount paid for the entire job is entirely fair to both the Government and the Packard Motor Car Company. I would ask that payment be made the Packard Motor Car Company promptly in this connection, as they are going to a great deal of trouble to do this experimental work for us.

A third voucher for \$60,000, for three engines, which was also a mere estimate, was paid on Dec. 6, 1917, on Colonel Deeds' certificate.

The fourth, and final, voucher was paid on Jan. 19, 1918, for the two remaining engines, which were put down at \$5,732.19 each so as to bring the total amount expended for the development work within the above-mentioned allotment of \$250,000. The Packard Company at this time submitted an itemized statement of its outlays which Major Vincent examined and approved. This statement purported to show the total cost of the entire work, that is the cost of material, and of labor, the direct expense (including travelling and other expenses of the organization which Mr. Vincent brought to Washington for the purpose of working on the design of the Liberty Motor) and the overhead charges. These items aggregate \$221,474.75, to which a profit of 12½ per cent (\$27,684.35) was added, making a total of \$249,159.10. Major Vincent wrote the following letter to Colonel Deeds in submitting the final voucher with his approval of the itemization of cost.

Dayton, Ohio, Jan. 19, 1918.

From: Major J. G. Vincent, Airplane Experimental Engineering Department, Lindsey Building, Dayton, Ohio.  
To: Colonel E. A. Deeds, Southern Railway Building, Washington, D. C.

Subject: Final Payment on the Liberty Engine Development Order.  
1. I am enclosing herewith bills from the Packard Company for the last or No. 6 8-cylinder engine, and the last or No. 5 12-cylinder engine. These bills have been held in abeyance until the Packard Company could furnish us with a final accounting covering the cost of the job.

2. You will remember that the joint Army and Navy Technical Committee set aside an appropriation of \$250,000 to cover the cost of this job. At the time they set aside this amount and asked me to have ten engines built, I was afraid it could not be done within the appropriation, but am glad to be able to advise you that altogether we built eleven engines, as well as two wooden models, and ran several tests under this order and still kept within the appropriation. You will note that the last two engines are built at \$5,732.19 each, as this just balances out the net cost to the Packard Company plus 12½ per cent profit.

3. As a matter of general information I want to point out that the Packard Company co-operated with us to the limit on this job, and many of their executives gave a great deal of their time to this work for which they received no pay whatsoever. It is also a fact that this work was put ahead of a great deal of other work, causing losses which can never be computed. They did this cheerfully because their heart was in the job, and my only object in mentioning it is to, in some degree, give them credit for their attitude, as I know no one at Washington can possibly realize what this brand of co-operation costs.

4. I want to go on record as stating that I do not know of any other place in the world where this job could have been done at anything like this cost.

5. During the last two years that I was with the Packard Company they spent approximately a half million dollars on aircraft development work—the spending of this money not only put me in position to know what should make an aircraft engine, but it also resulted in the development of an organization at the Packard plant which was ready and waiting to grab this Liberty job. I think you will find the brief résumé of costs entirely satisfactory, but I simply want to state that the Packard Company, of course, have a complete record of all the transactions, if they should ever be required. I think, however, that this job is so obviously reasonable that nothing else will be required. I want to urge that you have final payment made to the Packard Company immediately, as they are

carrying on a lot of development work for us and are, therefore, carrying considerable investment at all times.

(Signed) J. G. VINCENT.  
Major, S. C., U. S. A.

The irregularity of proceeding in this manner without a contract or proper order in writing is apparent. No price had been fixed for the work or materials; if only outlays were to be reimbursed, it was necessary that outlays should be appropriately proved before payment was made, and this had not been done in the case of the first three payments.

Nor does it appear that at the time the first voucher for \$104,500 was passed, on or about Aug. 11, 1917, Mr. Deeds had any authority in the absence of a written contract or a proper written order to give the certificate. The Chief Signal Officer testifies that he did not have such authority. Nor was his certificate itself accurate in its terms, as there was no agreement for a price, and if there was an agreement for the reimbursement of actual outlays, the voucher, being a mere estimate, was not in accordance therewith.

It should be said, however, that the evidence does not afford ground for the conclusion that the Government was defrauded or that there was any intent to defraud the Government on the part of any of the parties concerned.

The work was development work, these first engines being made by hand in advance of tooling up for quantity production in order to standardize the design, and it does not appear that the services rendered were not worth the amount paid or that the estimates of the outlays were not fair estimates; that is, that the amounts as estimated were not actually expended as set forth in the final statement.

Both Major Vincent and Mr. MacCauley, the president of the Packard Motor Car Co., testify that the amount paid under these vouchers as finally adjusted did not embrace any expenses incurred in the original work of the Packard Company in developing an aircraft engine, that is, prior to the time when Mr. Vincent came to Washington on May 27, 1917. Viewed as an arrangement for services on a cost plus basis, the allowance of profit does not seem to be excessive. While the vouchering was irregular, there is no sufficient basis for a charge under the statutes relating to false and fraudulent vouchers or the facilitating or obtaining of payments with intent to defraud the Government.

A distinct question, however, is presented as to Lt.-Col. Vincent. Section 41 of the Criminal Code explicitly prohibits any person who is directly or indirectly interested in the pecuniary profits or contracts of a corporation from acting as an officer or agent of the United States for the transaction of business with such corporation. It is manifest that Lt.-Col. Vincent acted as an officer and agent of the Government for the transaction of business with the Packard Motor Car Company in which he was a stockholder, and that this was in violation of the statute.

Lt.-Col. George W. Mixer

Lt.-Col. Mixer, formerly vice-president of Deere & Co. of Moline, Illinois, manufacturers of agricultural machinery, came to Washington in July, 1917, to undertake the organization of the Inspection Department of the Aircraft Engineering Division of the Signal Corps. He was later chief of the Inspection Department of the Equipment Division of the Signal Corps. He was commissioned as an officer in the Signal Corps, with the rank of Major, about Aug. 15, 1917.

The work of the Inspection Department covered the inspection or acceptance of material and manufactured articles furnished to the Signal Corps, including the inspection of airplanes and engines manufactured under contracts with the Government.

As chief of the department, Major Mixer dealt with the matters of organization and personnel and exercised a general supervision over the department in matters of administrative policy. In May, 1918, Major Mixer was made Production Manager and on the reorganization which resulted in the establishment of the Bureau of Aircraft Production he continued to carry the title of Production Manager, being directly under Archer A. Landon, who is Director of the Production Division which is broadly charged with the actual execution of the aircraft program after the receipt of engineering data.

Prior to his connection with the Government, Mr. Mixer held 25 shares (par value \$2,500) of the preferred stock of the Curtiss Aeroplane and Motor Corporation. He has not disposed of this stock. He testifies that he had sold his common stock in the company about two years ago and that he had not given thought to the retention of the few preferred shares; that his personal accounts are kept at his office in Moline, and are in charge of his secretary.

The Curtiss company had important contracts with the Government for the production of aeroplanes and Lt.-Col. Mixer was in charge of the organization of the inspection materials and products at its plant as well as at other

and he visited the Curtiss plant from time to time in the exercise of his authority as head of the inspection department and as production manager, and as an officer of the Government dealt with such questions at this plant as required attention.

The statutory phrase "transaction of business" is broad enough to embrace the activity of officers or agents of the United States who are heads of divisions having charge of the inspection of products under contracts requiring the action of Government inspectors in course of performance.

It would be a narrow construction to hold that the statute (Crim. Code, Sec. 41) is limited to the making of contracts or the placing of orders or transactions relating to payment or discharge. It would seem to be quite as important that the chief of a department of inspection, selecting the inspectors who act under his instructions at the plants of contractors, should be free from interest in the corporation whose work is inspected, as the inspectors themselves, and both the chief of an inspection department and the inspectors may properly be regarded as agents of the Government for the transaction of business with the corporation.

The same would be true of the production manager having supervision of production under contracts with the Government. No ruling in the Federal Courts with respect to the applicability of the statute to such an officer or agent of the Government has been found. In the view that the statute has the scope suggested, Lt.-Col. Mixer acted as an officer or agent of the United States, contrary to the prohibition, for the transaction of business with the Curtiss Aeroplane and Motor Corporation, in which he was a stockholder. His holdings were small, but it cannot be said that for that reason the statute is inapplicable.

#### Major Howard C. Marmon

Major Marmon joined the Signal Corps about June, 1917, and almost immediately was sent to Europe with the Aeronautical Commission. On his return he was assigned to duty with the Airplane Experimental Department at McCook Field, Dayton. Prior to his service with the Government he was vice-president and engineer of the Nordyke & Marmon Co. of Indianapolis, which was engaged in manufacturing mill machinery and motor cars, and he held \$15,000 in par value of the stock of that company, its book value being several times its par.

On entering the Army, he gave to his brother a power of attorney to dispose of his shares and they were transferred to his mother, Mrs. Elizabeth C. Marmon, and have since stood in her name. The transfer was a gift; Major Marmon testifies that he has no interest in the stock. His mother turns over to him the income of other property which is the equivalent of the salary he had previously received from the Nordyke & Marmon Co.

The Nordyke & Marmon Co. has a contract for 3000 Liberty engines, and spare parts, and previously had a contract, which was filled, for 1000 Hall-Scott engines and spares. The evidence is that Major Marmon had no part in the negotiations relating to these contracts or with the supervision of inspection, production or payments.

He has been engaged in the airplane experimental department, or engineering department at McCook Field. It does not appear that he has had any transaction with the Nordyke & Marmon Co. save that he sent to that company, with others, from McCook Field, the blueprints for the Liberty engine.

It also appears that he signed a communication from McCook Field relating to a Marmon automobile which had been ordered by Lt.-Col. Vincent for that department. Taking all the facts into consideration, there is no sufficient ground for a charge of violation of the statute in his case.

#### Second Lieut. Samuel B. Vrooman, Jr.

In a subsequent portion of this report, reference is made to the Mahogany Manufacturers and Importers Association, a voluntary association of the leading mahogany manufacturers of the United States, which was formed last January in connection with negotiations for the purchase by the Government of mahogany for airplane propellers.

One of the members of the association is the S. B. Vrooman Co. of Philadelphia. Second Lt. Vrooman is the son of Samuel B. Vrooman who was head of this company until his death a short time ago. Second Lt. Vrooman is thirty-one years of age and for upwards of nine years was at work in his father's company handling lumber, inspecting and selling. On his marriage in June, 1917, his father gave him \$10,000 in par value of the company's stock, which for some years has paid 20 per cent dividends annually.

This stock he still holds. In addition to the dividends on his stock, the S. B. Vrooman Co. has continued to pay him, since he entered the service of the Government, the sum of \$50 a week, which is the equivalent of the compensation

he previously received for his services to the company.

In December, 1917, S. B. Vrooman, Jr., became identified with the Equipment Division of the Signal Corps as a civilian and was made an inspector of mahogany purchased by the Government. In February, 1918, he was put in charge of the inspection of all propeller lumber. He selected the district officers, who in turn selected the inspectors.

Mr. Vrooman issued instructions to the district officers, visited the plants to see that the inspectors were doing their duty, and passed on disputed points. He has continued in this service and in July, 1918, received a commission as Second Lieutenant.

Among the plants subject to his jurisdiction as head of inspection of propeller lumber is that of the S. B. Vrooman Co., which has had contracts with the Government and is within the territory assigned to the district office at New York. S. B. Vrooman, Jr., selected the head of this office, Mr. McCullough, who was responsible to him for the efficiency of the inspection and for the carrying out of his instructions, which related to the inspection at the Vrooman plant as well as others.

The conclusion is not to be escaped that S. B. Vrooman, Jr., was the agent of the Government directly responsible for the proper inspection of the mahogany delivered by the S. B. Vrooman Co. to the Government under its contracts, and that his acting as such agent for the transaction of business with the corporation in which he was a stockholder was in violation of the statute.

#### FOURTH. THE AIRCRAFT PROGRAM

At the time of our entry into the war we had no combat planes, and only a few planes for training and scouting purposes. Approximately 100 airplanes had been delivered to the Army up to the year 1917. There were few flyers and still fewer who had any acquaintance with aviation engineering. The airplane manufacturing industry was in its infancy in this country. But these difficulties were not cealed. The necessity of prompt endeavor to surmount them and of securing at once the full benefit of foreign experience was obvious.

On May 22, 1917, the Joint Army and Navy Technical Aircraft Board, consisting of officers of the Army and Navy especially qualified by reason of aeronautical experience, made a series of recommendations to the Secretary of War and the Secretary of the Navy, which were duly approved by each secretary. It was recommended that there should be purchased by the Army (from the Curtiss Aeroplane and Motor Corporation) "700 Curtiss JN-4 advanced training planes, equipped with the Curtiss OX-5 engines, with 50 per cent extra engines and appropriate amount of extra engine and airplane spares." The purchase of 100 Gnome engines (40 for the Navy and 60 for the Army) from the General Vehicle Co. was also advised. It was recommended "that no action be taken on the suggestion by the Aircraft Production Board for the purchase of the Standard J airplanes, pending tests of this machine by Army flyers." Other recommendations were as follows:

9. The Board recommends that the Aircraft Production Board take immediate steps to obtain complete working drawings, complete machines for use as samples, and to arrange for the manufacture in this country of the following airplanes and engines:

##### AIRCPLANES

- Sopwith, 1 1/2 strutter.
- Spad, 1-place pursuit type.
- S. E. 5, 1-place pursuit type.
- Sopwith, 130-hp. Clerget, 1-place pursuit type.
- D. H. 4, 2-place reconnaissance.
- B. E. 2 D, 2-place reconnaissance.
- White, Gnome pusher, seaplane.
- Two types of Fairley seaplanes; 130-hp. Clerget type and also a Campania type.
- Farman, with a 150-hp. Hispano Suiza engine, seaplane.

##### ENGINES

- Lorraine-Dietrich 250 hp.
- Clerget, 130 hp.
- Hispano Suiza, 200 hp.
- Rolls-Royce, 270 hp.
- B. H. P. 200 hp.
- Gnome Mono-soupape, 170 hp.

The same Board on May 23 made further recommendations to the Secretary of War and Secretary of the Navy, which were also approved, as follows:

3. It is estimated that the needs of the United States Army for heavier-than-air aircraft until July 1, 1918, will be as indicated hereinafter and it is recommended that a building program to accomplish these needs be started at once.

## TRAINING

Under the present conditions in order to meet the needs of the United States Army only.

Type of Airplane	Number Required	Type of Engine	Number Required
J. N.-4	3,500	OX-5	7,000
DeH.-4	1,750	R-R or equivalent	3,500
S E-5	800	H-S	1,200
S.P.A.D.	800	H-S	1,200
Sopwith	800	Clerget 130	1,200
J. N.-4	800	Hall-Scott A-7-a	1,000

(Stop gap order)

In the event that the United States are called upon to train foreign flyers in addition to United States Army flyers.

Type of Airplane	Number Required	Type of Engine	Number Required
J. N.-4	5,000	OX-5	10,000
DeH.-4	2,500	R-R or equivalent	5,000
S E-5	800	H-S	1,200
S.P.A.D.	800	H-S	1,200
Sopwith	800	Clerget 130	1,000

airplanes and engines shown on the attached table, which also includes a schedule of guaranteed deliveries.

You will also find annexed a schedule of approximate prices of these airplanes and engines and a draft of the proposed agreement between the American and French governments which is now in the final stages of execution, although the orders have been actually placed by the French Government with its manufacturers. This agreement has been prepared after conference with the Judge Advocate General and his staff here and considerations of the arrangements under which England is having engines built in France.

## Foreign Orders

Accordingly Major Bolling reported that the following orders had been placed abroad:

## IN FRANCE:

## Training Airplanes:

725 Nieuports with Le Rhone engines and 150 Spads with Hispano engines. Deliveries to be in time to meet U. S. training program in France.

## Service Airplanes:

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1500 Breguet (Renault & Fiat)....	60	60	460	460	460	400	550	615
2000 SPAD (200 hp. Hispano)....	..	..	..	135	300	400	550	615
1500 New Spad (150 Gnome)....	..	..	50	100	200	300	350	500

## or

1500 Nieuport (150 Gnome)..... 300 400 400 400 .. ..

## Service Engines:

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1500 Renault (300 hp.).....	60	60	460	460	460	400	550	615
4000 Hispano (200 hp.).....	..	..	..	135	275	565	755	945
3000 Gnome (150 hp.).....	..	..	..	400	400	400	600	600

## IN ITALY:

500 S. I. A. 6 B (reconnaissance and day bombing airplane similar to the Breguet). Deliveries to begin October and be completed in December.

200 to 300 Caproni biplane with the new Isotta-Fraschini engine. Deliveries prior to June 30, 1918.

A formal contract was made between General Pershing and the French Government under date of Aug. 30, 1917, for the 5000 service planes and 8500 engines above described. The French Government entered into this contract upon the express condition that the United States should furnish the machine tools and raw materials which were fully listed.

In order to perform this condition, a contract was made under date of Oct. 4, 1917, by the United States Government with The J. G. White Engineering Corporation, by which the latter was to act as an agent for the purchase of the required materials on the basis of cost plus three per cent as compensation.

It turned out that there was great difficulty in obtaining these materials as the French specifications in important instances could not be met at the time by American manufacturers. While the contract with the French Government called for deliveries of materials for planes two and one-half months before delivery of the finished planes, and materials for engines three and one-half months before delivery of finished engines, and that all materials advanced by the French Production Service should be replaced not later than Nov. 1, 1917, it appears that only 14 per cent of the required materials had been placed at points of embarkation in the United States by Nov. 1, for shipment to France, 46 per cent by Jan. 1, 1918, and 67 per cent by March 1, 1918; 91 per cent was delivered at points of embarkation by June 1, 1918, and 99 per cent before the end of August.

From information recently received it appears that all materials shipped under the contract arrived safely in France and that substantially all have been satisfactory as to quality. For the materials thus delivered during the fiscal year ending June 30, 1918, there had been paid to The J. G. White Engineering Corporation \$9,005,074.31, of which \$8,742,412.29 represents the purchase price and \$262,662.02 the agreed compensation.

It is understood that in December, 1917, in view of the existing conditions, and the serious need for airplanes on the part of the French, the original contract was modified by a new contract calling for about one-quarter of the deliveries within the period contemplated in the first contract. The exact terms of the second contract are not now available here. It is also understood that further orders were placed with the French Government from time to time.

The deliveries originally contemplated on the foreign orders were not made; most likely by reason of the delays on the part of the United States in furnishing the required materials and the increased pressure of the needs of the Allies.

## Deliveries on Foreign Orders

Up to Feb. 1, 1918, it appears that only about 600 planes had been received under the orders placed with the French Government, of which only about 70 were fighters and bombers. The situation as it then existed is disclosed in the cable from General Pershing under date of Feb. 16, 1918:

P. 610 Paragraph 1-A. Dated Feb. 16, 1918.  
Conference to-day between Chief of Air Service A. E. F. and French Under-Secretary of State for aeronautics develops fact that

6. It is recommended that the Aircraft Production Board of the Council of National Defense take steps immediately to advise concerning the formulation of the plans how best to obtain in this country the following airplanes and engines with the designs of these airplanes and engines and the rights to manufacture them in this country.

## Airplanes

Type	No.	Type	No.
DeH.-4	2	R-R	4
S E-5	2	H-S	4
S.P.A.D.	2	H-S	4
Sopwith	2	Clerget	4
		130	
B E 2 C	2	R A F	4
Farman seaplane	2	H-S	4
Martinsyde	2	R-R-190	4
Sopwith	2	Clerget 110	4
1 1/2 strutter	4	R-R	16
Handley-Page twin	4	C U R 92 Rh-110	4
Caproni	2	With engine	4
Savoia	2	With engine	8
Savoia	2		

7. In addition, all such modern German airplanes complete with engines as it may be possible to obtain. These may be obtained either from the Allies or from Holland.

## 8. Additional Engines Desired.

- 4 Lorraine-Dietrich, 250 hp.
- 3 Clerget, 130 hp.
- 2 Hispano Suiza, 200 hp.
- 3 Rolls-Royce, 270 hp.
- 2 B. H. P., 200 hp.
- 4 Gnome Mono soupape, 170 hp.

## Report of Aeronautical Commission

Two months after we had entered the War, an Aeronautical Commission was sent to Europe. This Commission, which sailed on June 17, 1917, in charge of Major (afterwards Colonel) R. C. Bolling, was composed of Army and Navy experts and civilians. Captain Virginus E. Clark and Captain Edgar S. Gorrell represented the Army, and Navy Constructor G. C. Westervelt and Lieutenant Warren G. Child represented the Navy.

Major Bolling's report was sent from Paris on Aug. 15, 1917. The governing principle for the American Production program was stated by Major Bolling to be:

First. The United States must first provide itself with all airplanes and engines required for training purposes in America.

Second. The United States must next provide the airplanes and engines necessary for use strictly in connection with the operation of American forces in the field. It is best known in Washington what will be the size and composition of the American forces in the field at any given dates in the future. You have the information as to the number of types of airplanes required in direct connection with military operations of these forces. We have learned nothing to change the views on that matter which were held by Major Foulois when we left Washington.

Third. After these first two considerations comes the American program of putting into the field next year air forces in excess of the tactical requirements of its army in France. It is greatly desired that the United States shall do this. Such air forces should consist of fighting airplanes and bombers. (Then follows a statement of the proportions deemed advisable.)

The conditions of European production were described; and the advisability of obtaining through foreign orders the supply of airplanes and engines required for use at the front and in training abroad for a period extending to July 1, 1918, was strongly emphasized, as is shown by the following extract from the report:

In our opinion these American needs may be divided into two periods: First period, from the present time to July 1, 1918. Second period, subsequent to July 1, 1918. With every confidence in the ultimate performance of the American production program our investigations of production experience over here and of the sea-tonnage situation have convinced us that airplanes and engines produced in America cannot be actually delivered at the front in any great quantity prior to July 1, 1918. Subsequent to July 1, 1918, we believe that American production will not only take care of our needs but may become a large factor in maintaining the air forces of our allies. In considering the period between now and July 1, 1918, due weight must be given to the experience of all foreign countries and manufacturers in the delays in airplane and engine production which were not and could not be foreseen. Only at close hand can one appreciate how many and how great those delays have been.

After long and careful consideration of this subject we and all others here have come to the very strong conviction that most of the airplanes and engines for American use at the front and for our training here between now and July 1, 1918, must be produced either in France or Italy, where effective and successful methods of production are already in full operation. Because we consider this imperative, and absolutely essential to prevent failure of our air campaign next year, an arrangement has been made with the French Government under which they are to produce for us the



due to non-arrival in France of sufficient raw materials French production of aeroplanes and engines is insufficient to meet needs of French and American air service during the next three months. Nine American squadrons will be available for front line service next month and if military necessity requires that they be put into front line service several of these squadrons must be equipped with inferior types of aeroplanes purchased from the French Government, a procedure which is strongly disapproved. Urgently important every effort be made to expedite remainder shipment of J. G. White & Co. materials destined for France—almost 14,000 tons, and also urgently request no delay in shipment of service aeroplanes from the United States.

PERSHING.

#### Plight of Our Cadets Abroad

There may also be noted at this point the serious delays which occurred in securing adequate provision for the training of American cadets abroad. Hundreds of these cadets were held at concentration camps and other places for several months without suitable training. This was the more regrettable because these students embraced a large number who were exceptionally proficient and who had gone abroad early on the assumption that they would have important and superior advantages in training. It is said that their numbers were larger than the capacity of the French and British schools which it was expected would receive them.

In his cable of March 13, General Pershing speaks of the plight of these cadets as follows:

P. 726, Paragraph 1. Dated March 13, 1918.  
For Chief Signal Officer. Approximately 700 cadets are now under flying training in Europe. These cadets had to wait an average time of three months before commencing flying training. Approximately 700 cadets in Europe awaiting flying training. These cadets have already waited from three to five months for training, and it is estimated that some of them will have to wait at least four months before their training can be commenced. All of those cadets would have been commissioned prior to this date if training facilities could have been provided. These conditions have produced profound discouragement among cadets. In order to remedy injustice and to relieve cadets in Europe on equitable basis of rank with cadets trained in the United States request approval of plan to immediately issue to all cadets now in Europe temporary or reserve commissions in Aviation Section Signal Corps subject to revocation in all cases where on completion of training cadets so commissioned are found not to have requisite qualifications for officers in the Air Service. If plan approved will recommend cadets by groups according to seniority. Strongly recommend approval.

PERSHING.

The Secretary of War observed this condition during his visit to France in the spring and cabled that these cadets should at once receive their commissions, which were to be held subject to revocation if later they were not found to be qualified. General Pershing stated in his cable of March 30, 1918, that this relieved the principal difficulty so far as training was concerned and the situation as it then existed was "difficult because of lack of machines for front and not because of lack of training facilities."

#### Lack of Information Here as to Exact Status of Foreign Orders

Despite constant interchange of cables, information was lacking here as to the exact status of the foreign orders. While cable inquiries had been made from time to time, it appears from a letter written by Lt.-Col. Horner for the Chief Signal Officer to Colonel Bolling, as late as March 12, 1918, that the desired information had not been obtained. There had been apparently an utter lack of an adequate system of communication by which proper records could be kept here of the transactions abroad. Tables and charts of the foreign orders and deliveries were finally received here, but it seems that there still was considerable uncertainty as to the extent of the foreign obligations, and at the beginning of this investigation the extraordinary statement was made by Lt.-Col. S. E. Wolff, then head of the Finance Division, that notwithstanding repeated inquiries, extending over many weeks, he had been unable to ascertain within \$100,000,000 what obligations had been incurred abroad.

#### Agreement with French Government of May 3, 1918

On May 3, 1918, a new agreement was made with the French Government by which the contract of Aug. 30, 1917, was cancelled. Provision was then made by the French Government for the acceptance of orders of the American Government for aeronautical material, and for the acceptance by the American Government of orders of the French Government for raw materials and other supplies.

As these orders would be intended to meet, in the common interest, the military needs of each country presenting them, it was agreed that each Government should fill the orders so far as compatible with its own requirements and resources.

It was further agreed that upon the arrival in France of raw materials included in the contract of Aug. 30, 1917, they should be delivered to the French Government on the assurance that they would be utilized in accordance with the conditions set forth in the new agreement; and also, that until the American Army should be able to meet its own re-

quirements in aeronautical material, the French Government should place at the disposal of the American aviation units, and such instruction units as may be required, the same aviation material as used by the corresponding French units, both as to quality and quantity.

It would seem that by May 23, 1918, there had been delivered by foreign governments for our use abroad about 1400 training planes and about 350 service planes. Since that time there have been additional deliveries and according to a list obtained by General Kenly the approximate number of airplanes received by our forces from European sources to July 31, 1918, were as follows:

School or training planes.....	1617
Service or combat planes.....	1512

#### PRODUCTION IN THE UNITED STATES

##### Recommendations of Bolling Commission

While Major Bolling's Commission, in anticipation of delays here, placed large orders abroad, it is evident that the speediest production in this country that was possible, of a variety of airplanes and engines, was contemplated. The Bolling Commission recommended for production here:

##### AIRPLANES.

Advanced training Bristol Scout with 80 Le Rhone.  
Division or Corps d'Armee Bristol Fighter with 200 Hispano.  
Long Range reconnaissance and day bombing D. H. 4 with Rolls-Royce or some other equivalent engine to be later adopted. Fiat 300 has proved successful here.  
Fighting or Pursuit (fixed engine) Spad with 200 H.P. Hispano.  
Fighting or Pursuit (rotary engine) New Spad with 150 Gnome. (This airplane is now undergoing final tests.)  
Night bombing Caproni Triplane with 3 Isotta Fraschini 270 H.P. engines or other equivalent engine to be later adopted. For very long distance bombing with heavy loads the Italians are now arranging to use the Caproni Biplane with 3 Isotta Fraschini engines instead of the heavier Fiats now used. For distances of 400-500 miles (out and back included) the much greater consumption of gasoline and oil by the Triplane gives it little greater bomb carrying capacity than the Biplane with Isotta-Fraschini engines and the Biplane can be produced much more quickly and in greater quantities. It is also much easier to house at the front. For bombing at shorter distances nothing gives such great bomb carrying capacity as the Triplane.

##### ENGINES.

80 Le Rhone for training purposes.  
200 Hispano Suiza for fixed engine one place fighters and division or Corps d'Armee airplanes.  
150 Gnome Monosoupape for rotary engine fighters.  
Rolls Royce for U. S. production only under some special arrangement of a Rolls Royce factory in U. S. This engine is not considered suitable for great quantity production. It also requires very skillful mechanics to keep it in commission at the front.

While we have investigated many other excellent engines such as Renault, Fiat, Isotta-Fraschini and S. P. A. all of them are too heavy per horsepower to be recommended as engines for great quantity future production in the U. S. Renault, Fiat and Isotta-Fraschini all have new designs now under test which may prove very desirable. The Bugatti engine appears perhaps to offer the most interesting future development for light weight per horsepower and ease of quantity production. The developments with our U. S. engine now under test are probably the most important consideration in this question of engine production in the U. S. Of course, we are without any adequate information over here as to these developments.

##### Recommendations of Army and Navy Technical Members of Bolling Aeronautical Commission

Captain Clark, U. S. A. S. C.; Captain Marmon, U. S. A. R. S. C.; Naval Constructor Westervelt, U. S. N., and Lieutenant Child, U. S. N., the Army and Navy technical members of the Bolling Commission, on their return to the United States made a report to the Secretary of War and the Secretary of the Navy under date of Sept. 4, 1917, which embraced the following recommendations:

23. So far as land airplanes are concerned, the types at present indicated as necessary, are the following:
  - (A) Primary Training—dual control—about 90 H.P.
  - (B) One or two types of machines for training toward the fast fighter—Single seater—using for the present, the 80 H.P. Le Rhone rotary engine.
  - (C) Army observation—two seater—using probably between 225 and 250 H.P.
  - (D) Single-seater fighter—using a rotary engine of about 170 H.P. (If a water-cooled engine can be built which will, at altitudes, give more power per total weight than the rotary, this type of aeroplane should be eliminated.)
  - (E) Single-seater pursuit—should mount an engine which will give about 150 H.P. at 20,000 ft. altitude.
  - (F) Day bomber—should mount one engine which will give about 325 H.P. at 15,000 feet.
  - (G) Night bomber—should mount two or three of the engines mentioned under (F).

In order to minimize the number of types of engines, it might be desirable to use the same engine in the Army Observation and in the single-seater pursuit. Such an engine should give about 130 H.P. at 15,000 feet.

##### Recommendations of Captain (afterwards Lt.-Colonel) Clark

Captain Clark, who had a larger experience in aeronautics prior to our entry into the war than any other member of the

Commission, was the expert largely relied upon to make suggestions as to the planes which should be manufactured. He visited numerous factories in England, France and Italy and also observed the types of planes in operation at the front. He testifies that his final recommendations on his return to this country in early September, 1917, after learning the situation with respect to engine production here, were for the production of the following types of planes:

Day bomber DeH-9 with the Liberty direct drive, 12 cylinder high compression engine.

Army observation Bristol fighter with the same engine.

Night bomber, a Caproni triplane with 3 Liberty low compression geared engines (Handley-Page an acceptable substitute).

Two-seater fighter, a Bristol fighter with the Liberty 8-cylinder, or with that number of cylinders which should be developed.

Single-seater pursuit,—the Spad, with the Hispano-Suiza.

Single-seater combat with a rotary engine, 150 H.P. Gnome.

Advanced training machine, Bristol Scout, with 85 H.P. Le Rhone.

## PROGRAM AS ADOPTED

### Elementary Training planes

There were selected for production to be used as elementary training planes the Curtiss type known as the JN4-D, with the OX-5 engine, and the Standard type known as SJ-1, with the Hall-Scott or A-7a engine. The program called for 4800 JN4-Ds (later reduced to 3700, and this number was somewhat increased after May, 1918); for 1600 SJ-1s; for 7950 OX-5 engines and 2750 Hall-Scott or A-7a engines (reduced to 2250).

### Advanced Training planes

For advanced training, it appears that there were originally chosen the Bristol Scout with the Le Rhone 80-hp. engine, the Thomas Morse S-4 with Gnome 100 hp., and the U. S. Training with the Hispano (150 hp.). There were modifications which resulted in the adoption of the types known as S4-B (with Gnome 100 hp.), the S4-C (with Le Rhone 80 hp.), the JN4-H and JN6-H (with the Hispano 150 hp.), and the Penguin (with the Lawrence 28 hp.).

### Service or Combat and Bombing Planes

The types first selected for production were the Spad (single-seater pursuit), with the 200 hp. Hispano Suiza engine; the Spad, using the U. S.-8 engine; the Spad Mono-coque, using 150 hp. Gnome engine; the Martinsyde; the DeH-9, the Caproni and the Handley-Page, with the Liberty engine (U. S.-12). Subsequently the Martinsyde and the Spads were rejected, the production of the DeH-9 was first limited and then postponed, the Caproni and the Handley-page were not treated as a part of the immediate program, and the plans for production were centered on the DeH-4 and the Bristol Fighter with the 12-cylinder Liberty engine (U. S.-12).

The program charts which were prepared show extraordinary variations with respect to quantities and surprising expectations as to deliveries. Thus the program for DeH-4s shows a total program on Aug. 2, 1917, of 8000; Aug. 16, of 7500; Aug. 22, of 5000; Aug. 24, of 6000; Aug. 25, of 15,000; Aug. 31, of 6000; Sept. 4, of 15,000; Oct. 17, of 250; Oct. 29, of 1000, at which number it appears to have been continued until Jan. 18, 1918, from which time it was increased until 4500 appear in the program of Feb. 11, 1918, and 8000 in that of Feb. 19 and thereafter.

According to this program or schedule it seems to have been anticipated on Aug. 2, 1917, that 25 DeH-4s would be delivered in October, 100 in November, 425 in December, 750 in January and 1000 in February, and more in each of the succeeding months. Even as late as Sept. 4, 1917, the schedule shows expected deliveries of 62 in October, 1917; 250 in November, 1063 in December; and in the program of Nov. 5 50 were scheduled for delivery in December, 100 for January, etc.

The program of Sept. 5, 1917, for the DeH-9s calls for 2000 of this type; that of Oct. 9, for 4000; Oct. 17, 6750; Oct. 25, 7750; Oct. 29, 7000, at which it continued until Jan. 18, 1918, when it became 7500, to be reduced on Feb. 1 to 5400; and on Feb. 12 the DeH-9 schedule was cancelled.

On Sept. 5, 1917, according to this schedule, deliveries of DeH-9s were expected as follows: November, 1917, 50; December, 200; January, 250, and 300 in February, March, April, May and June. On Nov. 5, 1917, 50 seem to have been expected in January and 300 in February, 1050 in March, 1500 in April, 1900 in May and 2200 in June. As late as Jan. 18, 1918, 40 are scheduled for March and 500 for April.

The program for the Bristol Fighters started on Aug. 2, 1917, with 1000. It appears to have been raised to 3000 on Aug. 16, 1917, within one week it was dropped again to 1000, and on Nov. 26 the program was finally raised to 2000. It seems that on Aug. 2, 1917, deliveries of 25 were scheduled

for October, 50 for November, 100 for December, 125 for January, etc. On Nov. 5, 1917, the schedule calls for 50 in January, 150 in February, 200 in March, etc.

On Aug. 9, 1917, the Caproni program called for 500; on Aug. 16, for 9000; on Aug. 22, for 2000; on Aug. 24, for 500, and there were other variations until the program appears to have settled down after Sept. 28, 1917, to 1000. On Feb. 19, 1918, the program dropped to 50; it called for 250 on May 3, 1918, and was afterwards increased to 1000.

On August 9, 1917, when the program for Capronis called for 500, monthly deliveries of 100 were scheduled to begin in February, 1918. A week later, on August 16, 1917, when the program was increased to 9000, deliveries of 900 were scheduled for December, 1350 for January and each month thereafter. When the schedule was dropped to 1000, deliveries appear to have been expected of 100 in February; and in February deliveries of 100 seem to have been looked for in May.

The Handley-Page program shows on September 5, 1917, a total of 1500, with anticipated deliveries of 100 in December, 300 in January, 400 in February, etc. As late as January 8, 1918, deliveries were scheduled for February of 110, 190 for March, 200 for April, etc. On March 18, 1918, the program had dropped to a total of 50.

These programs, with their variations and schedules of deliveries, appear to be grotesque in the light of the actual facts, but they bear the *imprimatur* of the Planning Department of the Equipment Division with the countersign (except in the case of the De-H-9s) of official approval.

### Suspension of the Program for Single-Seater Pursuit Planes

On October 5, 1917, in reporting the failure of the Spad Mono-coque, the cablegram from our representatives overseas also contained the following advice as to single-seater pursuit planes with rotary engines:

Recommend you build no rotary engine single-seater pursuit airplanes to be sent to Europe existing machines this type will be out-classed by changing time yours arrive build only what you need for use in United States training purposes.

This, however, did not touch the Spad intended to be used with the fixed engine, that is, with the Hispano Suiza engine. That machine was not experimental. As early as July 15, 1917, there was official advice that "200 H.P. Hispano Suiza (is) now fighting on front in Spad aeroplanes." Colonel Bolling reported in his cablegram of August 1, 1917, that the Spad with that engine is "the best fixed engine fighter now in service." There is no reason why this fighting plane should not have been produced here in quantity many months ago. The failure to do so was not due to lack of facilities, but simply to a change of opinion at a critical time as to what was advisable.

Responding to repeated and urgent recommendations for production of Spads in this country, an order for 3000 Spads was placed with the Curtiss Aeroplane and Motor Corporation under date of September 19, 1917. But this order had barely been placed when doubt was cast upon the enterprise, and after preparation for production was well under way the order was cancelled on November 7, 1917.

This is the date of the cancellation, as testified by Mr. Morgan, then vice-president of the Curtiss Company. It was nearly six months later that the production of a single-seater pursuit plane (the S. E. 5) was undertaken, and thus there was a serious loss of time through a reversal of judgment which was in turn reversed.

It should be noted that virtually all the cables of advice sent by our military representatives abroad are signed "Pershing," but doubtless they most frequently come from subordinate officers, and with respect to the subject under consideration, from those in charge of the Air Service overseas. In a cablegram received here on October 5, 1917, the following appears:

If USA 8 cylinder heavier than Hispano Suiza pounds per horsepower build no monoplane pursuit airplanes with USA 8 cylinder engines. Machine will be useless by time it arrives here. Increase number DH 4s or DH 9s by number monoplane pursuit airplanes. This is necessary provided USA 12 is success. Useful loads increasing so rapidly here that engines now in United States are not considered powerful enough meet requirements. Two-place pursuit airplanes considered most urgently needed airplanes next year.

The view thus set forth found support in influential quarters here. On October 27, 1917, Lieut.-Col. Clark in a memorandum sent to Mr. Coffin expressed the opinion that "all fighting and bombing by day will be done in two-seaters flying in regular formation." And he added, "The single seater will be eliminated." A few days later the following cablegram was received:

Nov. 8, 1917. No. 252 (S. D. 2709) Par. 1.

Your 359, paragraph 7, and other cables concerning American engine program. Situation here has changed much during three

months since original recommendations and continues changing constantly. Following general principles appear clear to us. First. Single seater fighter will probably become obsolete general use next year, although small numbers will always be used special purposes. Recommend you produce number already actually under contract and started. Believe we can obtain here all this type required future above number actually under contract here and America. This applies both single seater fighter airplanes and engines. Second. Two seater fighter airplane with stationary engine will supersede single seater. 400 horsepower probably sufficient next six months, after that five hundred horsepower necessary. This summarizes cables already sent you.

It will be observed that while this message recommended against further production, it distinctly stated that the number, already under contract and started, should be produced. But this was not done.

On November 30, 1917, Colonel Deeds cabled:

Curtiss company have completed drawings and ordered material for Spad for 220 H.P. geared Hispanos. We have cancelled that order. Tulasne suggests possibility of helping the French program by building Spad planes here to be equipped with 220 H.P. geared Hispano engines built in France. We could get production in February without materially affecting output of two-place fighters. We are not urging this because of the fact that we have ordered material which can be utilized in other machines, but if it would help your program here is a quick source for these machines.

To this there was a reply (from London) on December 14, 1917, as follows:

With reference to paragraph 1 your cablegram 461 do not recommend unionized production Spad airplanes for France. No such request received from French here. Believe they can produce all these airplanes they need. Think our only efforts should be applied airplanes and engines already on our program. United States should leave production single place fighter to Europe.

The Spad contract having been cancelled and preparations for the production of single seaters in this country abandoned, in less than two months there was an urgent request from our military representatives abroad that Spads be produced here. As early as February 10, 1918, it was recommended that steps be taken to "put into production 1000 Spads one-place with 220 H.P. Hispano Suiza engines for earliest possible delivery in France."

It was said that "French delivery of one-place Spads very uncertain and can not be depended upon. Should have more definite information next two weeks as to whether your production Spad one-place fighter should be further increased." While this new proposal was evidently the result of the breakdown in the French deliveries, it seems that a closer inquiry into the progress of our deliveries of raw material abroad and the conditions of French manufacture would have revealed the serious importance of continuing the production of single seaters in this country in accordance with the original program.

However, the authorities here were not then ready to follow the new recommendation, and two weeks later, on February 25, 1918, they cabled the following reply:

Production of Spads with 220 H.P. Hispano Suiza engines does not fit well into our program because engines cannot be put in production without material delay. Probably first deliveries in France in December. We could somewhat more easily produce the 300 H.P. Hispano Suiza engine. We are now producing large number of 150 H.P. engines for training planes, and could even increase production. We believe with this information you will probably decide not to request production of Spads here. Please give us your full advice.

It was not until March 9, 1918, that this cablegram was answered, with the statement that "question being considered. Will advise you soon." On April 6, 1918, Mr. Potter cabled that the British Air Board had advised that they could supply at once two hundred SE-5 planes without engines. He added, "We can arrange production for 180 H.P. Hispano Suiza engines for same at rate of five per day within 30 to 60 days. Shall we arrange engine supply. If so, will you arrange contract for planes." On the same day Colonel Deeds cabled:

We could within four weeks begin to supply 180 H.P. high compression direct drive Hispano Suiza engines to be shipped to England, to be installed in the planes by the plane manufacturer. Would this type of fighting machine be of value to you, and if so shall we proceed to provide them for you? We are advised that this type is in successful use by the British on the front.

On April 19, 1918, the following urgent message was received from our representatives abroad:

The United States should make immediate preparations for the production of single seater machines to supplement those we may receive from France and England.

But on April 21, 1918, there was a further cablegram (referring to Mr. Potter's cable of April 6, 1918) stating that the whole subject was still under consideration. This message was (in part) as follows:

Will the production of 180 H.P. Hispano Suiza engines be interfered with by contracts placed by French or English. If not, we strongly recommend production of this motor for our needs this year on following basis. (Giving delivery dates.) The situation with reference to single seater fighters for remainder of

1918 is as follows: Both France and England have a plane production in excess of their engine production and as the 180 H.P. Hispano Suiza is already in production in the United States in small quantity, our only practical means of securing the necessary number of single seater fighters will be for the production of this engine for overseas duty to be increased so as to provide the number indicated and for us to distribute these engines here month by month as conditions require. The entire question of the provision of single seater aeroplanes for 1918 and 1919 is being thoroughly investigated and a comprehensive report with all data necessary will be forwarded by an officer familiar with the entire situation.

On April 24, 1918, Mr. Potter cabled that contract could be made with the British Government for SE-5s at the rate of 30 per week beginning July 1st; that 180 H.P. high compression Hispano-Suiza motors could be supplied from here for those planes at the same rate, and that the same machine could be put into production here and shipments begun in September. He asked quick advice if arrangements were desired which would permit of "quickest possible delivery of single seater fighting planes on the front," and he added "SE-5 equipped with 180 Hispano is the only machine we can produce quickly."

To this an answer was received on May 4, 1918, disapproving the production of SE-5s, as follows:

Production of SE-5 for 180 Hispano in America disapproved since it appears that necessary planes for this engine can be obtained in Europe either SE-5, Spad or both.

This was followed on May 12, 1918, however, by a cablegram stating that the question was still open pending final report of Board of Air Service officers, and that final recommendation would be cabled in about ten days.

On May 15, 1918, Mr. Potter cabled referring to the message from overseas of April 19, 1918, urging immediate preparation for production of single-seater fighters and calling attention to the fact that the cablegram of May 4, 1918, was an exact reversal of the former recommendation. He said:

We took immediate action on this recommendation and have given orders for 1,000 SE-5s. Your 1052, par. 2-A exactly reverses these recommendations. In view of this inconsistent information and also due to requests for production of SE-5 from Air Division for training purposes, we have decided not to change our orders for production on these machines, and request that samples be sent promptly in accordance with our London 81, par. 3.

The final result is that there has been no renewed order for the production of spads, and that the order for SE-5s is being proceeded with, but that the American machine of this type is still in an experimental stage. It is understood that the machines are being tested, and that the questions which have arisen and have been brought to the attention of the authorities are receiving their consideration. We have not as yet sent from this country to the battle front a single pursuit or combat plane, as distinguished from the heavy observation or bombing planes, and after giving due weight to all explanations the fact remains that such pursuit planes could have been produced in large quantities many months ago had there been prompt decision and consistent purpose.

#### Delayed Program for the Handley-Page and Caproni Bombing Planes

Although the Handley-Page and Caproni planes remained in the program, production was delayed. Both these types of bombing planes were included in the modified recommendations of the Joint Army and Navy Technical Board on Nov. 21, 1917, and these recommendations were approved by the Secretary of War and the Secretary of the Navy.

#### Handley-Page Planes

On Jan. 25, 1918, a resolution recommending a contract for Handley-Page planes with the Standard Aero Corporation was tabled by the Aircraft Board, in view of the fact that such an order might interfere with work already undertaken by the company. On Feb. 8 the board discussed the advisability of concentrating upon the manufacture of a single type of night bomber, and it was stated that, due to the lack of history as to the comparative performance of the Handley-Page and Caproni, the decision had been made to put both types into production in the United States.

Arrangements had been made for the assembly in England of Handley-Page machines for the American service, and on Feb. 19 the minutes of the Aircraft Board show that a cable had been received on Feb. 14 by the British War Mission indicating that it would be serious to cancel these arrangements.

The minutes add that in view of "a cable received Feb. 18 from General Foulis recommending the building of both the Handley-Page and Caproni types, because of the military needs for the immediate future, it was decided that at present both types should be constructed," and the secretary was asked to keep before the board's attention the necessity



of making a decision prior to July 1 concerning the concentration on the manufacture of one of these types for the year 1919.

On March 19 the Aircraft Board recommended that a contract be placed with the Standard Aircraft Corporation for the assembling of 500 Handley-Page planes and the furnishing of such parts (other than wood parts) as the Government might require, these planes to be assembled and taken down and disassembled and packed for export shipment to such extent as the Engineering Department should require, but not more than 10 per cent of these, that is, 50 planes, to be fully assembled for testing and flying in this country. Orders for 1000 sets of wood parts and for various metal parts of the Handley-Page were placed. In a letter to Colonel Bloomfield, Air Division, under date of March 20, 1918, M. W. Kellogg, Director of Production, thus summarizes what had been done up to that time:

2. Some time ago miscellaneous orders were placed from time to time, either by letter or word of mouth with people that our Production Department felt could facilitate this matter by having manufacturers start on the work. These manufacturers, as per list attached, have done more or less work. The ones that are further advanced are the W. R. Mullins Company of Salem, Ohio, who are supplying approximately 75 per cent. of the metal parts to be used, also the Grand Rapids Airplane Company of Grand Rapids, Michigan of the wood parts, they having at this time received about 250,000 feet of spruce and I understand that a large part of this has been in the kilns and they will start work in a short time which, we would judge to be approximately from a week to ten days manufacturing some of the parts. The other manufacturers are in a more indefinite condition. We are now trying to adjust the questions between them and the Signal Corps by giving them a formal contract, and at the same time ascertaining as far as possible the exact conditions of their detail part of the work. Some of these sub-contractors have very small items. As an example, the two tire companies have only been instructed to develop and make the molds for the tires and have manufactured a very few tires each. Other companies have only made dies for a very small percentage of the stampings, etc., etc.

3. We gave a contract a week ago for the assembling of the machines that are going to be assembled, to-wit: fifty, and for the marking, listing, packing, etc., for export abroad for four hundred and fifty, to the Standard Aircraft Corporation who, in connection with our engineers, will use their best efforts to push the work.

4. We are just starting at this time to line up our Production Department on an aggressive assembling of this material and a correlation of same with a view that if it develops that any of the manufacturers are in such a position that they would seriously delay the work, to put pressure upon them to try to overcome such a condition.

5. We are advising you of all these facts to as clearly as possible give you a picture of the situation so that you can use your own judgment and do as he sees fit in this connection.

6. You will note that while he has ordered numerous parts for 1,000 planes, our assembling contract only covers 500. This was done with the distinct understanding that if the contractors did their work efficiently and well and in proper time, we would favor them with a further order of not less than 500 more machines.

The first Handley-Page plane assembled in this country was flown in the early part of July.

The Standard Aircraft Corporation, it appears, was able to produce the first Handley-Page machine within ninety days from the time they were given full authority for that purpose, and the testimony is that, making allowance for whatever advantage existed by reason of the fact that previous contracts had been let for certain parts the first machine could have been produced at the outset within one hundred and twenty days. Further time, of course, would have been required for quantity production, but for the long postponement of the program of the Handley-Page no satisfactory reason is shown.

#### Caproni Planes

In the minutes of the Aircraft Board, under date of Feb. 12, 1918, it was recited that the Italian manufacturer Caproni had sent to this country samples of his triplane and biplane, with his production engineer, Captain D'Annunzio, expert fliers, and thirteen factory experts, to assist the United States in placing Capronis into production.

On Feb. 7 the board had recommended that a contract be made with the Standard Aircraft Corporation for the manufacture of fifty Caproni planes. Mr. Coffin urged on Feb. 20 that plans be laid for quantity production of Capronis to be assembled in Italy, but it was the feeling of the board that the matter should be held in abeyance until the production of sets of Caproni parts for the Italian Government were under way.

On April 11, 1918, it appears to have been the sense of the Aircraft Board that the Caproni should be put into immediate production, in view of (1) repeated cable advices to that effect, (2) the actual experience in Europe with the Caproni, (3) the fact that Captain D'Annunzio had assured the Signal Corps that there would be no difficulty in the installation of the Liberty motor. On March 21, 1918, Mr. Potter advised the board that the Italian Government did not desire a contract for the manufacture of Caproni parts in this country because of the remoteness of contemplated

deliveries, and inquired the disposition of the board as to the manufacture of 50 complete Capronis, as recommended on Feb. 7. On March 26, 1918, the question of manufacturing the Caproni was again raised in the board, and after discussion was referred to the Chief Signal Officer for the consideration of Colonel Waldon, with especial reference to the question of the establishment of an assembly plant in France.

On April 2 a letter addressed by the Italian ambassador to the Chief Signal officer was referred to the board, inquiring whether the American Government intended to build Caproni planes for its own use, and if so, how many. Discussion was had of the question, "in view of cables recently received urging such production and the expense already incurred by the Government in preparation therefor."

On April 23 Mr. Potter stated to the board that a verbal order has been given to the Fisher Body Corporation for 250 Caproni planes, and that preparations for production were under way. On May 9 it was further stated by Mr. Potter that arrangements had been made with the Fisher Body Corp. and Captain D'Annunzio for the manufacture of 500 sets of Caproni parts by that company, contract for which would be let as soon as funds were available, and that preparation for production was under way, which, however, was not promised before September. Contracts were made in June, 1918, by the Fisher Body Corp. and the Curtiss Aeroplane and Motor Corp., each for 500 Capronis. There were arrangements several months ago, apparently of a tentative character, with the Standard Aircraft Corp. for four Capronis, of which one has been built.

There appears to be no adequate reason for this long delay in putting the Caproni planes into production. If it was due to congestion in plants selected for production this could have been obviated by a better and wider distribution of work. This is, of course, so far as the matter of plane production is concerned. The immaturity of the Liberty motor doubtless had its effect, but it would seem that orders for the motors sufficient to meet all appropriate demands should have been distributed in such a way that there could have been no occasion for delay in the building of planes because of the lack of orders for the engines to go with them.

#### Postponement of the DeHaviland 9

In his recommendation, on his return from Europe in September, 1917, the DeHaviland 9 was preferred by Captain Clark, as the DeH-4 appeared to him to be obsolescent at the time the Bolling Commission was in England and the DeH-9 was designed along the same general lines as the DeH-4, but with its weaknesses, from a military standpoint, corrected.

In other words, he regarded the DeH-9 as far better suited for bombing than the DeH-4. The principal distinction is that on the DeH-9 the rear man—the gun fighter—is moved back about twenty inches from his position on the DeH-4; the pilot is moved back so that he is placed immediately in front of the gun fighter; the fuel is moved forward so that it is near the engine, and between the fuel tank and the pilot is a bomb compartment.

The contracts with the Dayton Wright Airplane Co., the Fisher Body Co. and the Standard Aircraft Corp., originally called for DeH-9s. When, on Sept. 22, 1917, the program, as it then stood, was submitted to Colonel Bolling on behalf of the Chief Signal Officer, it called for 2000 DeH-9s, and the reply was that the number was not sufficient and should be doubled.

It may also be noted that in the same cablegram (Sept. 22nd) from the office of the Chief Signal Officer it was stated that the first deliveries of the DeH-9 with the Liberty 12, and synchronized Marlin piston type airplane gun, would be made in November, 1917.

The sample machine, however, which was first received from England was the DeH-4. The DeH-9 had not yet been put into service at the front. Apparently there was no sample DeH-9 available here until at the end of February, 1918, and it seems to have been thought that progress had been made to such a degree in the developing of the design of the DeH-4 for production that it was advisable to concentrate upon the production of the DeH-4 to the virtual exclusion of the DeH-9.

Consequently, in the substitution of contracts, the DeH-4 took the place of the DeH-9 and it appears that in February, 1918, directions were received from Colonel Deeds and Colonel Montgomery that orders for DeH-9s were to be cancelled for the present, pending information from abroad.

It seems that with an adequate production program this improved type, or its American equivalent, could have been produced here some time ago, but it has not yet been put into quantity production. It is said, however, that the DeH-9 is

now "being put out of production abroad" because of the "coming in" of the DeH-9A which is a further improvement.

#### Result

For obvious reasons, it is not deemed advisable to make public the details of the present aircraft program. That can be stated by the military authorities whenever they think it wise to do so. For the present purpose it may be said that the abandonment of the program for the Spads left us, until recently, without any program for single-seater pursuit planes, and that also, until recently, so far as service planes were concerned, there remained a program for immediate production which was virtually limited to DeHaviland 4s and Bristol Fighters.

The Bristol Fighter as redesigned to take the Liberty motor proved to be a failure and after a series of fatal accidents was discarded. The Bristol was so far removed from a machine that could carry an engine of that power that it has been admitted by high authority that it as "a very foolish thing to put the two together."

Thus, nothing is left of last fall's program for service planes save the DeHaviland 4s. The course of production of these planes is hereafter stated. It appears that after the remedying of various defects they are being successfully used as observation and bombing planes. There are certain limitations, which it is not necessary to describe, of their military effectiveness for this purpose, and machines of the later and improved types are to be provided. By reason of a lack of manouverability the DeHaviland 4 cannot serve the purpose of a pursuit plane.

#### Engines for service airplanes

The Bolling commission's recommendations for the production of engines in the United States for service airplanes embraced the 200-hp. Hispano-Suiza for fixed engine single-seater fighters, the 150 Gnome for rotary-engine fighters, and the Rolls-Royce for United States production only under some special arrangement for a Rolls-Royce factory in the United States.

It was said that the Rolls-Royce engine was "not considered suitable for great quantity production. It also requires very skillful mechanics to keep it in commission at the front." It was added that the Renault, Fiat, Isotta-Fraschini and S. P. A. were too heavy per horse power to be recommended for great quantity production in the United States and that the first three mentioned had new designs under test which might prove very desirable. Special attention was directed to the development of the Bugatti engine. And this statement of the Bolling commission concluded with the observation that the developments in connection with the United States (Liberty) engine now under test "are probably the most important consideration in this question of engine production in the United States."

#### Rolls-Royce and Sunbeam Engines—British Experience

There has been considerable testimony as to the feasibility of securing, in the year 1917, the early production of certain foreign engines, notably the Sunbeam and the Rolls-Royce. In order that there might be an authoritative statement of British experience, there was obtained, through the courtesy of the British ambassador, a memorandum under date of June 22, 1918, which has the authority of the British Air Ministry.

From this it appears that when we entered the war in April, 1917, the British had in use the following airplane engines: 160-hp. Beardmore; 150-hp. RAF4-A; 180-hp. LeRhône; 130-hp. Clerget; 190-hp. Rolls-Royce; 150-hp. Hispano-Suiza; 275-hp. Rolls-Royce; 320-hp. Cossack Sunbeam; 230-hp. RAF3-A. The following engines at that time (April, 1917) were "coming on": 150-hp. BR-1; 180-hp. Viper Hispano; 220-hp. Geared Hispano; 200-hp. Arab Sunbeam; 220-hp. B. R. 2; 270-hp. Falcon, Rolls-Royce; 140-hp. Clerget; 375-hp. Eagle Rolls-Royce; 260-hp. Maori Sunbeam. With respect to these engines, the memorandum furnished by the British ambassador contains the following statement:

Of those "in use" in April, 1917, all were good reliable engines, but it was obvious that they could not remain in the front rank for very much longer.

Of those "coming on" the two Rolls-Royce engines and the 180 Viper Hispano were practically certain to be a success.

The others were undeveloped and could not have been recommended at that time; so that in April, 1917, no Sunbeam engine could have been recommended for manufacture in America, and the general opinion in England was that the Rolls-Royce was quite unsuited to American methods of production.

A further communication from the British ambassador states that what is quoted above on the Rolls-Royce and Sunbeam may be taken to apply equally to July and August, 1917. It should be added that in 1917 Colonel Bolling cabled advis-

ing against the production of the Sunbeam engine in the United States.

#### The Hispano-Suiza Engine

A different situation existed with respect to the Hispano-Suiza engine, which had been used extensively abroad. In the summer of 1917 the 150 hp. Hispano-Suiza engine was in production at the plant of the Wright-Martin Aircraft Corp. at New Brunswick, N. J. That company had received an order from the French government in February, 1916, for 450 of these motors. Although the contract was to be fully performed by the late summer of 1916, there was serious delay and deliveries did not begin until March, 1917.

This delay was due in large part to the difficulty of putting into production an article of very fine workmanship and material which was entirely new to American shop practice. The greatest problem in this sort of work has been the procurement of materials of proper refinement and texture.

The delay was also apparently due in considerable measure to conditions which could have been remedied, and a comparatively small force was engaged on the Hispano-Suiza motor work during the year 1916, the main effort of the company at that time being motor car production. (Since the fall of 1917 virtually all the facilities at the New Brunswick plant of the Wright-Martin Corp. have been engaged in the manufacture of airplane engines.)

By Sept. 1, 1917, 202 engines had been delivered under the French contract and by October, 1917, the difficulties had been surmounted; in that month 117 were produced and the French contract was completed in November, 1917.

The Signal Corps placed a number of contracts with this company, reflecting changing purposes. Under date of July 31, 1917, it placed a contract for 500 of the 150-hp. Hispano (Type A). In September, 1917, a further contract was made for 500 of the same type and this was cancelled on Oct. 2, 1917.

On the latter date the company received a contract for 4000 of the 220-hp. Hispanos (Type F), which were the 150-hp. engines geared to high speed.

This contract was cancelled on Nov. 13, 1917, and was replaced by the contract of that date for 1000, 150-hp. Hispanos (Type A). On Nov. 20, 1917, the company received a contract for 3000, 300-hp. Hispanos (Type H) which was modified by two contracts in the present year postponing the delivery dates, the second of which (May 11, 1918) provided for the manufacture of the 300-hp. Hispanos in Long Island City and for a further postponement of deliveries.

On Feb. 2, 1918, another contract was awarded to the company for 1000, 150-hp. Hispanos (Type A). On Feb. 25, 1918, a contract was made for 1000 Type E or I Hispanos; and on May 25, 1918, another contract for 1000 Type E or I Hispanos was placed with the same company.

Type E is Type A modified as to connecting rod construction, magneto drive construction, and the piston design so as to make possible the carrying of a higher compression and thereby greater power, that is, 180-hp. at normal speed. Type I is 150-hp. and has all the improvements of Type E, except the big compression.

The 300-hp. Hispano (Type H) was in an experimental stage last November and the first deliveries now due of Type H are in October. Under the contract of July 31, 1917, for 500 150-hp. Hispanos deliveries were to begin ninety days from date of contract and determination of final details.

Subsequently, Oct. 25, 1917, was fixed as the date from which the ninety days were to be reckoned and the deliveries were actually completed in February. Under the contract of Nov. 13, 1917, for 1000 150-hp. Hispanos, deliveries were to be completed in April, 1918, and with the exception of one motor they were completed in May, 1918. Under the contract of Feb. 2, 1918, for 1000 150-hp. (Type A) motors, deliveries were to be completed in July and, by the end of July, 988 had been delivered.

The Type A or the 150-hp. Hispano, has been used for the advanced training plane known as the JN-4H. The 180-hp. Hispano is adapted to single-seater pursuit planes such as the Spad or the SE-5 and is now in course of delivery.

On July 25, 1917, the Wright-Martin Aircraft Corp. submitted to the Aircraft Production Board a schedule for proposed deliveries of the Hispano-Suiza motor "of either direct driven or geared specifications" amounting to approximately 7000 over and above the deliveries then due on the French contract.

The offer was on the condition that "orders are placed with us or some definite arrangement made for same at once, so that we have sufficient assurance to warrant us in making the necessary capital expenditures and providing further that arrangements can be made for the Government to furnish us

with the necessary working capital in excess of our present resources."

There is ample basis for the conclusion that had there been a sustained effort to produce single-seater pursuit planes, and with this definite purpose adequate orders had promptly been given so as to justify the provision of additional facilities by this company and the speedy utilization of its highest capacity, engines for these pursuit planes could have been delivered in quantity through the winter and spring and large numbers of these engines would have been available by July 1, 1918, in addition to the production needed for advanced training planes and without interfering with the development of the high-power Liberty motor. This is aside from what could have been accomplished through timely arrangements made for production by other companies.

#### Rotary Engines

In the cable of Oct. 5, 1917, in General Pershing's name, it was recommended that "no rotary engine single-seater pursuit aeroplane" should be built here to be sent to Europe. On Nov. 8, 1917, Brigadier-General Saltzman, Acting Chief Signal Officer, requested the opinion of the Joint Army and Navy Technical Board as to the extent to which rotary motors should be included in the building program for airplanes and engines in the future.

In response, the Joint Army and Navy Technical Board replied that as "the tendency in the design of fighting airplanes" appeared to point toward two-seater fighters of maximum power, it was believed that in the general building program for the coming year "rotary engines should be considered of secondary importance."

It was added, however, that in order "to anticipate improvements in the art or changes in the military situation" it was desirable that the art of building rotary engines be retained in the United States, and that for this purpose "the organization skilled in rotary engine production be preserved."

Referring to the schedule of production of rotary engines, the board expressed the opinion that the order for 2500 80-hp. LeRhône engines was larger than was necessary to preserve the art and that this order should be reduced to the minimum number that would accomplish the purpose, and it was further recommended that steps be taken to preserve the possibilities of production of the 160-hp. Gnome engine. The immediate occasion of this inquiry was the pending question whether the Government should purchase the plant of the General Vehicle Co. of Long Island City, which was manufacturing Gnome motors.

This purchase was made but the manufacture of Gnome motors was continued at this plant for a time. In May, arrangement was made for the use of the plant by the Wright-Martin Aircraft Corp. in the building of 300-hp. Hispano-Suiza. Additional orders have been placed for LeRhône engines. The rotary engines have been used for advanced training planes.

#### The Liberty Engine

In the latter part of the year 1914 the Packard Motor Car Co. decided to go extensively into the development of air motors. It had received one of the Mercedes motors, used by the Germans in their airplanes, which had been imported in a racing chassis.

Taking certain features from that motor and from other motors, an engine was designed in 1915, a duplicate of which was used in a racing car. This engine developed 140 hp. at 3600 r.p.m. Another model, with greater power, was completed in December, 1916, and was also used in a racing car; this was rated at 200 hp. at 2180 r.p.m. It was described in a pamphlet exhibited at the Aeronautical Show in New York in January, 1917, as "The Packard Aircraft Engine," exhibited as a "stimulant to the new aviation industry."

The work of developing these motors had been under the direction of J. G. Vincent, then vice-president of the Packard Motor Car Co. in charge of engineering. In the latter part of May, 1917, Mr. Vincent took his drawings to Washington for the purpose of laying before the Government the plan of the Packard company to manufacture these engines in large quantities through enlisting the aid of other automobile manufacturers who had experience in high-grade motor work.

Mr. Vincent met Mr. Deeds, Mr. Waldon and others. The design was not deemed to be adequate for the needs on the Western Front and it was necessary to increase the horsepower of the motor with lighter weight per horsepower. Mr. Vincent worked in Washington in conjunction with Mr. E. J. Hall of the Hall-Scott company, making sketches for the purpose of improving the motor, and in a few days a new motor was designed embodying to a considerable extent the engineering features which had been developed during the past two years of experimental work.

The first efforts were directed to the development of an 8-cylinder motor, and in a few days Mr. Vincent returned to Detroit, taking the Washington sketches for the purpose of having a wooden model made by the Packard company, and this was done.

At the request of the authorities, Mr. Vincent was loaned by the Packard company in order that he might take charge of the Engineering Division of the Aviation Section of the Signal Corps. The Packard company made a full-sized operating model, which was sent to the Bureau of Standards on July 3. Later, about August, 1917, the production of an 8-cylinder engine was postponed and the immediate production of a 12-cylinder engine of the same type was decided upon.

In developing the design for the purpose of quantity production various difficulties were encountered. Aside from minor changes found to be necessary in the course of production, the crankshafts, connecting rods and bearings in the first thousand engines were too light, creating a dangerous condition.

The crank shafts, connecting rods and bearings had to be redesigned. It was also found to be advisable to change the system of lubrication and, again, it was difficult to obtain a development of radiators that were suitable for a motor of this size. As late as June 25th of this year, General Pershing's cable described a series of defects in the motors which had been shipped abroad and these, it is understood, were speedily remedied.

It now appears to be conclusively established that the Liberty engine is a great success for observation and bombing planes, and for this purpose it has found high favor with the Allies. It is too heavy for the lighter pursuit planes. The following statement furnished by the British Ambassador with respect to British opinion of the Liberty motor, was received on June 22, 1918:

No bench tests have been applied to the Liberty Engine in England but tests in the air, similar to those applied to British engines, have been carried out on a D.H.9-A with satisfactory results. Bench tests in France were observed by members of the British Technical Department and were satisfactory. The tests carried out in France were the Standard French tests, and do not differ very largely from the Standard English tests, except that the power output was taken with a fan brake instead of a Froude Water Brake, as generally used in England. The results were excellent, except that the design of crankshaft and connecting rod was found to be faulty, but this was well known and had been modified in the United States. The carburetor was also found to be unsatisfactory but is now in course of being remedied.

The official opinion of the Liberty Engine is that it is an engine which, with a natural development in the perfecting of its details, will prove reliable and up to the power and consumption standards that have been claimed. It is eminently suited for bombing and reconnaissance aeroplanes, but not for fighting aeroplanes. The number of engines actually ordered for the British Government is 980, but 4,500 are required by the end of the year. The British Government would have prepared to place an order for 3,000 at once, but, at the desire of the American Government, the order was limited to 980, the number which was allocated for delivery up to the end of June. Up to date, 205 engines have been delivered from the Works.

The following is the text of a telegram received from the Air Ministry on June 8th:

The British technical authorities have reported to the air minister that the liberty engines have now been subject to sufficient air experiment in England to warrant confidence in this engine. Excellent results have so far been obtained which place the engine at once in first line of high powered air engines. Naturally service experiment in the field is still to be obtained but the Liberty engine will be a most valuable contribution to the Allied aviation programme and the United States should develop production with every confidence.

The following further statement was supplied by the British Air Ministry, under date of Sept. 27, 1918:

No severe bench tests on the Liberty Engine were carried out in England, owing to the extensive tests in America.

The only bench test in England was one short test, at nine-tenths power, for data re oil and fuel consumption. The result was quite satisfactory.

One engine was stripped after 100 hours flying and was found to be in good condition.

Tests in the air have been carried out in de Havilland 9-A and de Havilland 10, machines. In these the engines have performed uniformly satisfactorily.

The performance of the Liberty Engine is at least as good as that of the Rolls-Royce in identical machines. The information officially expressed four months ago, that the Liberty Engine would prove satisfactory in service, is wholly confirmed.

The facts as to production will be given later.

#### FIFTH. SELECTION OF CONTRACTORS AND DISTRIBUTION OF WORK

##### Selecting of Contractors

For engines to be used in training planes, there were orders (to June 30, 1918) for 7950 OX-5s distributed among the Curtiss Aeroplane & Motor Corporation, the Willys-Morrow and Willys-Overland companies. Orders for the Hall-Scott engines (2250) were placed with the Nurdyke & Marmon Co.



and the Hall-Scott Motor Co. The General Vehicle Co. received an order for 111 Gnome engines (100 hp.), and the unfilled portion of this order was taken over by the Aeronautical Engine Co., which also received certain additional orders for engines of the same type, when the latter corporation was organized to conduct operations at the plant of the General Vehicle Co. after its purchase by the Government.

The Union Switch & Signal Co. had orders for 2500 Le-Rhone engines (80 hp.). The orders for the Hispano-Suiza engines placed with the Wright-Martin Aircraft Corporation have already been sufficiently detailed (*ante*, p. 96). In addition, orders for 450 of the Lawrence engine (28 hp.) were placed with the Excelsior Motor Manufacturing Co., and an order for 2000 Bugattis was given to the Duesenberg Motor Corporation.

In the summer and fall of 1917 contracts were entered into for the manufacture of 22,500 Liberty motors, as follows:

August 31, 1917, Lincoln Motor Co.....	6,000
September 4, 1917, Packard Motor Car Co.....	6,000
September 7, 1917, Nurdyke & Marmon Co.....	3,000
September 11, 1917, Trego Motor Corp.....	500
November 22, 1917, Ford Motor Co.....	5,000
December 11, 1917, General Motors Corp.....	2,000
Total .....	22,500

The contract with the Trego Motor Corporation was subsequently cancelled,\* only one engine being delivered.

For the production of elementary training planes of the type known as JN4-D, reliance was placed chiefly upon the Curtiss Aeroplane & Motor Corporation, which had already made planes for the British Government. Substantial orders were also given to the Springfield Aircraft Co. and the Canadian Airplane Co., Limited (of Toronto). A number of small orders were placed from time to time with various concerns. The total orders to June 30, 1918, were for 3975 of the JN4-D type.

The orders for the Standard-J training planes were distributed among the Dayton Wright Airplane Co., the Fisher Body Corporation and the Standard corporations (Standard Aero Corporation and Standard Aircraft Corporation). The total orders were for 1600 of this type.

For advanced training planes, there were orders given to the Curtiss Aeroplane & Motor Corporation (to June 30, 1918) for 919 JN4-H and 479 JN6-H; to the Thomas Morse Aircraft Corporation (for 100 S4-B and 400 S4-C), and to the Breese Aircraft Corporation (for 300 Penguins).

With respect to both elementary and advanced training planes there were also various orders for spare parts.

In service planes, the production of the DeHaviland-4s was pivoted upon the work of the Dayton Wright Airplane Co. in connection with the designing of the plane for American production, as hereafter explained. There were contracts for 8500 of the DH-4s as follows:

Dayton Wright Airplane Co.....	4,000
Fisher Body Corp.....	4,000
Standard Aircraft Corp.....	500
Total .....	8,500

The contract for the Bristol fighters (2000) was given to the Curtiss Aeroplane & Motor Corporation.

In view of the exigency, it was inevitable that the responsible officials of the Signal Corps entrusted with the duty of aircraft production should exercise a broad authority, virtually unhampered by restrictions, in the selection of contractors.

The Aircraft Board, in which the responsible Army officers sat as members, afforded a useful opportunity for the comparison of views, but not a legal, and only to a limited extent, a practical, check. There have been numerous complaints from individuals and corporations who sought contracts unsuccessfully. The extent to which activities were centered at Dayton, the profitable contract promptly given to Colonel Deeds' former business associates, and the preference of a small group of manufacturers in the allotment of the large contracts, created a feeling of distrust which finds frequent expression in the record of this inquiry.

There could be no well-founded objection to a well-directed effort to standardize products for production in large quantities under conditions favoring the most economical and efficient work. So far as orders for production of planes in small quantities and various spare parts are concerned, to give an adequate statement of the facts with respect to the companies who received, or which asked and were refused, contracts would require a great variety of detail which it is impracticable to set forth.

It does not appear that in the award of these contracts there was adherence to any clearly defined principle. It is sufficient to say that in many instances the parties complain-

ing have no ground for their complaints, save that others in no better situation obtained what the complainants were denied.

For, while offers or requests of some manufacturers went unheeded because of alleged lack of proper facilities or of assured financial ability, in other cases contracts were made with parties equally destitute of adequate resources. Among those whose facilities were apparently adequate, some were taken and others were left.

But aside from any question of discrimination between manufacturers, it is obvious that the exigency demanded that important and needed sources of supply should not be neglected, and in this connection, without attempting to make a comprehensive statement of other available resources, the case of the Singer Manufacturing Co. deserves special attention.

#### Singer Manufacturing Co.

While this company had no experience in the building of airplanes, it had perhaps the largest plant in the country for cabinet work, and one of the largest veneer plants, and its facilities available for the processes demanded in aircraft production were hardly excelled in the country.

As Colonel Waldon testifies, "There was every reason why they should be successful in airplane manufacture." The officers of the company were not seeking contracts but they offered its facilities to the Government, and these were not utilized. As early as July 14, 1917, Mr. Waldon of the Aircraft Production Board requested an interview with the vice-president of the Singer Sewing Machine Co., and this was had. Later, representatives of the Singer company visited the plants of the Curtiss company, the Dayton Wright company and the Canadian Airplanes, Ltd., of Toronto, and an interview was then had with Mr. Deeds and Mr. Waldon, on August 14.

Up to that time, the manufacture by the Singer company of 3000 training planes had been under consideration, but it was then suggested that it should build 1000 service planes of the DeH-4 type. Before undertaking this work, the representatives of the Singer company desired to examine the sample DeH-4 at the plant of the Dayton Wright Airplane Co. The letter of introduction to that company, however, revealed the fact that the whole proposition was still very indefinite. The letter (Aug. 15, 1917) stated:

We are asking the Singer Sewing Machine Co. to conduct such investigations as is possible while we are making up our minds as to the part of our program they are to fulfill. When they were here yesterday we suggested that they should help in the DH-4 production. This is not definitely settled, and they may be given some other part of the program, but we would like to have them given the privilege of an opportunity to study the details of the DH-4, inasmuch as it represents the latest type of barge war machine from abroad.

On receiving this letter, the vice-president of the Singer Company telegraphed Mr. Waldon that it was so indefinite that the trip would be postponed until it was decided whether it was desired that they should undertake the building of the DeH-4. To this Mr. Waldon replied, under date of Aug. 16, as follows:

We are promptly in receipt of your telegram about the indefiniteness of our letter of August 15th. Since your visit we have received a cablegram which indicates that there will be a very important change in our program, in all probability causing us to change the type of machine you would build. This was the reason I stated in my answer that it was not definitely settled that you would build the DH-4. It will be in your hands, however, whether you go to Dayton and look over the DH-4 as a sample of an up-to-date war machine. The one we have in mind now that we would ask your assistance upon would be quite a little larger than this.

On Aug. 17, Mr. Waldon telegraphed "change in program will probably make it necessary to assign a type other than DH-4." On Aug. 20, the Singer Company informed Mr. Waldon that they had decided to postpone their trip to Dayton "until it is more definitely settled what you wish us to do for you." In a postscript to this letter it was stated that the Singer Company had been requested by the British Government to duplicate their order from that Government for certain airplane parts (universal joints), and they asked whether there was any objection to their undertaking this additional work.

An answer was received on Aug. 23, that this was entirely satisfactory. This additional work for the British Government required the services of perhaps 100 persons, and left the Singer Company quite free to undertake the making of planes for the Government, but no further word was received and no order was given to the Singer Company. In the light of the correspondence, no explanation has been given of the failure to enlist its important resources for the purpose of aircraft production.

#### Engel Aircraft Company, of Niles, Ohio.

In view of the former connection of Mr. Harry E. Baker, the brother of the Secretary of War, with the Engel Aircraft

\*It is understood that it has been taken over by the Ordnance Department, for tanks. It is canceled so far as its relation to aircraft is concerned.

Co., the facts with respect to its organization and its contracts with the Government should be set forth.

The company was organized about August, 1917, under the laws of Ohio. Mr. Harry E. Baker testifies that it was originally intended to have a capital stock of \$3,000,000 (preferred \$1,000,000 and common \$2,000,000), but this was subsequently reduced to \$1,500,000 (preferred \$500,000 and common \$1,000,000). Mr. Harry E. Baker, of Cleveland, was president and general manager. His associates in the organization of the company were Mr. Engel, vice-president and production manager, and Mr. Patterson, secretary and treasurer.

Mr. Baker had taken an option in the spring of 1917 for the plant at Niles, Ohio, formerly owned by the Engel Airplane & Motor Co., and this was taken over by the new company, which, in effect, issued its preferred stock therefor, at a cost of about \$225,000. The remainder of the preferred stock was sold for cash. The preferred stock was entitled to seven per cent cumulative dividends and, as Mr. Baker states, was to be retired at par before the common stock participated in earnings. The common stock was issued to Mr. Baker and his associates for services in promotion. As an officer of the company, Mr. Baker received a salary at the rate of \$7,000 a year.

On Oct. 9, 1917, the Aircraft Board recommended that an order be placed with the Engel Aircraft Co., for spare parts for 100 JN4-D training planes, at the aggregate price of \$80,827.80. At the meeting of the Aircraft Board on Oct. 19, 1917, it was recited that the Equipment Division had recommended that a larger order be placed with the Engel Company, and the Board thereupon rescinded its resolution of Oct. 9, and recommended that an order be placed with the Engel Company for spare parts for 700 JN4-D airplanes at a total cost of \$585,077.50.

Following this contract for 700 sets, Mr. Baker states that there were further orders from the Government during his connection with the company for 200 sets of spares for JN4-Ds, 200 sets of spares for JN4-Hs, and another order of 100 sets of spares for JN4-Ds, the aggregate orders being for 1200 sets of spares at a price of about \$1,000,000. Mr. Baker testifies that he ceased his connection with the Engel Company on Jan. 21, 1918.

The Secretary of War testifies that either before or after our entry into the war his brother (Harry E. Baker) asked him whether there was any reason why he should not go into the manufacture of a certain flying boat for the Navy, in association with one Engel. The Secretary told him that he knew of no reason why he should not.

Later his brother informed the Secretary casually that they were going to make airplanes, and asked if the Secretary objected. The Secretary replied that he had no right to object, but did not wish to be consulted about it; that he had nothing to do with it. Later, the Secretary discovered that the Engel Aircraft Co., of which his brother was president, had a contract with the Government, which was not a competitive contract, but one which had been given upon an inspection of the facilities of the aircraft company.

The Secretary sent for General Squier and asked for the facts. The Secretary regarded the situation as intolerable and directed that the contract should be cancelled. Thereupon it was immediately cancelled by telegraph and arrangements were made, through Mr. Eugene Meyer, Jr., (acting for the Secretary) for the separation of Mr. Harry E. Baker from the company.

The Secretary thought it was just that his brother should be paid on the basis of the value of any services he had rendered, but that his complete separation from the company was necessary before a contract should be regarded as possible.

Mr. Harry E. Baker testifies that, in January last, he was informed by telephone that all of the contracts of the Engel Company had been cancelled; that he immediately went to Washington and had an interview with Assistant Secretary of War Crowell, who told him that his association with the aircraft business was embarrassing to the Secretary of War, and that he should retire from it.

He said that he had no desire to furnish cause for embarrassment, and accordingly, after an interview with Mr. Meyer, he turned back to the treasurer of the company all of the stock that he had in his name and resigned as president and general manager.

Mr. Baker testifies that the company paid him nothing for his stock. In addition to the payments of salary which, according to his testimony, he had received for two months at the rate of \$7000 a year, Mr. Baker says that he was paid on his retirement the sum of \$15,000 in consideration of the services that he had rendered.

Being assured that the separation of his brother from

the company had been effected, the Secretary notified General Squier that the capacity and merits of the company were the only matters to be considered. All the contracts were immediately reinstated on the same terms. Subsequently an additional order was given to the Engel Company for 500 sets of spares for DeHaviland-4s, at an estimated cost of \$2,275,000.

#### Distribution of Work.

Quite as important as the selection of contractors and the development of adequate sources of supply, was the distribution of work so as to insure prompt and efficient production. Each type of plane requires special preparation and the demands of varied sorts of work may easily be mutually restrictive and demoralizing. A conspicuous instance of this is furnished in the case of the Standard Aircraft Corporation.

This company with its predecessor (the Standard Aero Corporation) had the unusual features of being a manufacturing corporation under the direction of two lawyers, Harry Bowers Mingle and Max J. Finklestein, of the firm of Mingle and Finklestein, of New York City. It is unnecessary to review the financial history of the two Standard corporations, with their plants at Elizabeth and Plainfield, New Jersey.

It is sufficient for the present purpose to say that from the time of the organization of the Standard Aircraft Corporation in November, 1917, it has been the operating company, except that recently the Standard Aero Corporation has been availed of, and it has taken the plant at Plainfield for the purpose of handling fixed-price orders, the cost-plus contracts being in course of performance at the large plant at Elizabeth.

Both these corporations are controlled by Mitsui & Company, a leading Japanese firm, which holds all the preferred stock and a majority of the common stock of each company. The orders which have been given by our Government to one or the other of these Standard companies exhibit an extraordinary range of types embracing training planes of the Standard-J type, six machines and spares of the JR-1B type for the Post Office, advanced training planes of the M-Defense type, four Capronis, the assembly of Handley-Page planes, five hundred DeHaviland-4s, as well as flying boats for the Navy and various orders for small parts.

The effect was to put in this plant almost every variety of airplane work, a proceeding which has no justification from a production standpoint. Mr. Charles H. Day, the chief engineer of the standard companies, whose ability is generally recognized, frankly admits the serious disadvantage of this multiplicity of orders. He says:

There is a natural amount of confusion in having a multiplicity of those parts. . . . The engineering personnel is limited by the number of different machines you have to produce, and the executive force is limited by the same amount. The physical layout of the factory itself is very seriously affected. . . . We have on the HS boat job, made entirely our own drawings. It was out of the question to work to the drawings which were supplied us and we therefore redrew the entire job. That occupied a great amount of time of the drafting room and the engineering departments of the Standard Aircraft. Then a great amount of drawing has been necessary on the DeHaviland-4, it being impossible to get VanDyke drawings from the Signal Corps, and we have attempted to draw up a great deal of that machine, and we have redrawn in its entirety the Handley Page machine. That involves the engineering department and the drafting department and the bill of materials department sometimes known as the specification department which is one of the most important we have, inasmuch as under the present regulations we are not allowed to purchase material except we bill the material. The approvals officer will not approve the materials except on the basis of a bill of materials supplied, and making the bills of materials and completing the drawings on all these different machines has been extremely difficult.

Q. Have you had in your drawing department the HS boats for the Navy, that is the seaplane, the Handley Page planes and the DeHaviland planes, all being worked out at the same time? A. Yes, sir.

On the same point, Mr. Day again testified:

The order for the DeHaviland-4s is a very small order comparatively. . . . If we were to turn over our plant entirely into building the 500 DeHaviland-4s and had a go-ahead on 500 DeHaviland-4s, it would not last very long. We expected early in this year and were preparing to take over a large order for Capronis. That was before we had the DeHaviland machines, and it was supposed to be a thousand Capronis. That was a fair sized order, and we expected we would have that alone and nothing else. But that was withdrawn, and the order for 700 sets of spare parts for the Bristol and 1500 sets of spare parts for the DeHaviland-9 was given us, and that was a pretty fair sized order. That in itself would have been sufficient for some length of time, but both of those orders were recalled. The interference, so far as spare parts of machines is concerned, would have been less than the interference caused by two orders for complete machines. It has been impossible for us to obtain a large enough continued order to actually know what we were going to do and to prepare for doing it.

Criticisms upon the management of the corporation do not excuse such a state of affairs. If a manufacturing corporation is to be entrusted with work, it is manifest that it should be given the work it can handle efficiently; and if

its efficiency is distrusted, there is still less reason for embarrassing it with confusing orders.

On the other hand, if it is deemed capable of successful production it should have a suitable opportunity to develop it. The effect of placing such an assortment of orders, coupled with the difficulties besetting production in this new industry, has not only interfered with production, but has promoted waste, made it exceedingly difficult to maintain proper cost accounts, and has confused responsibility for delays.

Other illustrations of a poor distribution of work might easily be given; the result of it is that one part of the Government's program has stood in the way of another.

#### SIXTH. THE COURSE OF PRODUCTION.—DELAYS.— MISLEADING PUBLIC STATEMENTS

It is not deemed to be necessary to review in detail in this report such delays as occurred in the delivery of training planes and engines therefor. As early as Feb. 16, 1918, 1733 had been delivered of the JN4-D and 683 of the SJ-1 elementary training planes. As already stated, 2972 of the JN4-D had been delivered by June 30 and the total order for the SJ-1 (1660) was completed by May 11, 1918. By Feb. 16, 1918, there had been delivered 1438 of the OX-5 engines and 1083 of the A-7a engines and deliveries continued from week to week.

The elementary training planes of the JN-4D type seem to have been satisfactory. In connection with this phase of the execution of the aircraft program it should be said that the general average of accidents in training for all the camps in the United States, is one accident for every 3200 to 3600 hours of actual flying.

The worst school, in this respect, is one accident for every 1900 hours of flying and the best school shows one accident for every 4800 hours of flying. While it is somewhat difficult to obtain comparative statistics with respect to accidents in French and British training camps, it is believed from reports from our officers serving in the English and French schools that we have about twice as much flying per accident as either of the other nations.

The condemnation of the SJ-1 plane as dangerous, because of the Hall-Scott engine, has already been mentioned. It is to be noted that as early as Feb. 12, 1918, the Joint Army and Navy Technical Aircraft Board passed a resolution reciting the opinion of the Board "that the Standard airplane as completed with the Hall-Scott engine is not a satisfactory training machine" and recommending "that if it is necessary to make further purchases from the Standard Company of types that have been developed by them, that such machines be of the type designed for the installation of the Hispano-Suiza engine and the 150 Hispano-Suiza engines be purchased for these machines." The Standard J training plane with the Hall-Scott engine continued to be used until it was condemned in June, 1918, on General Kenly's return from overseas and after his careful examination of its operation. The order of General Kenly, under date of June 6, 1918, is as follows:

1. Due to the shortage of training type airplanes in the past it was necessary to use a certain number of Standard J-1 airplanes for training as filler-in until there were sufficient JN-4 machines manufactured for all schools.

2. At the present time there are sufficient JN-4 machines in storage to entirely replace all Standard machines in use. The Director of Military Aeronautics therefore desires that no more Standard airplanes be used in flying training and that steps be taken at once to entirely replace the Standard J-1 machines now in use by JN-4 airplanes. The Standard machines can be utilized in Mechanics' Training Schools, Ground Schools and any other schools where it is not necessary that they be taken into the air.

With respect to advanced training planes, it may be said that by Feb. 16, 1918, 60 had been received of the S4-B and 105 of the JN4-H. The delivery of Penguins did not begin until the middle of April, and of S4-Cs until May. There had been delivered by Feb. 16, 1918, 121 of the Gnome (100 hp.) and 444 of the Hispano (150 hp.) engines. Deliveries of the Lawrence (28 hp.) began in March and of the LeRhône (80 hp.) in May, 1918.

#### Service Planes

As already stated, the program during the period under consideration and until recently has been practically limited to the DeHaviland 4s and the Bristol Fighters.

#### The DeHavillands

The contracts for these planes, after the substitution of DeH-4s for DeH-9s, called for 8500 DeH-4s, viz.: Dayton Wright Airplane Company, 4000; Fisher Body Corporation, 4000; Standard Aircraft Corporation, 500.

Under the first contract with the Dayton Wright Airplane Company (dated Sept. 7, 1917), deliveries of the DeH-9s then

provided for were to begin in November, and the entire 2000 were to be delivered by the end of June, 1918. Under the modified contract (Jan. 17, 1918), for 1000 DeH-4s and 3000 DeH-9s, deliveries were to begin in January and to be completed by the end of July, 1918.

Under the final contract (April 1, 1918), substituting 4000 DeH-4s, the latter were divided into two lots of 2000 each, the first lot for immediate production to be delivered by Aug. 1, 1918, and the remainder to be delivered as order.

The first DeH-4 was shipped from the plant of the Dayton Wright Airplane Company on Feb. 5, 1918. It was intended for the American Expeditionary Forces in France, but it was not completely equipped; it did not have any bomb gear that would work. On Feb. 14, 1918, the following telegram was addressed by Mr. Talbott to Colonel Deeds:

Wire received reference Secretary Redfield and Dr. Stratton. Major Shepler advises first one hundred DeHavillands to remain in this country. If so, will you recall plane shipped for foreign shipment, allowing us to substitute plane completely equipped. Progress here encouraging.

However, the plane already shipped, was not recalled. The transport containing it sailed on March 22 and, on account of engine trouble in the Azores, it did not reach Europe until May 4.

Nine additional DeH-4s were shipped by the Dayton Wright Airplane Company in February for the use of various fields; two on the 15th, one on the 16th and two on the 17th, intended for Gerstner Field in Louisiana; one on the 21st for McCook Field (which was sent to South Field); one on the 22nd for the Fisher Body Corp.; one on the 23rd for the Standard Aircraft Corp., and one on the 25th for McCook Field. Four were shipped in March; two for Gerstner Field on the 9th and 12th, one for McCook Field on the 10th, and one on the 21st was delivered to the Property Officer at the Dayton Wright Airplane Company.

There were no shipments for the American Expeditionary Forces between Feb. 5th and April 3, 1918, when four were shipped; four more were shipped on April 14th and four on April 22nd, and there were no more shipped for use abroad until May 2, 1918. That is to say, up to May 2nd there had been thirteen DeH-4s shipped for our forces abroad.

It was in May, 1918, that what may properly be called quantity production of DeH-4s began. By the end of that month 193 DeH-4s, and by the end of June, 529 DeH-4s had been delivered by the Dayton Wright Airplane Company. Of these 529, it appears 381 had gone to ports of embarkation, 116 to the Navy and 32 to various destinations in this country, including training fields.

On June 25th, advices were received that there were serious defects in the planes which had been received abroad. At the meeting of the Aircraft Board on July 31st Colonel Arnold stated that all planes shipped to Europe by the Army which were found on arrival to have weaknesses were rebuilt at the aircraft production centers. At the same meeting, Mr. Potter stated that the DeHaviland planes for the Navy which had been shipped from the factory but were not yet floated should be sent back to the Dayton Wright Company to be rebuilt.

From June 30th to Oct. 11th, 1918, the Dayton Wright Airplane Co. delivered 1320 DeH-4s, making 1849 in all to the latter date.

In the contract with the Fisher Body Corporation (Nov. 6, 1917) provision was originally made for 3000 DeH-9s, the deliveries to be completed before July 1, 1918. For these there were subsequently substituted 4000 DeH-4s, of which 2000 were to be delivered by Sept. 1, 1918—afterwards extended to Nov. 1, 1918—and 2000 more at dates to be fixed. Up to June 30, 1918, no deliveries of DeH-4s had been made by the Fisher Body Corporation. This company got into quantity production in August and had delivered 452 up to Oct. 11, 1918.

For the order of 500 DeH-9s placed with the Standard Aircraft Corporation (Jan. 26, 1918) there were eventually substituted 500 DeH-4s by the contract of March 28, 1918. No deliveries had been made up to June 30, 1918, and only 49 had been delivered up to Oct. 11, 1918.

The total deliveries of DeH-4s, to Oct. 11, 1918, amounted to 2350. Of these, 1617 had been floated, 388 were at ports or in transit, 177 had been shipped to camps and training fields, and 168 are described as being for 'manufacturers and miscellaneous.'

#### Bristol Fighters

The contract with the Curtiss Aeroplane and Motor Corporation called for 2000 Bristols to be delivered by Aug. 31, 1918.

There was no definite release for production until February and then only to the extent of 25 machines. 400 were released for production in the latter part of March and 400 more on



April 24th. As already stated, only 27 were delivered in all, and the order was cancelled in July.

### Liberty Engines

The deliveries were to be completed as follows:

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
Lincoln Motor Co.	5	80	160	275	701	1400	1500	1400					
Packard Motor Car Co.	50	200	500	800	1000	1200	1300	1000					
Nordyke & Macdonald Co.			25	125	550	700	800	800					
Ford Motor Co.						300	800	1000	1000	1000			
General Motors Co.						25	125	250	300	400	500	400	

These were the actual deliveries:\*

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	to Oct.	Total
Lincoln Motor Co.				7	24	134	105	300	454	701	1022	2737	
Packard Motor Car Co.	1	25	43	94	153	314	439	556	794	543	970	3854	
Nordyke & Macdonald Co.							0	16	24		117	157	
Ford Motor Co.								53	197	450	1213	1868	
General Motors Co.								130	244	306	371	1012	9689

The total deliveries of Liberty motors (US-12) to Oct. 11, 1918, amounted to 9689, of which 6895 were for the Army and 2794 for the Navy. Of those for the Army, 3555 had been floated, 456 were at ports or in transit; and there had been delivered 990 to Allied Governments, 260 to flying fields, 1429 to manufacturers, etc., the remainder, or 205, being turned over to the Navy.

Contracts have recently been made for the production of the Liberty 8 (US-8), but no deliveries had been made to Oct. 11, 1918.

### Misleading Public Statements

In the face of the delays in production a series of misleading public statements were made with official authority. While these statements were authorized by the Secretary of War, he states that they were issued in reliance upon information furnished by the Chief Signal Officer, General Squier, and by Colonel Deeds, who were acquainted with the actual conditions. It is unnecessary to review the delusive predictions and exaggerations contained in these utterances.

But particular attention should be directed to the official statement released for publication in the papers of Feb. 21, 1918, which contained the following:

The first American built battle planes are to-day en route to the front in France. This first shipment, though in itself not large marks the final overcoming of many difficulties met in building up this new and intricate industry.

This statement had its origin in a conversation between Colonel Deeds and a representative of the Committee on Public Information a week or two before the completed statement was issued. A draft was first prepared and submitted to Colonel Deeds, who examined it and made some corrections. The statement contained in the paragraph above quoted was not only left unchanged but was the subject of special inquiry.

Colonel Deeds was asked what was meant by the "first shipment," and he replied, "They are on the water now, on the way to France." He was then asked, "How many?" and he answered, "I do not know, but I do not think more than ten." The statement in its final form was then presented to the Secretary of War, who permitted it to be issued upon the understanding that it had been verified by General Squier and Colonel Deeds.

At the time this statement was issued (Feb. 20) only one plane had been delivered for shipment to the American Expeditionary Forces, and while this had been shipped from the factory on Feb. 5, it did not leave the United States until March 22. The only other service planes which had been delivered were five DeH-4s, which had been shipped for use at Gerstner Field, Louisiana. No additional shipments of airplanes for the use of our forces abroad were made until April 3. Actual production in quantity did not really begin until May.

Colonel Deeds admits that this statement was brought to him before its publication, and that he went through it. He examined it minutely enough to correct with his own hand one of the paragraphs following that above quoted, which gave the number of men required on the ground for every plane in the air, his correction making it 46 instead of 45.

Colonel Deeds denies, however, that he said in response to the inquiry upon the point that the battle planes were "on the water now, on the way to France." That he did make this statement is testified to directly and unequivocally by John W. McConaughy and Merlen E. Pew, representing the Committee on Public Information.

When Colonel Deeds was examined as a witness before the Committee on Military Affairs of the Senate, on April 2, 1918, he was asked this question and gave this answer:

\*There are slight discrepancies between the factory records and the Government reports, and the latter apparently based on actual receipts are used in this tabulation.

Senator Wadsworth. Did you see, or do you know whether any other responsible officers in your Aviation Section of the Signal Corps saw the statement given out by Secretary Baker on February 21st before it was published?

Colonel Deeds. No, sir, I did not see it. I do not know of anybody seeing it.

Colonel Deeds admits giving this testimony. He testified that he did not then recall the paper in question.

Colonel Deeds further testifies, in explanation that when the paper was before him, his information was that "four planes were on the cars en route to France," and that it later developed that only one was sent and the others were diverted to Lake Charles, that is, to Gerstner Field, for tests on radiators.

The shipments to Gerstner Field, however, had been made directly from the Dayton Wright Airplane Co. on Feb. 15, 16 and 17, and these planes had not been shipped from the factory for the American Expeditionary Forces. There is evidence, also (*ante*, p. 113), that on Feb. 14 Mr. Talbott had telegraphed to Colonel Deeds that Major Shepler advised that first one hundred DeHavillands should remain in this country and asking on this assumption for the recall of the one plane "shipped for foreign shipment," so that another could be substituted "completely equipped."

There is no question but that this grossly misleading statement was published on the authority of Colonel Deeds and that the Secretary of War relied upon the fact that it had Colonel Deeds' approval in giving it his official sanction. While this conduct of Colonel Deeds does not come within the scope of the Criminal Code, it deserves the prompt attention of the military authorities.

General Squier testifies that he had nothing to do with the statement that was issued for publication on Feb. 21 and that he did not know of it before it was published.

He testifies that when it was brought to his attention he did not regard it as a proper statement to have been sent out, but that he did not institute an inquiry to ascertain who was responsible for it. It is evident that the matter called for immediate investigation and for suitable disciplinary measures, but no steps were taken either for correction or punishment.

The Secretary of War states that the responsibility for the statement clearly rested with General Squier and Colonel Deeds, and that he did not learn of the inaccuracies of the statement until his return from Europe in the latter part of April.

There were earlier statements of a delusive character as to the progress of aircraft production, but the particular statement to which attention has been called was inaccurate in its specific statement of facts, and its misleading character was obvious to anyone having knowledge of the actual conditions.

### SEVENTH: CAUSES OF DELAY IN PRODUCTION.

#### First: Lack of knowledge and experience.

This was a fundamental difficulty affecting production in all its stages. The industry was new, and there was a lack of engineers and skilled workmen. Novel problems were encountered at every step, and lack of knowledge bred indecision and confusion.

Experience in other manufacturing enterprises gave no assurance of facility in this untried field. In addition, it was necessary to develop new sources of supply of needed materials, and the difficulties of the main contractors had their counterparts in the plants of sub-contractors by various sorts of material or fabricated parts were supplied.

#### Second: Defective organization in the Signal Corps.

The duty of providing an adequate organization for aircraft production was left to the Signal Corps. It is quite clear that this undertaking was beyond the competency of the Chief Signal Officer, who had neither training nor experience for such a large industrial enterprise, and those who were brought to the task in his department failed to produce an organization which was adapted to meet the exigency.

The contracts were for production, and presupposed that the manufacturers should have an established design. The contractors agreed to produce the described machines in accordance with drawings and specifications to be furnished by the Government.

In order to secure production of types of planes unknown to our manufacturers it was necessary that the Government should create an engineering department which should settle the design and furnish adequate and accurate drawings and specifications. But this essential condition of achievement was not met.

Undoubtedly the lack of airplane engineers was a serious obstacle. Still, there were a few in the country who had

devoted themselves sedulously for a considerable time to the study of aviation problems, and it does not appear that there was a suitable effort to draw to the Government's service such talent as was available.

Whether or not much assistance could have been obtained in this way is a question which cannot be answered in the absence of an appropriate test. It was, however, entirely obvious that the exigency called for the most efficient organization and that to add to inexperience the lack of a suitable organization and the confusion of a divided responsibility would inevitably lead to serious delays and threaten the entire program.

There was an Engine Design Section established about July 1, 1917 in charge of Mr. Vincent, who had been engineer of the Packard Motor Car Co., but had no experience in the designing of airplanes. And this department did not have anything to do with the designing of airplanes as distinguished from airplane engines.

Captain (afterwards Lt.-Col.) Virinius E. Clark, who had had perhaps as much aeronautical experience as anyone in the Army, had been in charge of airplane designing, but he was absent in Europe with the Aeronautical Commission from June until about the first of September, 1917. On his return he resumed the work of airplane designing, and the Airplane Experimental Department was organized about Oct. 1, 1917, in charge of Lt.-Col. Clark, who was put in command at McCook Field, Dayton.

This organization continued until Feb. 6, 1918. Lt.-Col. Vincent testifies that he had been arguing for an "engineering department" with the idea that it would take entire charge of engineering as it pertained to engines and planes" and "definitely straighten out" what he thought to be "an unsettled condition."

By this he meant that "an attempt was being made to put planes into production in this country without having complete drawings or a complete understanding as to just what equipment such planes were to carry."

But for the purpose of settling designs of airplanes and furnishing drawings to the manufacturers the Airplane Experimental Department proved to be hopelessly inadequate, and the result was that it was largely left to the manufacturers themselves to work out the designs of service planes, an undertaking for which they were ill-equipped.

When the Airplane Experimental Department failed to give satisfaction, instead of strengthening it and making it adequate to the engineering work which had to be done, an additional department was created (about January 1, 1918) which was called the Production Engineering Department.

This Department was also located at Dayton, because the Dayton Wright Airplane Co., was at that place, and there the department remained until the middle of April. It was said to be its function to supply manufacturers with engineering information, drawings, specifications, etc., from which they could produce in quantity what they were to manufacture; to specify materials, to decide upon details of design, etc.

It was not, however, established merely as an aid to the manufacturer in producing according to a settled design, that is to enable the manufacturer to cope with the difficulties which were sure to arise in the course of production, but this department was largely placed in control of the airplane design itself, which the Airplane Experimental Department had failed to establish satisfactorily.

The new department was never informed or equipped so that it could perform its function adequately. It was under the general supervision of the head of the Production Department of the Equipment Division, who was inexperienced in airplane engineering or in airplane production, and this creation of another inadequate department failed to solve the difficulty.

On Feb. 6, 1918 the Airplane Engineering Department was established in charge of Lt.-Col. Vincent, who was put in command at McCook Field. Lt.-Col. Vincent at once began to direct the efforts of the new department toward getting some well known machines ready for production, rather than doing the purely experimental or research work, and he obtained permission from Mr. Potter to take the DeHaviland 9 from the Dayton Wright Co., at South Field "and put it through McCook Field."

But this new department did not have a definite function with respect to the types of service planes already under contract, that is, the DeHaviland 4 and the Bristol, and these were left apparently as before, subject to the inadequate direction of the Production Engineering Department.

The consequences are easy to trace. When the model DeH-4 was received in this country it was accompanied by the English drawings. It was necessary to re-design the plane to accommodate it to the Liberty motor.

The model was sent to the Dayton Wright Airplane Co., and this company, which under its contract was to produce in accordance with drawings and specifications furnished by the Government, appears to have undertaken the work of redesigning and making the new drawings.

These were made and the DeH-4 as re-designed was flown on Oct. 29, 1917. When, later, changes were required the company expected drawings to be furnished by the Signal Corps; the Production Engineering Department apparently expected the drawings to be provided by the company.

Rapid and successful production which demanded clearly defined responsibility could not be expected under such conditions. About Feb. 21, 1918, the Production Engineering Department having been unable to secure production, the work on the DeH-4 was virtually taken out of its hands and placed in charge of Lt.-Col. E. J. Hall for the purpose of a swift effort to get results.

Lt.-Col. Hall proceeded to get necessary information as to equipment, developed a little organization of his own, at once built three model planes (one for the Dayton Wright Airplane Co., one for the Fisher Body Corp. and one for the Standard Aircraft Corp.) and sought to remove as rapidly as possible the various hindrances to production. In this way, production in quantity was finally attained.

But this was not the perfecting of the organization, but in substance was a desperate effort outside the regular instrumentalities of the Equipment Division because those instrumentalities could not be relied upon.

With respect to the development of the Bristol, similar conditions existed. When Lt.-Col. Hall had made sufficient progress at the plant of the Dayton Wright Airplane Co. to warrant it, he turned his attention to the production of the Bristol, at the plant of the Curtiss Aeroplane and Motor Corp.

As he testifies, "they were worse than at a standstill." "It would have been easier," he says, "for me to have taken and designed the whole machine around the equipment if they had not had the material started." He found that practically all they did was to get in a row, so that the condition when I went in there was that everybody was damning everybody else." This was about April 11, 1918.

It appears that Captain Clark in the fall of 1917 began the work of re-designing in order to adapt the Bristol to the Liberty motor, and about the last of October the model Bristol with a large number of drawings was sent to the Curtiss company.

Mr. Mueller, who was the chief engineer of the Curtiss company, states that they were unable to make the plane from the drawings that "the dimensions would not check up" and that "it was impossible to get the machine together from the parts made from the details of the Signal Corps drawings."

In January, 1918, the Production Engineering Department took over the work on the Bristol, but differences with the contractors speedily arose, and at the end of January, for the purpose of reconciling these differences, a conference was held between the representatives of the Signal Corps and of the company, respectively, and it was determined that engineering decisions should thereafter be left to the engineer of the Curtiss company.

This authority apparently was exercised for two or three weeks, but opposition developed and there was no real progress. Lt.-Col. Hall took the matter up in April and an effort was made to drive through to production.

It is apparent, however, that this plane never got beyond an experimental stage, and yet 400 were released for production in March and 400 more in April. This was evidently in response to criticism of delays. But the plane as designed for the Liberty motor was doomed to failure. Had there been an adequate engineering department to settle the matter of design and make the necessary engineering tests and decisions before production was entered upon, much time and money expended in fruitless effort would have been saved.

Throughout this period the Equipment Division of the Signal Corps presented an organization with a host of sections and departments, with ill-defined functions, creating disorder and confusion rather than sustained, well directed and expert effort. There was a vast amount of lost motion.

Manufacturers were brought into contact with various divisions with overlapping powers; earnest and able scientific men, who were brought into particular sections, found themselves lacking in authority or in conflict with other sections; and uncertainty, indecision and vacillation enfeebled the entire undertaking.

Military organization was another obstacle to the rapid prosecution of what was essentially an industrial enterprise. Whatever might be accomplished by such an organization in a thoroughly understood activity, it was certainly unsuited to an entirely new industrial endeavor of this sort.

A mobile force in which men could readily be moved about, tested, elevated and deposed without regard to military rank or precedent, was absolutely required. The inherent difficulties of the situation were thus greatly increased by defective organization. No doubt, also, the swift creation of a large force of inspectors, without the qualification of experience in their line of work, not only opened the door to abuses, but to an extent retarded production.

The situation, as it appeared to Archer A. Landon (Mr. Coffin's assistant) more than six months after we had entered the war, is strikingly shown in his letter to Mr. Coffin dated Oct. 16, 1917, in the course of which Mr. Landon said:

The lack of organization and continuity of responsibility is so apparent that success will be a miracle. If we are to be successful there must be fixed, from the Secretary of War or the Secretary of the Navy down almost to the office boy, a direct line of responsibility that will make every individual assume the absolute responsibility for the work he is undertaking and under no circumstances should any conflict of authority or responsibility occur. Industrial men of known responsibility and capacity for the particular work undertaken must be selected. They should be peculiarly fitted for the position they occupy and should be responsible for their work as in civil life.

We men who have come here in an effort to assist you find ourselves very seriously embarrassed and justly so. We are started off to do what seems to be an important piece of work only to find that this work has been delegated to somebody else in some other department and that we are treading on other people's toes. The result is that we do not get the information we want and we do not get anywhere. They do not throw us out, but they are all adept at pulling the latest Washington game of "passing the buck," or else, frankly, resenting our appearance in the matter.

Take the spruce situation as an example of dilly dallying through a lack of organization. The first I knew of the spruce situation was around the latter part of July or the first of August. At that time it was one of your great worries. The entire aircraft program was and is now endangered by the lack of ability to get spruce; and yet from that time until now, notwithstanding repeated conferences, there was nothing done on the spruce situation, either towards closing contracts or increasing production, until October 13th, when Colonel Disque was sent west on the situation; a loss of time of practically three months. If this had been your own business, the men would have been on their way west the day after the matter was first brought up. The only reason that there was no action in July was because we do not possess an organization of direct responsibility and on that account these inefficiencies are possible and they will continue to occur until such time as somebody wakes up and thoroughly organizes the work.

After giving a further illustration, Mr. Landon continued:

This is not intended as a criticism of General Squier or the other officers, but it is intended to be a very vigorous criticism of methods of organization that make such a condition possible; and I submit to you, s.r., that, if this same condition exists in all departments and continues to exist, we might as well submit to the Germans now, because the one way you can beat efficiency is to match it with efficiency, and efficiency can only be obtained by a thorough organizing of our responsibilities and following them through to a definite conclusion, which conclusion should be the winning of the war.

Mr. Landon, leaving the aircraft work in October, 1917, returned to it in June, 1918, then becoming chief of the Production of Aircraft in the Bureau of Aircraft Production. Up to that time, the policy he had recommended had not been carried out. He testifies that he "could see practically no change in the organization in six months;" that is, prior to the new organization through the Bureau of Aircraft Production which had just been instituted.

It should be understood, of course that the complaint so emphatically voiced was not directed at the Aircraft Board, as this, as Mr. Landon stated in his letter, was "merely an executive advisory board." The responsibility lay with the officers entrusted with the duty of effecting an adequate organization for aircraft production.

### Third: Lack of information as to the equipment required for Service Planes

The model DeHaviland 4 was not received until about the beginning of August, 1917, and, as already stated, it was necessary to re-design it and make new drawings. But whatever delay was due to a failure to obtain a model earlier, or to the necessity of re-designing the plane, was greatly increased by the lack of needed information as to the equipment which was to be put in.

From the time the model machine, as re-designed, was completed and flown on Oct. 29, 1917 several months elapsed before its equipment was finally determined upon. The engineer of the Dayton Wright company testifies that "the information which we were anxious to receive and which was necessary for production was not forthcoming until the middle of April."

There appear to have been several reasons for this. There was always the difficulty created by lack of experience in equipping airplanes for service in war and there was considerable trouble in obtaining some portions of the equipment. But, in addition, it appears that there was a lack of exact and detailed information as to just what was required.

The drawings and the specifications which accompanied the sample plane sent here were supposed to designate defin-

itely the apparatus to be put upon the planes and its location. The testimony is that these drawings and specifications "did not check up with the actual plane," and there was resulting uncertainty as to what should be done.

Communications with the other side were had frequently with regard to instruments, accessories and various parts of equipment, but, despite this, the uncertainty seems to have continued for a long period and there was apparently an inability to frame a definite bill of material which could be given to the manufacturer. The showing indicates either an extraordinary lack of decision on the part of those whose duty it was to decide, or an even more remarkable absence of administrative efficiency in seeking and obtaining necessary information.

About Feb. 10, 1918, definite instructions were received from the other side as to the armament and instruments of the DeH-4, but these instructions involved serious changes in the plane. And, subsequently there were further changes in equipment, as stated below, causing still further delay.

### Fourth: Changes in design and equipment of Service Planes

The following statement, set forth in the testimony of Mr. Schoonmaker, the engineer of the Dayton Wright Airplane Co., which is substantially uncontroverted by the representatives of the Signal Corps, is an illuminating description of the delays in production incident to changes in design made necessary by changes in equipment so far as the DeHaviland 4 is concerned and also indicates the waste thereby occasioned. It will be observed that changes were made necessary not only by new requirements as to equipment, but by inaccuracies in drawings and various defects. Mr. Schoonmaker testifies:

The first sample DeHaviland machine was received on August 14, 1917. This was accompanied by an incomplete set of drawings, but with the machine as a sample and with what drawings we had at hand, we were able to complete the necessary lay-out from which to build one sample machine which was flown on October 29, 1917. This plane was satisfactory in every detail as a machine and practically no changes have been made in the construction except where they were affected by the equipment which the machine was to carry.

We were advised at that time in answer to our request for information on guns, that the machine was to be equipped with the Vickers Gun and that the gun mounts would necessarily be the same as the English gun mounts. This information was requested by the Dayton Wright Company during August when the preliminary lay-outs of the machine were being made. At a late date we were advised that the Marlin Gun would supplant the Vickers, and that the Signal Corps would take care of the necessary design of gun mount, etc. The front gun mount design was received on January 8; after a conference with Signal Corps men, it was decided that this mount would not be satisfactory and, therefore, was discarded. The Dayton Wright Company produced a design of gun mount and cartridge box which was built and installed and accepted by the Signal Corps after a firing test on January 26.

Owing to the fact that the Marlin Gun was not similar to the Vicker, a complete re-arrangement of the cowling over what had already been designed was necessary. The first drawing of the Marlin Gun which we received was delivered to us on February 12 but no bill of material on the complete gun equipment accompanied same. On February 26 we were requested to mount two stationary guns on the forward cowling. This necessitated a re-design of the gun mount already ordered into production, and this work was carried on by the Signal Corps. This also affected all cartridge boxes of which drawings had been made and which were released to production. A re-design of the cartridge boxes for the double gun mount was furnished by the Signal Corps on March 5. This design was not satisfactory as the drawings were incorrect and the pieces manufactured from them did not assemble in the machine. A new re-design was furnished by the Signal Corps on March 15; parts were made from these drawings and were released to production. On April 1 the Dayton Wright Company was ordered by the Signal Corps to again re-design the cartridge boxes changing certain dimensions; since that date few minor changes have been necessary, but nothing which directly interfered with the production of these parts.

Changing the gun equipment as mentioned above, necessarily changed the shell chute lay-out. The first drawing which we received from the Signal Corps for the left hand gun chute came to us on March 5. Parts made from these drawings were not satisfactory as they did not assemble in the machine. The Signal Corps corrected these drawings and sample parts were made and the Dayton Wright Company's drawings were released for production several days later. The Signal Corps found, however, that these samples were not satisfactory and they were rejected as there had been an error in the drawings. The Dayton Wright Company re-designed the chute for the left hand gun on March 29. Samples were made from these drawings which were satisfactory to the Signal Corps and released to production on April 7.

The first right hand shell chute was laid out by the Signal Corps on March 6. Samples manufactured from these drawings were not satisfactory and did not assemble properly in the machine. The Signal Corps proceeded on the correction of these drawings and they were released for the production of sample. These drawings were very difficult to work to and samples manufactured from them were not satisfactory and rejected.

The Dayton Wright Company produced a new design of this shell chute on March 29, which before samples could be made and tried out, it was seen that a new design would be necessary due to the change of location of the electric generator for the electrically heated clothing. A new design was started by the Dayton Wright Company on March 30.

A design along entirely different lines had been started in the meantime by some Signal Corps men at South Field on March 29, and this type was approved on March 31 by the Signal Corps and drawings were made and released to production. This design was tested out on the evening of April 2 and proved unsatisfactory.



Another new design was started by the Signal Corps on April 3, which after a few modifications was released to production on April 11.

The same procedure of re-design and development as was required for the shell chutes applies also to the cartridge box and shell chute covers.

Our first request for information on the synchronizing device was in November, 1917, but up to February 14 no bill of material or complete set of drawings had been delivered. We received on January 23 a few parts which were intended for production, however, the assembly was incomplete and the parts made would not fit the engine. We received drawings of the hand pump on February 5. During January a sample hand pump was delivered to South Field; no drawing or instructions accompanied this to show mounting and this office was never advised as to its use. When assembled on the machine in January, it was found that an interference was encountered with the gasoline shut-off cocks and strainer, necessitating a re-design of these parts and the transferring of them to the other side of the fuselage. This in turn caused an interference of the spark and throttle controls necessitating scrapping of parts then on hand and re-design of this layout.

The first synchronizing outfit which we received caused a considerable amount of trouble and upon examination of the trigger motors, it was found that practically no two of them were alike and it was almost impossible to get a pair of guns on a machine which would function correctly. The first synchronizers were delivered directly to us instead of the engine builder, and they were not made so as to be directly interchangeable with the motor crank shaft, the result being that a considerable amount of hand work had to be done in the fitting up of these synchronizers.

On April 2 it was found that the synchronizer generator did not have a satisfactory lubrication system and it was necessary to connect it to the motor oiling system. This necessitated the disassembling of the synchronizer head and welding on a special boss for the attachment of this oil line. This has been done on all of the synchronizers to date.

Information, drawings and bill of material for the gun sights were requested on October 19, 1917. A list of different types of sights were received on January 4 but no bill of material or drawings. Drawings for wind vane sights were received February 6. No drawings were ever furnished on any of the sight mounts, however, the sight locations were approved February 13.

This will recall that it was advised that the old English DeHaviland be used for the mounting of guns and sights so that all of the difficulties which were likely to be encountered, could be worked out on this job. Our engine cowlings was held within the limit of the cowling used on the English job so that no interference would occur. On November 20, it was called to the attention of the Signal Corps that no use had been made of this machine to date, and early in the Spring was shipped to Wilbur Wright Field.

On April 6 the location of the Aldis sight was removed and changed to the left hand side of the right gun; this necessitating a change of all the parts which had been made up for the old sight and which were already released to production.

Our first instructions regarding the bomb dropping gear were to equip the DeHaviland machine with two rails similar to the English machine. Information had continually been requested on bombing apparatus but no drawings could be furnished. On January 18 we received our first information from the Ordnance Department on Bomb Gear. This was merely an unlocking device and we gave space in our drafting room for several Ordnance Department men to complete their drawings for application to the machine, they being turned over to me on February 1. On going over these drawings, it was found that they were not complete and about a week later more drawings were received which assisted in production of the first model gear. The delivery of this apparatus has been sadly deficient, it being necessary to ship a large number of planes without it, as some of this is built in the floor of the fuselage and must be put in during the various assembly operations. A further change on the operating mechanism of the bombing gear is coming thru which will be incorporated possibly on the five hundredth machine.

Information was requested during October, 1917, on the camera and camera mounts. We were advised at that time that the camera mount which the English DeHaviland was equipped with would also be used on the American-made machine. On January 19 we received from the Signal Corps a camera which would not fit the English mount. As the English mount was already built into a number of fuselages, it was impossible for us to change this part of our early shipments. A new design of mount was made by the Signal Corps and installed in the sample machine in our shop. On February 25 this was rejected by the Signal Corps and a new design started and drawings furnished on same May 27.

The focusing lens retainers were designed at the direction of the Signal Corps for a 4" x 5" lens. The location of these was shifted several times and the size of the lens was changed by the Signal Corps to 5" x 6" and the drawings for retainers were furnished on April 2.

Up to February 14, we had no information on oxygen apparatus except that it was to be part of the equipment. As late as April 6, we had no samples of the apparatus or drawings showing installation of same. Final approval of the oxygen installation was received June 10.

Drawings for the radio equipment and first information regarding same came to us February 1. These were recalled for changes and new set issued which were illegible. These were returned and on February 8 a new set of drawings were received for the bonding together of all metal parts on the machine; these drawings could not be followed on a production basis. The Dayton Wright Company then prepared a sample machine and drawings were made from this and accepted by the Signal Corps March 25. Radio instruments were received February 20 and installation according to Signal Corps drawings was stopped February 25 and new installation directed. The Dayton Wright Company prepared drawings for this installation and wiring according to the sample which was prepared.

On March 28 the generator mount on the side of the fuselage was abandoned. A new installation was furnished by the Signal Corps but was found that it interfered with the landing gear strut. On April 10 the new design from the Signal Corps showing the correct location of the generator was received.

Considerable trouble was encountered with the installation of the Holt flare lamps as there was a misunderstanding between the Dayton Wright Company and Signal Corps as to who was to furnish them. The first Holt flare lights were received on February 25.

The first navigation light samples were received on March 20 and wiring instructions for same were delivered a few days later.

The electric generator for lighting and heating was received on March 15. The Signal Corps drawings showed the location on the side of the fuselage. This was unsatisfactory as the generator propeller interfered with the rear flying wires of the wing structure. The Signal Corps prepared new drawings for the re-location of this generator but these were unsatisfactory owing to the interference with the landing gear strut. On April 9 a new set of drawings were received showing the correct location of this generator.

Radiator and water lines were approved by the Airplane Engineering Department, Signal Corps on November 21 after flying test. At this time, of course, there was practically no information at hand regarding the equipment of the DeHaviland plane which necessarily added considerable weight, so that the radiators which we had ordered for production were considered unsatisfactory by the Production Engineering Division. The radiators furnished by the Signal Corps were 1" deeper in the core which necessitated re-design of the shutter assembly. At a late date it was decided to make a further change on radiator design, making it 4" longer. This affected the under cowling of the motor, the forward cowling water lines and numerous other details entailing a large amount of scrapping and re-operation of parts.

The Signal Corps advised that they would furnish us short radiators for our first 150 ships and long radiators for the next 100, after which we were to supply our own. A shortage of 50 radiators was encountered in the first agreement which necessitated us going to the long radiator job 50 machines earlier, which caused a serious delay and complication in the shop.

Drawings were received from the Airplane Engineering Division, Signal Corps, November 21 on gas and air lines. From these drawings all parts were ordered into production. All gas and air line connections were changed by the Signal Corps and final information received on this change April 6. This necessitated scrapping of all parts on hand and a delay was occasioned in securing necessary new material.

The delays at the plant of the Dayton Wright Airplane Company, due to these changes in design, also caused delay in the other plants which were to produce DeHaviland 4s, for both the Fisher Body Corporation and the Standard Aircraft Corporation were awaiting a definite design and a determination of equipment and proper drawings before proceeding to production.

The Dayton Wright Airplane Company was in advance simply because it had the advantage of the possession of the model and it was working out the necessary drawings.

It will be observed that these changes were required in the course of production. That is, instead of proceeding with production on the basis of a given equipment where changes in equipment would cause serious delay, and introducing different equipment in the planes subsequently produced, virtually the entire production was held up to accommodate the new demands.

As Lt.-Col. Horner testifies, "We would go on changing this way and that way and let that change go through production, when it could be done without interfering with production, and if we had done it we would have had a thousand more planes on the French front to-day than we now have without any question."

It is unnecessary to review the changes in the ill-fated Bristol. They were numerous and related to the structure of the plane itself. Production was of course impossible while these changes were in progress. The real effect of the changes, however, in view of the result, was not to retard the production of a useful plane, but to cause an unnecessary expenditure.

#### Fifth: Conditions in Manufacturing Plants

The conditions in certain plants engaged in the manufacture of airplanes were unfavorable to production, not only because of lack of experience and the absence of mechanics trained in that class of work but because of defective organization and want of efficiency. The Dayton Wright Airplane Company had the difficulties inherent in a new organization, but in view of the changes that were required in the course of production it would be impossible to define to what extent, if any, production was retarded by reason of the fact that the organization was a new one.

The lack of competent organization at the North Elmwood plant (Buffalo) of the Curtiss Aeroplane & Motor Corporation is commented upon later (*post*, pp. 150, 156), but in view of the cancellation of the Bristol order it need not be considered here.

Whatever delay there was, was in the course of an attempt to make an impossible plane. At the plant of the Standard Aircraft Corporation conditions were also far from satisfactory, but for the same reason, so far as service planes are concerned, its capacity for production was not put to a proper test. It should be added that at this plant the first Handley-Page was assembled and successfully flown within ninety days after the company had been given full charge of the matter.

There have not been lacking indications of sinister influences at various plants. The opportunities of workmen at aircraft plants to retard production or to injure material and product are quite obvious and the necessity of keeping the plants free of enemy influences is emphasized in another part of this report. But, so far as the delays in production of

service planes are concerned, it is impossible in view of interrupted work and changing plans to attribute the delays in any definite measure to such a cause.

#### Sixth: Changes in the Liberty Engine

In any proper estimate of what should have been accomplished in carrying out the aircraft program it is necessary that regard should be had to the development of the Liberty motor. The airplane must have its motor, and it was inevitable that in the development of a new high-power airplane engine, with the object of securing higher power with a lower weight per unit of power, that changes would be found necessary.

Needed improvements were constantly suggested by experimentation, and the number of changes looms very large in the testimony of the experienced engineers who were endeavoring to get into quantity production. It is unnecessary to attempt a review of these numerous changes, for whether time could have been saved by greater expertness is a matter of opinion, and in view of the time that has frequently been spent in the development of new types of motors, there is slight ground for criticism by reason of loss of time in perfecting the Liberty motor.

The difficulties were inherent in the task and the task itself was worth while. As has been said, there was no reason why the development of the Liberty motor should have stood in the way of the production of other motors, such as the Hispano-Suiza, for use in single-seater pursuit planes to which the Liberty engine was not adapted.

But, so far as the heavier observation and bombing planes are concerned, the weight of opinion is that it would have taken about as long to put any other high-power motor into successful quantity production in this country, according to our methods of manufacture, as it has taken to develop the Liberty motor.

The attempt to secure planes and motors through foreign production for service pending this development has already been reviewed. By pursuing different methods it is possible, as testified by Lieut.-Col. Hall, that there might have been a small preliminary production of Liberty motors two or three months earlier; but, making due allowances for the inevitable course of experimentation, the Liberty motor could not have been put into large production much earlier than it was.

What has been called the "immaturity" of the Liberty motor placed a time limitation upon the program for the planes that were made to take this motor, but it may be observed that by May 4, 1918, 778 Liberty motors (U. S. 12s) had been made, of which 390 were taken by the army, and only 36 DeH-4s had at that time been delivered, and no other army planes to take this motor were available.

It can hardly be said that unnecessary delays in service-plane production, caused by bad organization and lack of a settled design, were excused by unforeseen difficulties in the development of the Liberty engine; and it should also be observed that if, in the light of general experience in motor building, delay in the development of the Liberty engine was to be feared, there was the greater reason for making sure, to the full extent of ability, of the immediate production of single-seater pursuit planes for which other engines could be provided.

#### EIGHTH. CONTRACTOR'S PROFITS

Under the various fixed-price contracts it is probable that large profits have been gained, but definite information as to their extent would not be available without a survey in detail of manufacturing conditions and costs in a considerable number of plants, an undertaking which would have been wholly impracticable in this inquiry. The profits allowed by the cost-plus contracts present a distinct question.

The justification for cost-plus contracts was found in the fact that the undertakings were novel and that the manufacturers did not have accurate data upon which to make a satisfactory estimate of the cost of production. This was conspicuously true in the case of airplanes of types with which manufacturers in this country had been unacquainted previously.

For production in large quantity, either new plants or greatly enlarged facilities at existing plants, as well as special tools, would be required to meet an exigency of uncertain duration, and it would also be necessary to procure the requisite labor and materials for the new undertakings in a rising market and to provide working capital for long periods.

And while motors had been manufactured here upon a large scale, the newly-designed engines for the service airplanes required such a reduced weight per horse power and

such delicacy of construction that it was felt that the enterprise had many elements of uncertainty.

In these circumstances it was not an unreasonable conclusion that if contracts for the new types of airplanes and for the new engine were offered solely on a fixed-price basis, either manufacturers would not undertake the work or would insist upon high prices as a safeguard against the chances of ultimate loss.

It was deemed inexpedient for the Government to undertake the manufacture directly, and it was decided to adopt the alternative of an assumption by the Government of the cost of manufacture through contracts upon a cost-plus basis.

This practice, however, could not properly outlast the reasons which may have justified it at the outset. Contracts of this sort lead to waste, foster abuses, and impose an almost intolerable burden of cost accounting, in itself a hindrance to rapid production. Early in this inquiry it was abundantly shown that it was highly important to establish reasonable fixed prices whenever experience afforded a fair basis for estimates.

The principal features of the cost-plus contracts for airplanes and engines may be said to be these:

- (1) The payment by the Government of the contractor's outlays for labor and materials and for the overhead charges incident to the work;
- (2) The payment by the Government for special tools and certain "increased facilities" located in the contractor's plant, but owned by the Government;
- (3) Reimbursement by the Government for depreciation;
- (4) A fixed profit to the contractor; and
- (5) The fixing of an estimated cost, or "bogey," and a division of whatever saving was effected under this estimate so as to give 25 per cent of this saving to the contractor as additional profit.

It will be observed that by this method the contractor is assured not only the payment of the cost of labor and material used in the process of manufacture, but of administrative outlays for management and supervision, and an allowance for depreciation of plant.

To the extent that these payments are made promptly and at short intervals the working capital required would be reduced. Provision has also been made for the supply of needed assistance by means of advances through the War Credits Board where these are deemed to be justified.

The contractor is guaranteed a certain profit regardless of cost. This is called the "fixed profit." And finally, the fixing of a "bogey" cost was designed to counteract the temptation to wastefulness by giving the contractor a substantial share in the fruits of economy.

And it may here be noted that the popular impression that under this form of contract the contractors receive the same amount of profit, however wasteful they may be, and have no incentive to avoid unnecessary outlays, is without foundation.

The bogey costs were in all cases placed so high that the contractor had every reason to expect that the actual cost would be much less, and that through its share in this saving the contractor would be able to derive an increased profit from economical management.

It is apparent, however, that with a large fixed profit guaranteed the incentive to economy is not as strong as when the entire venture is at the contractor's risk.

And particularly when interruption of work and changes in design vex production managers, and it is difficult to maintain economical methods, there may easily be bred an indifference to an excessive cost where its burden falls upon the Government.

At least this is to be inferred from conditions in certain plants, and the conclusion is unescapable that the cost-plus system of contracts for the manufacture of commodities, as distinguished from such contracts for mere service, is a vicious system, and is to be tolerated only during such period as it is found to be absolutely necessary to secure immediate production.

The fact, however, that a cost-plus system is deemed advisable for a time does not justify an exorbitant fixed profit. It has already been pointed out in the case of the Dayton Wright Airplane Company that the contract for DeHavilland-4s originally called for a fixed profit of \$875 per plane.

This was arrived at on the basis of 12½ per cent of the bogey cost of \$7,000. This, however, was not an actual cost, and, as the event has shown, was very far above the actual cost. If it had been thought fair that there should be a profit of 12½ per cent per unit produced, it would have been a simple matter to have given this percentage of the actual cost, as the actual cost was to be ascertained in the course of the accounting and provide for payments from time to time on account.

There is no conceivable reason for giving a percentage of the bogey cost, if the object were merely to assure the cor

tractor a profit equivalent to a given percentage of cost.

The actual cost of the DeHaviland-4s at the plant of the Dayton Wright Airplane Company, despite all the difficulties of production and the enhanced cost of the first lot of machines produced during a period of many changes in design, is understood to be under \$4,400. A fixed profit of 12½ per cent on the actual cost of each machine would have been about \$550, instead of the \$875 which was fixed by making the calculation on the bogey cost.

Again, in a contract for manufacturing articles at the contractor's plant, the agreed profit upon a cost-plus basis should have a proper relation to the contractor's actual investment and risk.

The contractor is not only reimbursed for his outlays for labor and material, but for expenses of management included in overhead charges, including such reasonable salaries of officers, managers, etc., as may properly be allocated to the Government's work.

There is no sacred formula by which the Government is bound to pay a profit per unit of production regardless of the time in which capital is turned over. The extent to which the Government supplies the needed working capital, either by payments on account of work and materials supplied, or through advances, should also be considered. A percentage of outlays, or of a bogey cost, although small in itself, may give an exorbitant profit as applied to each unit of a large production.

#### Service Airplane Contracts

In the case of the Dayton Wright Airplane Co. the paid-in capital was \$1,000,000 invested in plant. Advances by the Government to the extent of \$2,500,000 were authorized and in December and January last advances of \$1,000,000 were actually made. These were followed by additional advances, and the balance of total advances on June 30, 1918, was \$1,405,222.57.

Approximately \$750,000 of the money thus borrowed from the Government at interest is represented by investment in fixed assets. The plant is exclusively devoted to Government work, and outlays for labor, materials and overhead, as provided in the contract, are met by the Government.

The operations of this company relating to production may be said to have begun about Aug. 1, 1917. The total fixed profit on 400 Standard-J planes was \$620 per plane, and the fixed profit on the 4000 DeHaviland-4s was \$875 per plane, making a total of \$3,748,000.

With the saving as now estimated of approximately \$2,600 under the original bogey cost of \$7,000 the additional profit of 25 per cent of this saving would amount to \$650 per plane, making the total profits on the DeHaviland contract about \$1,525 per plane.

At the present rate of deliveries the contract for 4000 DeH-4s will be completed before March 1 next. The total profits on the 4000 DeH-4s would have amounted to upward of \$6,100,000, and it is safe to say that including the profit on the Standard-J planes, the company would have earned a profit of more than \$6,350,000 under the original contract.

This does not include whatever profits would have been made on its experimental contract or on the spares for DeH-4s. It should also be added that under its contract it was provided, in substance, that at the completion or cancellation of its contract the Government should pay the difference between the cost of its plant, including real estate, building, machinery and appliances built or otherwise acquired for the performance of the contract, less what was found to be the fair market value at the time when the contract was completed or cancelled, and that in determining (through a board of appraisers) this fair market value, the need or requirement of such a plant in the neighborhood and the probability of securing a tenant promptly, or having an established business available, should be considered as one of the important factors.

In the case of the Fisher Body Corporation, which had the other large order for DeHaviland-4s (4000), as well as an order for 400 Standard-Js, the profits would certainly not have been less. Instead of establishing a new plant, as did the Dayton Wright Co., the Fisher Body Corporation had already effected a highly efficient organization and had an established plant, which required, however, a considerable expansion of plant facilities and special equipment.

The net investment in fixed assets, including building, land and machinery, which was made by the Fisher Body Corporation for the Government work amounted, to May 31, 1918, to \$860,849.05. The corporation was aided by an advance through the War Credits Board of \$2,000,000, made last December. Waiting for the necessary drawings, it got into production later than the Dayton Wright Company and up to Oct. 11, 1918, had only delivered 452 planes. But it should complete

its production of the entire 4000 within the next six months.

As already stated, in accordance with letters obtained at the time the contracts were made with the Dayton Wright Airplane Co. and the Fisher Body Corporation, which promised an equitable readjustment if it was found that the bogey cost was too high, it appears that contracts are now being negotiated for the reduction of the bogey cost of the DeH-4s to \$5,000 and the fixed profit to \$625 per plane. The total profit per plane with the percentage of saving (exclusive of profit on spare parts) under the new contract would amount to about \$775 per plane, or \$3,100,000 in all, which with the profit on spare parts would make the total profit on the DeHavilands not less than \$3,500,000.

#### Liberty Engine Contracts

The bogey cost, as first fixed in the contracts for Liberty engines, was \$6,087. This was approved by Mr. R. H. White of Cleveland and Mr. Henry May of Buffalo, to whom the propriety of the estimate had been submitted by the Secretary of War. The fixed profit as originally stipulated was 15 per cent of this bogey cost, or \$913.05 per engine. Lieut.-Col. Hall (who had had large experience in engine manufacture) testifies that he made an estimate about the time that contracts were being let, and told Colonel Deeds, that \$2,400 would cover the cost of labor and materials for the Liberty engine, without overhead charges.

In December, 1917, the bogey or estimated cost was reduced to \$5,000 and the fixed profit put at 12½ per cent of this sum, or \$625 per engine, and the contracts with the Packard, Lincoln and Nordyke & Marmon companies were modified accordingly. This was in consideration of further allowances for depreciation and provision for advances by the Government. In last May, the contract with the Ford Motor Co. was modified by the same reduction of the bogey cost and fixed profit. The contracts with the General Motors Co. were put upon the same basis.

Even at this reduced bogey and percentage, the profits allowed were very large.

By Sept. 6, 1918, that is within a year from the date of the contract, the Packard Company had delivered (according to the Government's report) 3100 Liberty-12s, and the agreed fixed profit on these amounted to \$1,937,500.

In the following month it produced 560, and it should complete its deliveries of the 6000 first contracted for not later than January, 1919, and on these 600 engines the agreed fixed profits would be \$3,750,000. This profit it would earn within seventeen months after it received the contract, and if it could have completed the deliveries as contemplated when the contract was made, that is according to contract schedule, the profit would have been earned in eleven months.

Only the fixed profit has been mentioned, as this was definitely guaranteed, but in addition to this the company was entitled to 25 per cent of its saving under the bogey of \$5,000. The Government's estimate is that the actual cost of the first 600 Liberty engines produced at the Packard plant was \$3,873 per engine, and that the average cost of the first 1200 motors was thus \$3,442 per engine.

It would seem that the actual cost of the entire 6000 is likely to be somewhat under \$3,200 per engine. But on the basis of \$3,200 there would be an additional profit, through the contractor's percentage of saving, of \$450 an engine, which would make \$2,700,000 additional profit, or with the fixed profit of \$3,750,000 a total profit of approximately \$6,450,000 earned on the 6000 engines, within a year and five months, despite delays in production.

To this there should still be added a considerable amount for profits on spare parts on the 6000 engines, which may be estimated at upward of \$1,500,000, and thus the aggregate profits on the Liberty engine (exclusive of the original development work) would reach about \$8,000,000.

The Packard Company estimated that on May 31, 1918, from the standpoint of plant values, the total investment exclusively for aircraft motor work was \$11,808,404.47.

This included, however, advances by the Government for working capital amounting to \$2,145,568, and inventory and other items which would be represented in the cost of labor and material ultimately defrayed by the Government.

The proportion of its plant, less depreciation, employed on aircraft work was estimated by the company at \$5,500,000. It should also be noted that in the contract reducing the bogey cost and fixed profit, it was provided that on the termination of the contract the Government should pay for depreciation upon the heat-treating building and equipment erected by the contractor for the purpose of carrying out the contract, the difference between their cost and "the value thereof to the contractor for use in its business," as determined by a board of appraisers; and that in determining this value the appraisers should be guided by the use the con-



tractor "shall have for said building and equipment at the termination of said contract, in the ordinary operation of its business of manufacturing motor cars and trucks, and shall not include the value, if any, which the same may have to the contractor in the manufacture of further aviation motors."

The Government was also to pay the full cost of facilities for testing and inspecting the engines, including the building and equipment erected by the contractor therefor, and should also reimburse the contractor for the machine tools purchased especially for the construction of aviation engines, to be used by the contractor without rental but to remain the property of the Government.

The contract with the Ford Motor Co. was for 5000 Liberty engines. The company did not begin its deliveries until the 14th of June. It was estimated by its officers that deliveries would reach 1500 in October, and that the entire contract would be completed by the first of December.

It is behind its schedule, but between September 6 and October 4 it delivered, according to the Government's records, 768, and it may be expected that it will complete its contract for 5000 by the end of January, 1919.

Under the original contract it would then be entitled to fixed profits on the 5000 engines of \$3,125,000, and the additional percentage of the saving under the bogey cost of \$5,000.

With its well-known efficiency, and in view of the fact that by beginning later it did not have as much difficulty as the Packard Company had experienced, it may be assumed that the actual cost of the 5000 engines at the plant of the Ford Company will be less than \$3,200 per engine and at the rate of \$450 an engine (that is 25 per cent of the difference between \$3,200 and \$5,000) its additional profits would amount to \$2,250,000, or its aggregate profits on the 5000 engines would be \$5,375,000, earned by January, 1919.

The plant investment required for this production certainly cannot be regarded as any greater than that on the part of the Packard Co. The Ford Co. has not received advances from the Government. The Ford Co. also has a contract for 400,000 cylinder forgings for the Liberty engine, on a fixed price basis of \$8.25 each; these are supplied to the other manufacturers.

The contract with the Ford Co. for the Liberty engines provides that there shall be allowed for depreciation on the machinery and buildings especially acquired for the performance of the contract, in addition to the facilities already owned by the contractor, the difference between the fair cost and the fair market value as determined by appraisers at the time of the completion or cancellation of the contract.

The Lincoln Motor Co. has its special feature in that it was a new organization and established a new plant which is devoted exclusively to the manufacture of Liberty engines for the Government. It has a highly expert organization, with Mr. Henry M. Leland at the head. When the bogey or estimated cost was reduced from \$6,087 per engine, with a fixed profit of 15 per cent, to \$5,000 per engine, with a fixed profit of 12½ per cent, the Government made a special agreement with reference to depreciation, which is thus summarized in a resolution of the Aircraft Board:

That the Government make an allowance for depreciation of the company's heat treating plant equal to the difference between the cost thereof and the value to the company of the business at the termination of the contract; further, that the cost of the company's testing plant be allowed as a part of the production cost of the engines to be manufactured; further that the machinery and equipment used by the company in the performance of the contract be depreciated 40 per cent over the term of the contract.

The Government made advances during the last fiscal year to the extent of \$6,500,000; additional advances were made in July and August of \$4,300,000, in order to discharge obligations and maintain a capacity of 1500 engines a month, making a total sum advanced by the Government of \$10,800,000.

The Lincoln Motor Co. had delivered, according to the Government's reports, only 580 motors by the end of June, but it had reached a production of over 600 per month by Oct. 4, and doubtless will soon be at full capacity so that the first 6000 motors will probably be delivered before the end of January.

For the first 600 motors the cost of production at the plant of the Lincoln Motor Co. was \$3,583, which was nearly \$300 per motor less than that of the Packard Motor Car Co., and it may be assumed that its average cost for the entire 6000 will be not much, if any, more than \$3000.

That is the figure which appears in the company's estimate of profit. But on the basis of an actual cost of \$3200 per motor the Lincoln Motor Co. would have earned by January, 1919 (through fixed profits and percentage of saving), on the delivery of the 6000 motors, about \$6,450,000.

There would also be profits on spare parts, which are estimated at upwards of \$1,500,000 more, making an aggregate profit of about \$8,000,000. This would be exclusive of the allowances by way of depreciation.

The investment in real estate, buildings, machinery and equipment (exclusive of the special tools to be paid for by the Government, and the cost of testing and inspection facilities on which there is to be a depreciation allowance of 100 per cent) amounts to approximately \$7,150,000, of which about \$3,460,000 is the cost of machinery, tools and equipment (to July 31, 1918), on which the Government is to pay a depreciation allowance of 40 per cent, in addition to profits.

The entire paid-in capital of the company amounts to \$850,000. At the outset the company obtained on the credit of its officers about \$2,000,000, which served its purposes until it obtained the amounts needed for its plant, equipment and working capital, through advances by the Government.

It is pointed out very clearly that the company has provided an excellent plant for the manufacture of Liberty engines and that ultimately its profit, after paying taxes, will represent only an equity in its plant, without any assured business, as it has been devoted exclusively to Government work.

On the other hand, it may be said that there is a very liberal flat depreciation allowance on machinery, tools and equipment; that the plant is a permanent one, admirably designed for commercial work, and not merely for a temporary exigency, and that there is every prospect that it can be successfully utilized. It should also be said that from the standpoint of the Government it was free to make arrangements with existing plants, and the amount of the profits it should allow should be determined accordingly.

It is unnecessary to review the original contracts with the Nordyke & Marmon Co., which is very far behind in its deliveries, and with the General Motors Co. (Cadillac and Buick plants). The profit allowed per engine was the same as in the other contracts, but the contracts were for fewer engines, 3000 in the case of the Nordyke & Marmon Co. and 2000 in that of the General Motors Co. The Nordyke & Marmon Co. received advances of \$2,000,000. There were no advances to the General Motors Co.

The large percentage of the contractors' profits which will be taken by the Government in taxation is strongly emphasized, and, of course, what the Government takes back through taxation should fairly be taken into account. But the contemplated tax does not justify an extravagant scale of profits which, even after payment of taxes, would permit an excessive return upon the capital invested, in view of the greatly reduced risks of the contractor under the cost-plus contracts.

#### Revised Contracts for Liberty Engines

What has been said above relates to the original contracts for Liberty engines. During a recent period the contracts with the Lincoln Motor Co., the Packard Motor Car Co. and the Nordyke & Marmon Co. have been revised and put upon a fixed-price basis of \$4000 an engine.

The revised contract with the Lincoln Motor Co. is dated July 31, 1918. The former contract for 600 engines is cancelled and superseded and the new contract provides for 9000 U.S.-12s and necessary spare parts, with an option to the Government to require the production of 8000 additional engines and spare parts. The schedule of deliveries provided for in the new contract is as follows:

Previous to Aug. 1, 1918.....	1,000
August .....	750
September .....	1,000
October .....	1,500
November .....	1,500
December .....	1,500
January, 1919 .....	1,500
February .....	250

The price is \$4,000 an engine. The spare parts are to be delivered on a schedule basis corresponding to a total price of \$4,000 for a completed engine. The contract provides for payments by the Government, by way of amortization upon a basis of 100 per cent, of the actual cost of all testing and inspecting facilities provided by the contractor with the approval of the Government; for payment by the Government, by way of amortization upon a basis of 40 per cent, of the actual cost of the heat-treating building and equipment theretofore provided by the contractor; and payment by the Government, by way of amortization upon a basis of 40 per cent, of the actual cost of all machinery, tools and other items furnished by the contractor.

It is further agreed that in case the Government shall not order from the contractor the 8000 additional engines for which it has an option, or the contractor is prevented by termination of the contract from manufacturing and delivering

It is understood that it has been arranged that similar revised contracts on a fixed-price basis will be made with the Ford Motor Co. and the General Motors Co., but these had not yet been executed according to the latest information received.

The plant of the Wright Martin Aircraft Corporation at New Brunswick, New Jersey, is a conspicuous exception, few, if any, women being employed in the shops. The testimony

is that the local labor organization has taken a stand against the employment of women, and accordingly this has not been pushed by the management.

In the case of the Wright Martin Co., also it was apparent that a very large proportion of the employees were within the draft age as fixed by the Selective Service Law of May 18, 1917. The records show that on Aug. 15, 1918, 41.36 per cent, or 2,300 of the total number of employees (5560) at the New Brunswick plant were within the draft age, and of this number 15.83 per cent were in Class 1.

The report by the representatives of the Government at this plant states that the method used by the company for securing deferred classification and indefinite furloughs is as follows: When a man is employed who is in Class 1 of the draft, he is given a week to "make good." If he then is found to be efficient his foreman induces an application for deferred classification, and if this is refused by the District Board and the employee is called to camp, a request is made by the company to the personnel department of the Bureau of Aircraft Production for his return on indefinite furlough. Prior to August, 1918, the operations of the draft department of the company were open to serious criticisms and exhibited many irregularities.

In one case a man, whose duties were such that anyone who could handle a screw driver could do his work, was drafted and immediate steps were taken to have him returned as a "motor builder." Previous to his employment by the company he had been employed as a stock clerk by a manufacturer of gowns and he had no previous mechanical experience. In another case a man who was considered a deserter by his Local Board was finally located at the plant of the Wright Martin Co., where he was arrested and inducted into the Army.

Affidavits were immediately presented for his return from camp upon industrial grounds, and he was returned accordingly. One who had been a clerk of a carpet company, without mechanical experience, and who had a minor assembly job, was drafted and was returned on indefinite furlough as a necessary employee.

A former proof-reader, a former skating-instructor, and a former coupon-clerk, who had obtained employment at the Wright Martin plant were drafted and similarly returned. In other cases, men whose work was entirely clerical secured deferred classification on industrial grounds. Cases of this sort have now been brought to the attention of the Provost Marshal General.

It is stated by the Government representative that at present the draft department of the Wright Martin Co. is in competent hands, and it appears that its work is being done with a better regard for the interests of the Government.

#### Labor cost.

To establish the labor cost under cost-plus contracts it was necessary that there should be proper time records and suitable provision for the identification and check of employees as they entered and left the factory.

The opportunities for irregular pay-rolls, through laxity or connivance, are obvious. The conditions in this respect at the North Elmwood (Buffalo) plant of the Curtiss Aeroplane & Motor Corporation were especially bad. It was at this plant, (completed last fall) that the cost-plus work was done on the Bristol Fighter for the Army and the HS-1 seaplane for the Navy.\*

There is abundant testimony, with picturesque detail which can not be given here, to the effect that at the North Elmwood plant large numbers of employees were kept on the pay-rolls when they were not needed; through an utter lack of a decent system men and women were paid when they did not work; employees were able to leave factory without being detected and remain absent for hours while recorded as on duty; employees would ring one another's time cards; men who were without work enough to keep them busy during the day were employed over-time at increased rates; men were brought to the plant on Sundays when there was virtually nothing to do; and for many months there was such demoralization at this plant that it became the subject of contemptuous gossip among the employees and in the community.

One of the inspectors for the Navy testifies that as late as July he, with others, went through the plant at night on a tour of inspection, and not only were they able to go

from one end of the plant to another without being asked for their passes, but they found absurd conditions of idleness. In one room, "the foreman and three men (were) sprawled out on the floor," and, as he put it, there were "slackers from one end of the plant to another."

It is urged in palliation that the cancellation of the Spad order and the difficulties encountered in the development of the Bristol created a state of confusion, and that the management was constantly expecting to be able to get into production and felt it necessary to maintain an adequate force for this purpose. That the force was increased heavily at the North Elmwood plant during the early period, despite the fact that there were serious difficulties with the Bristol design and the company was not ready for large production, is beyond question.

In October, 1917, the average number of men working at the North Elmwood plant was 578. In December this was increased to 4142; in January, to 5970; in February, to 7029; there was a decrease of a few hundred in March and April, and an increase in May to 7557, and in June the average number at work was 9788.

To approximately sixty per cent of its capacity, this plant was either idle or working only in connection with the Bristol. The employment of men on a large scale when there was not work enough for them had much to do with the virtual destruction of the morale at the plant.

But whatever loss the Government has sustained in this way is not nearly as it might otherwise have been, by reason of the fact that a careful re-audit is in progress, which should be strictly prosecuted, and final settlement of payments awaits a satisfactory determination of actual outlays.

#### Employment of Alien Enemies

Among the regulations established by proclamation of the President on April 6, 1917, was the following:

An alien enemy shall not approach or be found within one-half of a mile of any Federal or State fort, camp, arsenal, aircraft station, Government or naval vessel, navy yard, factory, or workshop for the manufacture of munitions of war or of any products for the use of the army or navy.

Under the authority granted by the President to the Attorney General for the administration of the alien enemy regulations, the Department of Justice developed a permit system whereby alien enemies could obtain permits to be employed within a munitions factory, including one engaged in the manufacture of aircraft, within the half-mile zone.

The granting of such permits is entrusted to the United States Marshal of the district, who is authorized to issue them if he is satisfied that such action will be in no respect dangerous to the community or the United States. He is required before issuing a permit to confer with the special agent of the Department of Justice in the locality, to make a thorough investigation, to get the approval of the United States attorney or assistant United States attorney of the district, and also to obtain from the employer a certificate in writing to the effect that he desires to employ the applicant and that he is satisfied that such employment will not be to the injury of the community or the United States. Sponsors or bonds may be required and all such permits are revocable.

It will be observed that while the precaution has been taken to require suitable investigation by agents of the Government, the co-operation of the employer, who has special opportunities for obtaining accurate information, is expected. It is manifest that unless the Government is in possession of facts showing the inadvisability of the employment, the certificate of the employer in compliance with the regulations is likely to be most persuasive.

There is considerable difference in the practice of the various companies engaged in the manufacture of aircraft as to the employment of enemy aliens under these regulations. The following illustrations will suffice:

The Fisher Body Corp. states: "We do not employ any German aliens in our aeroplane factory or in our aeroplane divisions." On May 22, 1918, Mr. Kepperley, the Vice-President and General Manager of the Curtiss Company, gave instructions that under no circumstances should alien enemies be employed. Despite this instruction some alien enemies, who had previously been employed on permits, were retained in positions of importance. One of these, who began work for the Curtiss Company last fall, was put in charge of the milling machine department in the machine shop, and became assistant general foreman of the machine shop at the North Elmwood plant.

Another German subject (having a brother in the German navy) who began to work in the Curtiss plant in February 1917, became foreman in the welding department at the

\*The Curtiss Aeroplane & Motor Corp. has seven distinct plants: at Buffalo, the Churchill Street group (including the Churchill Street plant where training planes are made, and the plants at Niagara Street, Bradley Street and South Elmwood, making parts for Churchill Street); the Austin Street plant, doing Navy work, including contracts for the British Government; and the North Elmwood Avenue plant. At Hammondsport, New York, motors are manufactured exclusively. The work, except at the North Elmwood plant, is on a flat price basis.



North Elmwood plant and has been at work on all the tubing work and tail units for the Bristol Fighter as well as on the engine braces for the HS flying boats. Another, who had himself served one year in the German army and was discharged on account of wounds, was employed as tool maker at the Curtiss plant until sometime in June.

The Lincoln Motor Company states: "It is our endeavor to employ none but American citizens or friendly aliens. We are careful and using every precaution to not employ enemy aliens." The Nordyke & Marmon Company is equally careful. Their statement is: "At this date there are no alien enemies employed in the airplane engine division. A very few have been employed in this division from time to time but for only short periods at a time, as it has been our settled policy from the beginning of the war to keep alien enemy employees out of our Government departments, notwithstanding the individual man might be perfectly harmless. As fast as these men have been discovered they have been discharged."

About 200 enemy aliens (including Austrians and Hungarians) are employed by the Packard Motor Car Company. About 200 enemy aliens (not Germans, but Austrians and Hungarians) are employed at the plants of the Wright Martin Aircraft Corporation in New Brunswick and Newark. No enemy aliens are employed by that company at its Long Island City plant.

The Ford Motor Company has about 250 German aliens who are employed in departments dealing with Government work. 143 of these are in departments in which from 20 to 60 per cent of the work done is Government work; 35 are at the blast furnace, and 61 are at the ship-building plant which is doing Government work exclusively. These enemy aliens are working under special permit granted on the company's recommendation.

#### German Sympathizers

The serious risk that is taken in permitting men of known pro-German sympathies, whatever their citizenship, to work in aircraft plants in any important capacity is generally recognized. The opportunities are abundant for delays and interferences in production through the action or inaction of those controlling the progress of production.

It is the assumed sympathy with his nation which makes the employment of the German subject dangerous, and the danger may be quite as great in the case of one who, although not an enemy alien, is more friendly to Germany than to the United States.

There have been persistent rumors of pro-German sympathies on the part of employees of the Curtiss Company, but it has been impossible to ascertain to what extent, if any, the demoralization that until recently has existed at the North Elmwood plant of that company was due to any influence of this hostile description.

The conditions that existed naturally bred distrust which was reflected in common talk, but facts warranting a definite conclusion as to disloyalty on the part of employees in important positions are lacking.

In the case of the Ford Motor Company, one of the company's employees (who formerly had been in the Educational Department and had represented the American Protective League) testified as to his inquiry into cases of disloyalty. The reports obtained by him exhibit utterances of employees in antagonism to the Government, insulting references to the President, and praise of the Kaiser.

In an extreme case, in which the employee reviled and even threatened the President, there was a prosecution and a plea of guilty. The man was fined \$300, was released, and the testimony is that he resumed work in the Ford plant. The reports were numerous, and the employee who obtained them testified that there were about 200 employees whose loyalty was seriously open to question, but how many of these were employed in Government work he could not say.

So far as the Liberty engine was concerned, his investigation related to half a dozen cases in the Drafting Department in the Ford Company. In this department there was a serious situation which engaged the attention of the management. Its importance was manifest from the fact that the drafting department embraces the tool design and drafting room in which the drafting work upon the Liberty engine is done, and it is possible for one in that department to bring about delays, the causes of which, in view of the multiplicity of drawings involved, it would be difficult satisfactorily to trace.

This department was in charge of Carl Emde. There were repeated reports of pronounced pro-German utterances by Emde. A former employee, who had left the plant voluntarily and had later been found with plans and photographs of the plant, was a close friend of Emde's and had been employed in his department. This man, it is understood, has been

interned. While nothing conclusive could be established against Emde in relation to his work, the advisability of removing him from a position of such strategic importance was clear to some of the most important men in the management.

A conference was held on the subject at which Mr. Ford and the factory managers were present. According to the minutes of this conference reports were read "from various members of the drafting department who were in touch with the situation, and who felt that the department was practically a pro-German institution." Several conferees expressed the opinion that Emde should be removed, and one said that in his opinion "in the very nature of things Mr. Emde could not give us everything required to assist the Government of the United States." Mr. Ford, however, was opposed to that course and overruled his associates. Mr. Ford's position and his reasons are thus set forth in the minutes:

Mr. Ford deliberated and stated that he had heard numerous rumors, but in speaking of all he had heard there had not been one thing shown him which would make him change the present head of the drafting department. He felt that it was a time of sacrifice—that in the next few years every man would be called upon to make some sort of sacrifice, and that possibly Mr. Emde, German born, was making his sacrifice now when making drawings for the Liberty motor to be used ultimately against Germany.

This statement of attitude is sufficiently expressive and requires no comment. The proposed removal did not take place. There has been a laxity at the Ford plant with respect to those of German sympathies which is not at all compatible with the interests of the Government. In deference to Mr. Ford's view, those in direct charge of production, who were alive to the situation, have had to pursue a policy of constant watchfulness and supervision instead of being free to take the precautions which the exigency demanded.

#### MATERIALS

The leading causes of waste in material were engineering changes and faulty workmanship. As material was rendered useless it was scrapped, and there is no little evidence of a lack of care in securing salvage.

For the losses due exclusively to changes in design after authorized production had begun the manufacturers cannot be regarded as responsible; and these losses, while they cannot be accurately computed, are undoubtedly heavy.

Their extent, of course, is proportioned to the stage of production reached when changes were directed; and with respect to the service planes the history of production at the Dayton Wright Airplane Co., the Fisher Body Corp. and the Standard Aircraft Corp. discloses the same conditions varying only in degree as to the delay and waste caused by repeated changes.

With respect to the intelligence and efficiency of the inspection, and the extent to which rejections have been on sound grounds, there are naturally differences of opinion and complaints and counter-complaints the basis for which cannot be satisfactorily determined. It is to be noted that the rejection of spruce which has gone into production has reached a high percentage. Even at one of the best plants the Government representative puts the percentage as high as sixty per cent after allowing for salvage, and at other plants the percentage of rejections was probably higher.

A poor industrial organization such as existed at the plants of the Standard Aircraft Corp. and the Curtiss Company (North Elmwood plant) did not favor economical production, and in the case of the former company conditions were aggravated, as already pointed out, by the assignment to that company of a large number of small orders for varied work.

At the North Elmwood plant of the Curtiss Company the waste which was incident to delay and changes was vastly increased by irregular practices. Thus, in order to keep men busy who apparently had no proper work to do, there was excessive production of parts.

A production order might be for 500 parts but the actual production might run to 5000 or even more of these parts until this unwarranted conduct was discovered and stopped. There is instance after instance of excessive production which served to increase the size of the scrap heap when a change made the parts useless.

Again, at this plant when a change would lead to an order stopping the production of parts, production often would continue despite the order.

As an illustration, one witness testified that he had personally given a stop order on certain metal parts and found two weeks after, in going through the metal shop, that they were still making the parts, sending them through the various operations and working over-time on their production.

During periods of idleness employees devoted their time to making clocks and toys out of the materials at their com-

mand in the factory. Excess material was scattered about the factory without a proper record being kept of it. And it appears that material would be sent to the scrap heap instead of being properly salvaged, in order to cover mistakes.

There was also a lack, at the Curtiss plant, of proper records of material. In the case of steel stores there was confusion between what had been supplied for the Army work, for the Navy work, and for the Curtiss fixed-price work so that accurate accounting based on the ledger entries was wholly impossible.

And in addition to other manifest delinquencies, there was an absence of proper plant protection. The situation of the company in view of its experience with both the Spad and Bristol orders was undoubtedly a difficult one, but the lack of competent industrial administration is too clear to admit of dispute and has freely been confessed.

There has been little evidence at the North Elmwood plant of the exercise of the broad powers of the Government to prevent these abuses, and the fact that conditions were permitted to continue reveals the failure of the representatives of the Signal Corps to take proper steps for the protection of the Government's interest.

There was, however, such an absence of system on the part of the company in the keeping track of parts, and so many changes in the persons employed, that, while there is abundance of general testimony, it is practically impossible at this time to trace particular instances of dereliction to individuals in order with suitable particularity to support definite charges.

The divided responsibility which resulted in giving the design of the Bristol so largely into the control of the representatives of the Curtiss Company was also a source of embarrassment, and the extreme haste to make up for lost time added to the confusion. Conditions through the winter and early spring were chaotic and the improvement that has been made since that time has been unnecessarily slow. It is fair to say, however, that recently there have been changes which promise a needed betterment in the industrial organization.

So far as the loss of the Government in connection with the Bristol is concerned the payments already made to the Curtiss Company, according to the Government accounts, amount to upwards of \$2,000,000 exclusive of advances, and as already stated, the Government has estimated that the loss, including claims growing out of the cancellation may reach \$6,500,000 (*ante*, p. 16.)

The Government, however, has a margin of security by reason of deferred payments and a re-audit is in progress which must be completed before a final settlement is made for materials furnished. The loose methods employed by the company should be taken into consideration and a final settlement should be reached only upon satisfactory proof of proper outlays.

#### Overhead Charges

In the course of production payments have been made on account of overhead charges upon the basis of a general estimate; that is, by taking a percentage of other outlays, which seems to be justified in the experience of the plant, as representing the overhead expense. The overhead expense embraces general administrative outlays, including executive salaries; and the theory of the cost-plus contract is that the Government pays the expense of superintendence as a part of the cost.

It is, of course, important that fair salaries should be allowed, and all exorbitant demands rejected. Reference has already been made to the salaries paid to the executive officers of the Dayton Wright Airplane Co., who were at the same time the stockholders in a close corporation and divided their time with other companies from which they received high salaries.

There appears to be no justification for even the temporary allowances to the Talbotts and Kettering of annual salaries aggregating \$100,000, and the explanation furnished that the "relations with the contractor were somewhat delicate at first, and, moreover the company was in crying need of cash, and any withholding of amounts due was sure to create much friction," is not convincing; inasmuch as the individuals, and not the company, got the money, and it is difficult to see how "friction" in this matter could have injured the Government.

It is also stated that when the salaries were allowed in the fall of 1917, dating from Aug. 1, 1917, it was felt that it was a matter of considerable importance "that would have to be passed by Colonel Deeds who was in charge of the Equipment Division," but Colonel Deeds testifies that he knew nothing of the salaries that were paid to these officers.

It should be said, however, that these allowances, under

the terms of the contract, should be regarded as tentative, and that it is within the authority of the finance department in its final settlement to adjust the matter on a fair basis. And that is the position of that department.

Even more extraordinary was the salary paid by the Standard Company to its president, Mr. Mingle, at the rate of \$63,000 a year, which is sought to be charged as a part of the cost of operations. This, however, has not been allowed.

The question what would be a proper allowance has been under consideration. Several vouchers have been passed which represent merely payments on account, or payments "subject to adjustment," and it is stated that the amount of Mr. Mingle's salary thus far actually allowed is at the rate of \$15,000 a year.

The adjustments of overhead expense as are the other payments on vouchers under the cost-plus contracts, are subject to a revision of accounts and it is within the power of the finance division in the ultimate adjustment of cost in accordance with the terms of the contract to protect the Government against any claims on the part of the contractors which may be found to be unjustified.

#### TENTH. SPECIAL MATTERS

##### 1. Purchase of the Plant of the General Vehicle Company

In November, 1917, the Government purchased the plant of the General Vehicle Company at Long Island City, New York, for \$1,527,568. The purchase embraced all the real estate, building and machinery constituting the plant, and all other assets, except that patents (other than those relating to internal combustion rotary aircraft engines) franchises, good will, cash, bills and accounts receivable, specified securities and all inventory assets not acquired and used in connection with the manufacture of Gnome engines, were retained by the General Vehicle Company.

The company also agreed to release for the use of the Government its administrative and manufacturing organization so that the Government might take over the plant property and organization as an active manufacturing establishment in full readiness for production.

Upon a physical valuation and inspection of the books of the company by Government appraisers and accountants showing that the price was a fair one on the basis of prices previous to the war, and upon an opinion of the Judge-Advocate General as to the legality of the purchase and as to the propriety of the form of contract, the purchase was recommended by the Aircraft Board.

The advisability of the purchase, however, was doubted at the time by officers of the Government. It appears that at the outset, in formulating the aircraft program, it was supposed that the Gnome rotary engine would be a factor of some importance, and a small order for Monosoupape motors was placed with the General Vehicle Company, but in view of doubts as to the planes to be built, with which such engines would be used, further orders were not placed.

Later, on word from overseas that Gnome rotary engines should be put into production, there were negotiations with the General Motors Corporation looking to the acquisition of the General Vehicle plant and the manufacture of these engines in large quantities. Before the matter was closed, the instructions from abroad were changed and the proposed transaction was abandoned.

The considerations underlying the purchase are stated in the recitals of the Aircraft Board in the resolution adopted at its meeting of Oct. 19, 1917. It was stated that advices from France indicated a doubt as to the future demand for rotary engines in aviation, but that nevertheless these engines would be used to a greater or less extent for a considerable period to come; that it was desirable that "the technique of manufacture of rotary engines should in any event be studied and developed in the United States in case of need;" that the General Vehicle Company had "the only plant and organization of substantial size in the United States, equipped and organized with the necessary facilities and experience for the manufacture of such engines;" and that the present and future demand for rotary engines was "not sufficient in amount or sufficiently continuous to justify a manufacturer in the maintenance of a plant and organization adequate for a prompt supply of such engines and for the proper study and development of the technique of that type of engine."

In a previous part of this report (*ante*, p. 98), reference has been made to the opinion of the Joint Army and Navy Technical Board, given on Nov. 16, 1917, that in the program for the coming year rotary engines should be considered of secondary importance, but that it was deemed desirable that the art of building rotary engines should be retained in the United States and that for this purpose the organization skilled in rotary engine production should be preserved.

While it was thought that an order which had been given to the Union Switch and Signal Company for 2500 80 hp. LeRhones was larger than was necessary to preserve the art, it was further recommended that steps be taken to maintain the possibilities of production of the 160 hp. Gnome engine. The resolution of the Joint Army and Navy Technical Board did not in terms approve the purchase of the General Vehicle Company's plant, nor did it express opposition in any definite way.

The actual necessity of the purchase of the General Vehicle Company's plant is not apparent. As soon as the Government made the purchase, a corporation called the Aeronautical Engine Company, with a nominal capital, was incorporated for the purpose of building Gnome engines at the plant and contracts were made for the manufacture of small quantities at cost, without profit. This, however, did not continue long.

It was found that the Union Switch and Signal Company had mastered the art of making LeRhone engines, and although these were of a different type, it seemed that the necessity of keeping the organization in existence at the plant purchased from the General Vehicle Company soon ceased, or was very much minimized. In April last, it was proposed that the plant at Long Island City be leased to the Wright-Martin Company for the manufacture of the 300 hp. Hispano-Suiza engines, and an arrangement for this purpose was made soon thereafter, one of the reasons being stated to be "the practical abandonment of the manufacture of Gnome motors."

At the time of the purchase of this plant by the Government, the General Vehicle Company had outstanding notes amounting to \$1,530,000, which were held by the Peerless Truck and Motor Corporation. The purchase price paid by the Government was substantially equivalent to the amount of these notes and thus provided for their retirement.

The purchase, however, was made on the basis of the value of assets, and whatever difference of opinion there may be as to the advisability of the purchase, there are no facts warranting the conclusion that it was not made in good faith or that the amount paid was in excess of the fair value of the property acquired.

## 2. Mahogany Manufacturers and Importers Association

True mahogany is a desirable wood (ranking in the opinion of the Government's production engineers next to Black Walnut) for the making of propellers for service or combat airplanes. To meet this demand, contracts had been made for Mahogany in the fall of 1917, but with only one responsible corporation, that is, Lewis Thompson and Company. A contract with one of the companies selected was cancelled because it was apparently without financial resources and could not provide a bond, and in the case of another contractor no deliveries were made.

In the beginning of January, 1918, it appeared that there was a serious shortage in the Government's supply of wood for service-plane propellers and through the War Trade Board the leading Mahogany manufacturers of the United States were invited to a conference in Washington.

This conference was held on Jan. 21, and at that time, or in the later conferences, the following corporations and firms were represented: Huddleston-Marsh Mahogany Company, Ichabod T. Williams & Sons, George D. Emery Company (said to be closely affiliated with I. T. Williams & Sons) and the Astoria Veneer Mills and Dock Company of New York; Palmer, Parker and Company, of Boston; Lewis Thompson and Company, and S. B. Vrooman Company, of Philadelphia; Freiberg Lumber Company, of Cincinnati; C. C. Mengel and Brother Company, of Louisville; Talge Mahogany Company, of Indianapolis; C. L. Willey Company, of Chicago, and the Otis Manufacturing Company, of New Orleans.

At the first conference the manufacturers were notified of the Government requirements for propeller stock, their co-operation was sought, and they were asked to advise the Government of the quantity which each could furnish, and the price. The representatives of the War Trade Board suggested the advisability of an organization of the manufacturers to secure effective co-operation with the Government, and accordingly an association of the manufacturers was at once formed which appointed a War Committee composed of A. S. Williams, of the Astoria Veneer Mills and Dock Company, C. H. Thompson, of Lewis Thompson and Company, F. C. Leary, of Ichabod T. Williams and Sons, F. G. Otis, of the Otis Manufacturing Company, and J. C. Wickliffe, of the C. C. Mengel and Brother Company.

The committee met at once and passed a resolution expressing the opinion that the best interests of the Government would be served by the purchase by the Government "of all Central American mahogany logs now under contract with the members of the association at a price to be agreed upon; the

Government to arrange transportation of said logs; the manufacturing of the logs into lumber to be done by the mills represented by this association at a price to be agreed upon."

At the same meeting, the officers of the association were elected: Thomas Williams, of Ichabod T. Williams & Sons, president; R. S. Huddleston, of the Huddleston-Marsh Mahogany Company, treasurer, and Charles H. Thompson, of Lewis Thompson and Company, secretary.

This proposition was rejected by the representatives of the Signal Corps, for reasons stated at length, which were in substance that it was deemed inadvisable that the Government should arrange for the purchase of logs directly from the loggers in Central America and Mexico in view of the unfamiliarity of the Signal Corps with the logging business, or that the Government should take over existing contracts for purchases of logs on account of the complications that might arise, or that the Government should become directly involved in log purchases.

Recognizing the difficulties in the disposal of a largely increased quantity of lumber, the representatives of the Signal Corps felt disposed to pay "a higher price than pre-war or existing prices for propeller stock" in order that the mahogany manufacturers might offset any loss due to the low market value of rejected material.

It was then recommended by the Signal Corps that the manufacturers should make a proposition as to the price to be paid for propeller stock, and it was stated for the manufacturers that they could not quote prices on the basis of the existing Signal Corps specifications, as these were too restrictive as to the grade to be selected and permitted the Signal Corps to accept or reject the material based upon the judgment of the inspector.

It was finally suggested that the manufacturers should submit a proposition based on what are called 'National Hardwood Inspection' rules (that is, the rules of the National Hardwood Lumber Association) quoting a separate price on "first and seconds, selects and No. 1 common."

Discussions continued between the War Committee of the Association and representatives of the Government, among the latter being Lieutenant Ryerson who was in charge of propeller parts in the Plane Production Section, Joseph S. Otis (who, as the result of a disagreement, had recently severed his connection with the Otis Manufacturing Company and had offered his services to the Government as a mahogany expert, and representatives of the Lumber Committee of the Council of National Defense.

At the meeting on January 23rd, according to Lieutenant Ryerson's report, the War Committee of the Association suggested prices for propeller mahogany according to 'National Hardwood Inspection' rules as follows: firsts and seconds, \$350 per M feet; selects, \$320; No. 1 common, \$270.

After these figures were submitted a discussion of costs followed in which Joseph S. Otis, representing the Government, and J. C. Wickliffe, representing C. C. Mengel and Brother Company, gave their respective estimates of costs. Mr. Otis' estimate was considerably lower than the other, and was contested by Mr. Wickliffe.

The question of specifications was again discussed and the Signal Corp representatives stated that it would be impossible to place orders on the basis of 'National Hardwood Inspection' rules, which permitted widths considerably less than those required for propeller stock.

After further parley, Lieutenant Ryerson stated that it would be preferable to negotiate with the various manufacturers and importers individually for the purchase of such mahogany as they were in a position to offer. It was considered that if negotiations could not be brought to a close on the basis of the prices quoted that it might be desirable for the Government to fix a price for the purchase of propeller stock and agree to provide in its contracts that after partial performance there should be an audit of costs and a readjustment of prices upon a fair basis.

After the negotiations had thus proceeded for several days, the manufacturers submitted to the officials of the Signal Corps the opinion that Joseph S. Otis was not competent to advise the Signal Corps with respect to mahogany costs and suggested that action should be taken by which some one should be put in charge of the purchases of mahogany for the Government "who could develop the actual facts and be fair to the industry." Joseph S. Otis left the Signal Corps on January 29th.

On January 31st Henry Lockhart, Jr., was placed in charge of the 'Materials Department, Foreign and United States' which had the duty of procuring the materials necessary for the production of airplanes, with the exception of motors and instruments.

About February 5th, Henry K. S. Williams, who had formerly been in the lumber business as a member of the



firm of Ichabod T. Williams & Sons (being a brother of Thomas Williams of that firm) but had retired several years before, was put at the head of the Hardwoods Section, which was a sub-division of the Materials Department and had charge of the orders for woods required for propeller stock.

Shortly after, on February 25th, J. C. Wickliffe, who had been for ten years Secretary of the C. C. Mengel and Brother Company of Louisville, and had been active as a member of the War Committee of the Mahogany Manufacturers and Importers Association, entered the service of the Government as assistant to H. K. S. Williams in the Hardwoods Section.

The suggestion that he should take this position was made about the middle of February in a conversation between H. K. S. Williams and Mr. Mengel when the latter was asked if he could spare Mr. Wickliffe from his organization.

On March 4, 1918, J. Edward McCullough, who had been superintendent at the mill of the George D. Emery Company, one of the members of the Mahogany Manufacturers and Importers Association, was made district inspector of mahogany as well as other woods in the New York district, embracing Boston, New York, Philadelphia and New Orleans.

He was selected by S. B. Vrooman, Jr., who about February 10th was given general charge of the inspection of all propeller lumber throughout the country. Prior to his connection with the Government (he started as an inspector in December, 1917) S. B. Vrooman, Jr., had been in the service of the S. B. Vrooman Company, also one of the members of the Mahogany Manufacturers and Importers Association; he was, and has continued to be, during his service with the Government, one of the stockholders of that corporation (*ante*, p. 68).

Mr. Wickliffe, during his connection with the C. C. Mengel & Brother Company, had owned five shares of its preferred stock, which he disposed of some years ago; his wife owned five shares of the common stock, which were sold when he entered the Government service.

His salary as secretary of the Mengel Company had been \$500 a month; his compensation from the Government was at the rate of \$4000 a year. When it was suggested that he should become connected with the Government, he said that he could not afford it, but he was informed that Mr. Mengel had offered to continue his salary "as a donation to the Government during the war."

Mr. Wickliffe replied that he did not like the arrangement, would not accept it without Mr. Lockhart's approval, and in any event would not consent to be paid more than enough to defray the living expenses of himself and his family. Mr. Wickliffe was paid by the Mengel Company, in addition to his salary from the Government, \$250 on March 25th, \$250 on March 29th, and \$250 on April 15th, a total of \$750.

This was subsequently adjusted on the basis of \$350 for the period to April 1st and \$400 was returned by Mr. Wickliffe to the Mengel Company. This was explained in Mr. Wickliffe's letter to Mr. Mengel as follows:

628 Lexington Place, Washington,  
Apl. 13th, 1918.

Mr. C. R. Mengel,  
Pres., C. C. Mengel & Bro. Co.,  
Louisville, Ky.

Dear Mr. Mengel:

The Signal Corps having fixed the salary I am to receive from them at the highest figure they can pay of \$4,000.00 per annum, I want to let you know that I think it necessary now that you reduce the amount that you are remitting me monthly to \$350.00 per month. As near as I can estimate it, I can get by on Washington living expenses and do such official entertaining as I shall have to do on the sum of these two amounts. If I find that I cannot, I shall frankly let you know the condition. But I feel that living here and doing the necessary at my present job on this figure is about the equivalent of the salary I had when I was with you in Louisville. Therefore, kindly give the necessary instructions to have the remittance cut down.

Again thanking you and the company through you, I am,  
Very truly yours,

J. C. Wickliffe.

The arrangement with C. C. Mengel and Brother Company was approved by H. K. S. Williams in his letter of April 24, 1918, as follows:

Washington, D. C., April 24, 1918.  
From: Office of the Chief Signal Officer.  
To: C. C. Mengel & Brother Co., Louisville, Ky.  
Subject: Services.

1. In line with the request of your president, Mr. C. R. Mengel, this Section desires to give you this letter stating that at the time it asked you for the services of your former secretary, Mr. J. C. Wickliffe, it was fully understood by it that you or the Mahogany Industry would pay him an amount of money per month over and above the salary the Signal Corps was authorized to pay him, so that the sum of these two would be sufficient to cover his and his family's expenses during his service with the Signal Corps. This was done with the full knowledge of Mr. Henry Lockhart, Jr., head of the Materials Department, because of the fact that the Hardwood Section needed his services, and in view of the further

fact that your offer to do this was made with the distinct understanding that he should sever all connection with your company and with the mahogany industry and assume his new duties, of course, entirely as a member of the Signal Corps organization. This Section would also set forth the fact that your offer was specifically asked by you to be considered in the light of a donation to the war.

By direction of the Acting Chief Signal Officer.

Henry Lockhart, Jr.

Materials Department, Foreign and United States,

By H. K. S. Williams,  
Hardwood Section.

The salary which S. B. Vrooman, Jr., had received from the S. B. Vrooman Company has been continued by that Company, and when J. Edward McCullough entered the service of the Government, the George D. Emery Company paid until the arrangement mentioned below, the difference between his Government pay and his former compensation from the company.

It was soon arranged that the Mahogany Manufacturers and Importers' Association should assume the payment of the additional compensation to Mr. Wickliffe and to Mr. McCullough. Accordingly, for the period beginning with April this compensation was paid to both in checks from Mr. Huddleston, the Treasurer of the Association. The amounts were raised by voluntary contributions of various members of the Association. The minutes of the Association show the following action in the matter:

The matter of the difference in compensation between the amount paid by the Government for services to J. C. Wickliffe and to Mr. McCullough and the amount of compensation previously received was discussed. The following resolution was then presented, duly seconded and adopted by the affirmative vote of all present:

Resolved, That such excess compensation be paid by the various members of the association in the form of an annual subscription, which is made up by various amounts subscribed by the mahogany firms, amounting in total to fifty-seven hundred (\$5,700) dollars.

The motion was duly made, seconded and carried by the affirmative vote of all present, that a copy of this resolution be sent to Mr. H. K. S. Williams.

Mr. Wickliffe testifies that this arrangement was made "because it was felt that it was not right for any one individual firm to pay it all." Mr. Huddleston testifies that it was "purely a question of co-operation with Mr. Mengel." Early in May there was correspondence between H. K. S. Williams and Mr. Huddleston, the treasurer of the Mahogany Association, in which a letter in the following form, addressed by Mr. Huddleston to Mr. Wickliffe was first submitted to H. K. S. Williams and approved by him:

347 Madison Avenue, New York, N. Y.  
May 10, 1918.

Mr. J. C. Wickliffe,

Materials Department, Foreign and United States,  
Hardwood Section, Washington, D. C.

My dear Mr. Wickliffe:

A few days ago when the heads of the various mahogany importing and manufacturing concerns met for general discussion, attention was called to the fact that by virtue of your recent appointment as assistant to Mr. H. K. S. Williams, your annual income had been cut something in excess of fifty per cent.

After a general discussion it was agreed that it would not be fair that you stand alone the burden imposed on you by your services to the Government in this particular department, therefore, it was mutually agreed that the various mahogany firms, feeling as patriotic as you have demonstrated yourself to be, will make up the difference between your former income and what you are now receiving from the Government, provided such an act would meet with the approval of Mr. H. K. S. Williams, the head of your department.

I am pleased to advise you that I am today in receipt of a letter from Mr. H. K. S. Williams, approving of this transaction: so acting in the capacity of treasurer, I will mail you each month a check for \$350 beginning the month of April, which I am informed will make up the difference in your salary.

A similar letter was written, with the approval of H. K. S. Williams, to Mr. McCullough. Mr. McCullough was paid by the Association for April, May, June and July, at the rate of \$91.67 a month. He returned to his former employment early in August. In the case of Mr. Wickliffe, the arrangement continued until it was officially disapproved on August 20, 1918, by Mr. J. Gilmore Fletcher, on behalf of the Bureau of Aircraft Production, in the following letter:

War Department, Bureau of Aircraft Production,  
Washington, Aug. 20, 1918.

Mr. J. C. Wickliffe,

Hardwood Section,

119 D Street, N. E., Washington, D. C.

My dear Mr. Wickliffe:

In view of the fact that the Government looks with disfavor upon your receiving from the Mahogany Manufacturers and Importers Association your present monthly remittance, which I shall refer to here as a salary of \$350 per month, I deem it best, and hereby request, that you immediately refuse to accept any further payments from that source, or any other source which comes in direct line with your duties in the Hardwood Section, the Raw Materials Department, Division of Aircraft Procurement, Bureau of Aircraft Production.

I shall at once take the proper steps to have the salary now paid by the Government, namely, \$4,000 per year, increased to \$8,200 per year, and shall make every effort to expedite a decision on the point of allowing you this increase.

Yours very truly,

J. GILMORE FLETCHER,  
Chief of Aircraft Procurement.

Mr. Wickliffe immediately requested Mr. Huddleston to discontinue the payments, and accordingly there has been no payment of additional compensation since the payment for the month of July.

Early in February, 1918, arrangements were made with some of the manufacturers for the taking over of certain mahogany which had been under contract for delivery to British merchants, but the amount was relatively small. After H. K. S. Williams took charge of the Hardwood Section, and also after J. C. Wickliffe became his assistant, negotiations were continued with the manufacturers composing the Mahogany Manufacturers and Importers Association for the purchase by the Government of mahogany in large quantity for propeller stock. On the appointment of H. K. S. Williams, his brother, Thomas Williams (of Ichabod T. Williams and Sons) had resigned as president of the Association, and C. R. Mengel was elected in his stead.

On February 14, 1918, new specifications had been adopted by the Signal Corps (No. 15,028-A), modifying and liberalizing the prior specifications which had been adopted in the previous December. At about the same time (February 13th) the manufacturers had submitted two proposals, one under the Signal Corps specifications (No. 15,028-A) at \$400 per M feet for firsts, seconds and selects, and \$320 per M feet for lower grades, f.o.b. cars eastern mills (with corresponding prices for other points according to estimated freight rates), and another proposal under the 'National Hardwood' rules for specified sizes at \$350 per M feet for firsts, seconds and selects, and \$280 per M feet for No. 1 common, f.o.b. cars eastern mills. These had been refused. The important difference was with respect to the inspection.

In this situation, a conference was held on March 6th between the manufacturers and H. K. S. Williams, J. C. Wickliffe, and S. B. Vrooman, Jr., representing the Government.

The minutes of this conference show that H. K. S. Williams opened the meeting with the announcement that "it was the purpose of the Signal Corps to grant as liberal an inspection as could be given consistent, of course, with the principle that no lumber could be taken that would not make propeller blades."

After a discussion of the matter of utilizing lumber which showed scattered pin-worm holes, and the opinion having been expressed by Mr. Vrooman that such stock could be used where it did not affect the strength of the board, Mr. Williams stated that he would endeavor to have the Inspection Department accept such lumber. This, as Mr. Wickliffe, testifies, was accomplished.

The minutes show that Mr. Williams "stated that Mr. Vrooman is going to be in charge of the inspection all over the country; that he will appoint various men to do the inspecting at the various mills, and shall show them what is to be done."

Mr. Williams further stated that his object in having Mr. Vrooman at this conference was that "the interpretation of the Signal Corps specifications might be as easy as such interpretation could be made consistent with the principle of accepting only propeller material, but that the Government might get all such material that it could get."

Mr. Williams then requested that each manufacturer advise him of the cost of its logs placed alongside steamer at Central American and Mexican loading points, and these estimates were given.

Another conference was held on the same day between the manufacturers and H. K. S. Williams and J. C. Wickliffe, representing the Government, at which, after considerable discussion, Mr. Williams stated that he would recommend the payment by the Government of the following scale of prices on Mexican and Central American mahogany propeller stock under Signal Corps specifications No. 15,028-A, as follows: \$350 per M feet for first, seconds and selects, and \$280 for lower grades, f.o.b. eastern and middle western points, and \$330 and \$265, respectively, at New Orleans; and the same schedule of prices was stated for African mahogany f.o.b. eastern and middle western points. At these conferences Mr. Wickliffe was in attendance as Mr. Williams' adviser.

He reviewed the manufacturers' estimates and made calculations for Mr. Williams as to costs, and in view of his extensive experience there can be no doubt that considerable reliance was placed upon his opinion and advice. The terms of the contracts were virtually settled, in accordance with Mr. Williams' proposal, at the second conference on March 6th, and these terms were subsequently approved by Mr. Lockhart. The formal contracts were not made until sometime later. On March 26th the Aircraft Board recommended the execution of the contracts, on the above terms for the following quantities:

#### For African mahogany:

	Minimum	Maximum
Astoria Veneer Mills Dock Co.....	2,000,000	3,500,000
I. T. Williams & Sons.....	500,000	1,500,000
Palmer & Parker Co.....	600,000	1,500,000
C. C. Mengel & Bro. Co.....	2,800,000*	2,800,000
Taige Mahogany Co.....	2,130,000	2,450,000

#### For Central American and Mexican mahogany:

	Minimum	Maximum
Huddleston & Marsh Mahogany Co.....	1,750,000	3,000,000
Astoria Veneer Mills & Dock Co.....	1,500,000	2,500,000
Lewis Thompson & Co.....	1,500,000	2,000,000
Otis Manufacturing Co.....	1,000,000	2,000,000
Frieberg Lumber Co.....	500,000	1,250,000
I. T. Williams & Sons.....	750,000	2,000,000
Palmer & Parker Co.....	300,000	750,000
C. C. Mengel & Brother.....	2,800,000	2,800,000

\*Amended to read 1,700,000 minimum.

On April 16 the Aircraft Board recommended the making of a contract with the S. B. Vrooman Company for Central American or Mexican mahogany, 500,000 ft., minimum, and 1,500,000 maximum.

It is hardly necessary to say that it was a gross impropriety for corporations or firms, either individually or collectively, to pay additional compensation to an employee of the Government, and for the employee to receive such compensation, for services in relation to contracts and transactions in which the corporations or firms were directly and pecuniarily interested.

It is not found, however, that there is any statute making this a criminal offense unless it is a case within the statute against bribery, or proves to be part of a fraudulent scheme to take advantage of the Government, or part of an endeavor to induce a violation of law.

The act of March 3, 1917 (*ante*, p. 25) making it a crime to pay additional compensation to an employee of the Government, or for an employee to receive such additional compensation, only applies to such contributions after July 1, 1919.

The occasion of this statute, it is understood, was criticism of payments of additional compensation made to experts in the employ of the Government, where, however, the employee in the Government service was not acting in matters in which the person or corporation contributing had any pecuniary interest or motive of gain.

Contributions for the support of those who have made sacrifices in undertaking war work for the Government are doubtless made in many instances, but there is no analogy between cases of this general description and payments of additional compensation to employees of the Government by those having direct pecuniary interest in the transactions in which the employee acts as the Government's agent.

But under the statute against bribery (Criminal Code, Secs. 39, 117) it must be proved that the payment was made or received with intent to influence the decision or action of the representative of the Government on a question which may be brought before him in his official capacity or in his place of trust or profit, or to influence him to commit, aid, collude in or allow a fraud, or to make opportunity for the commission of a fraud, on the United States, or to induce the employee to do or omit to do an act in violation of his lawful duty.

Whether in the present case, in the circumstances disclosed, any charge of this sort could properly be made would largely depend upon the question whether the terms and prices secured by the mahogany manufacturers were fair and reasonable, or could be deemed excessive and the result of improper influence. In view of the intimate relation of the representatives of the Government who took part in the negotiations to the manufacturers it is obviously appropriate that there should be a fair and impartial examination of the transactions by a body competent to make a survey and determination of questions of costs and profits.

Testimony has been given in the present inquiry tending to show that the prices were high. Lower prices under prior orders and offers are referred to. On the other hand, the manufacturers urge that in view of the peculiar conditions of the industry, the difficulties attending the procurement of logs, and the risks taken by reason of the small percentage of lumber suitable for propeller material, the prices and terms were in all respects fair; that Mr. Williams, Mr. Wickliffe, Mr. Vrooman and Mr. McCullough took their positions simply because of the necessity of having men in their respective places who were qualified by experience, and that throughout the transactions all the persons concerned have been moved solely by the desire to serve the Government.

It was manifestly impossible in the course of the present inquiry to make such a survey of the mahogany industry as to reach a satisfactory conclusion with respect to the cost of producing the required mahogany and as to the fairness

of prices and terms. This sort of investigation would require special facilities of the kind which are at the command of the Federal Trade Commission, and through its instrumentality it is believed that such a survey of the industry and a determination of fair costs and profits can be made. Upon its report as to the cost of producing the required mahogany it can readily be decided whether there is ground for prosecution by reason of the transactions which have been disclosed in this inquiry.

#### African Mahogany

Attention should be called to the fact that the contracts with the mahogany manufacturers called for considerable quantities of African mahogany. It appears that prior to the war large importations of mahogany had been made from Africa. Thus, in 1914, out of total importations of mahogany logs of 70,914,000 ft., there were 31,177,000 ft. of African mahogany. At the first conference with the Government representatives, on Jan. 21, 1918, as the minutes kept by these representatives show, Mr. Mengel had suggested the increased supply which could be obtained from Africa, and Mr. Leary (of Ichabod T. Williams & Sons) "described his efforts to induce the Signal Corps to use African mahogany." Offers of African mahogany were made in proposals by several of the mahogany manufacturers under date of March 6. Thus, in the proposal then sent to the Signal Corps by C. C. Mengel and Brother Company it was stated that his company had at Axim, Africa (on the Gold Coast) "awaiting steamers, 3,000,000 ft. of sound, fresh logs"; and also at Axim, "now in streams tributary to it, and available for the June rains, 4,000,000 ft.; and these logs, located as they are, and from the best information we have, pretty nearly sure to be delivered at Axim on the June rains, as they were put in pretty good, safe streams by our own men, in our own employ, and paid by us, and put in streams selected so that they would come out on light water."

The advisability of using African mahogany as propeller material, however, was far from clear. It was not regarded as within the original specifications, but the modified specifications adopted on Feb. 14, 1918 (No. 15,028-A) stated that African mahogany (*Khaya senegalensis mahogani*) was approved by the Signal Corps.

Despite this statement, the question was not regarded as settled. On Feb. 13, 1918, H. S. Betts, Acting Assistant Forester, in reply to a letter of Captain Oakleaf of the Signal Corps, stated that it was "undoubtedly true that the term 'African mahogany,' without further specifying as to kind of wood, would include several species which are inferior in quality for propellers"; but after referring to various tests, quoted a report from the Forest Products Laboratory that the African mahogany was "practically the equal of the General American species, and could be substituted satisfactorily for the latter."

On Feb. 26, H. K. S. Williams wrote to Major Gray of the Production Engineering Department that he was "anxiously awaiting information as to whether African mahogany has been approved for use for the manufacture of propellers for battle and bombing aeroplanes." He said that he had reported the matter a number of times to his superiors, and had been told to communicate with Major Gray, and after referring to communications he had received on the subject he asked for a reply by telegraph. On March 1 the Production Engineering Department telegraphed its answer to H. K. S. Williams as follows:

This department is not favorably disposed towards African mahogany for combat propellers and does not see why it should be shipped here and then back to Europe. Can not arrangements be made to have walnut for English diverted to our propeller manufacturers and to ship African mahogany to England? There is much poor African mahogany on American market. In any event for safe use African mahogany would have to be inspected at the source to make sure that we obtained the proper varieties and proper wood. We feel further that with provision for splicing which has been adopted there should be enough of other woods available to meet the propeller requirements.

Before this was received a telegram was sent on the same day to Major Gray, with the signature of the Materials Department, to the effect that they were "anxiously awaiting telegraphic reply to letter Feb. 26." And on March 2 the Production Engineering Department, notwithstanding the statements in its telegram of March 1, telegraphed to the Materials Department as follows:

Regarding use of African mahogany for combat and bombing airplane propellers advise that such wood is acceptable for use in these propellers.

And on March 16 the Airplane Engineering Department (by Mr. Caldwell, on behalf of Major Marmon) wrote to Major Gray of the Production Engineering Department, referring to tests of propellers made of African mahogany at Langley Field and McCook Field, and stated the following

order of preference for propeller woods: (1) walnut, (2) Honduras mahogany, (3) cherry, (4) African mahogany, (5) quarter-sawn poplar, (6) quarter-sawn white oak. Mr. Caldwell stated further that the following species of African mahogany were acceptable: (1) Grand Bassan, (2) Lagos, (3) Benin; also that there was an African wood similar to mahogany, known as "Iroko," which had been found acceptable in the English propeller construction.

On March 21 Mr. Caldwell wrote to Lieut.-Col. Horner of the Equipment Division, stating that they had definitely ascertained that the wood they had tested came from Axim, and that "this wood would be acceptable at least to the extent of 3,000,000 or 4,000,000 ft." Mr. Wickliffe, on behalf of Mr. Lockhart of the Materials Department, sent the following memorandum to the Contract Section on the same day (March 21):

It is only recently that the use of African mahogany has been authorized in the construction of propellers, and therefore the entrance of purchase request to cover the quantities of African mahogany shown in the attached proposals (of the mahogany manufacturers) has been withheld pending such authorization. Permission has now been received for the use of this wood and purchase requests are being sent to the Priority Section today covering the quantity of African mahogany shown in the proposals of Astoria Veneer Mills and Dock Co., Palmer & Parker Co., Ichabod T. Williams & Sons, and C. C. Mengel & Bro. Co.

In view of the heavy demand for shipping facilities, a serious question arose with the Shipping Board as to the necessity of getting in the African mahogany. In a conference between Mr. Karl deLaittre, representing the Shipping Board, and Mr. Sibley and Mr. Wickliffe of the Signal Corps, on May 4, Mr. Wickliffe's attention was called to the lack of shipping space, and he replied (according to the stenographer's minutes produced by Mr. deLaittre):

Yes, but this is a matter of contract. We make our contracts in good faith on both sides. It is not permissible for the Government to break these contracts; it would break the people making them. We cannot let these people down on the African product.

At another point in the conference Mr. Wickliffe said:

If the timber from Africa is not brought forward, coming in June, and is allowed to deteriorate, the first part that will be hit will be the outside of the log, out of which the aircraft material comes. If we do not get this African lumber, we have exhausted every resource in walnut and cherry and in Central American mahogany. We do not yet know as to the use of quarter-sawn oak. Then if we do not get this timber we cannot get any African logs before June of the following year.

Meanwhile the subject had been taken up for investigation by representatives of the War Trade Board and of the Forestry Service. Its importance lay in the fact that there was an abundance of white oak available in this country, and it developed that there was opinion of considerable weight in favor of the use of oak on combat propellers.

On June 2 a conference was held between representatives of the Production Engineering Department, the Airplane Engineering Department, the Propeller Inspection Department, the Propeller Purchase Section and the Wood Inspection Section of the Signal Corps. Mr. Caldwell, who had written the letter of March 21, represented the Airplane Engineering Department. Lieutenant Ryerson's memorandum of this conference contains the following:

The question of the advisability of, and necessity for, importing African mahogany was carefully considered and it was the unanimous opinion that it would be possible to meet our present and future propeller lumber requirements from domestic or South American supplies, and that because of the difficulty of inspecting African mahogany, its further use in propellers should be discouraged.

On Aug. 3, 1918, Lieutenant Ryerson of the Propeller Section, having been asked for a statement of the requirements of woods for propeller stock, requested the Production Engineering Department for "an up-to-date formal statement" as to the kinds of lumber to be specified for combat propellers, in their order of preference. This brought a reply under date of Aug. 7 from the Production Engineering Department, through Professor J. S. MacGregor (head of the Physical Testing Department, School of Mines, Columbia University) as follows:

Answering your memorandum of August 3rd requesting information on kinds of wood for propellers we advise you herewith that this department has authorized the use of the following woods for combat propellers. The list is given in the order of their preference:

Black walnut.  
True mahogany (Honduras).  
Cherry.  
Quarter-sawn white oak.  
African mahogany.

The objection to African mahogany (aside from the shipping problem) was that it varied considerably in quality, and that inspection of it so far from its source would make it difficult to be sure that the right species was received



Throughout the controversy Mr. Wickliffe has expressed his views with considerable emphasis and has thrown the weight of his influence in favor of contracts for African mahogany and of the provision of shipping facilities to bring it in.

In support of his position he has produced a memorandum, under date of Aug. 23, signed by Charles Day, as special assistant to the Secretary of War, to the effect that "while oak propellers are being used with satisfactory results in connection with our training planes, they have not been adopted for planes for active service overseas on account of unsatisfactory results obtained abroad when their use has been attempted for any considerable period."

Mr. Wickliffe has also presented a letter under date of July 19 from Lieutenant Hollande, in charge of wood purchasing for the French Government, in which it is said that "we are buying a very great quantity of African mahogany in France direct from our colonies"; also a letter received from the office of the British War Mission giving information to the effect that "the home authorities propose during 1919 to use British Honduras and West African mahogany exclusively for propeller construction, cutting out walnut completely," and that demands from factories in England for propeller lumber are met "indiscriminately by the supply of either British Honduras or West African mahogany, the latter being considered as equivalent to the former for all purposes."

On the other hand, a very recent cablegram (Sept. 28) from the Scientific Attaché to the American Embassy in London in answer to an inquiry of the Research Information Service here, states that "authorities British opinion and practice placing walnut and Kauri, Nicaraguan, Cuban mahogany ahead of African. British would not use African if sufficient quantities of above were available. African used only in combination with other woods."

The statement to the contrary as to British practice is said to be incorrect, and it is added "British have not tested oak, cherry, poplar sufficiently to make comparison. American army wood experts now here state A. E. F. satisfied with oak and have advised Washington, D. C., accordingly. Poplar has also showed up well on tests. British unable to see any justification for U. S. using African mahogany in view of other furnishings available."

It is understood that ships for African mahogany were finally provided. Upon the evidence, it is apparent that the matter was the subject of discussion and presented grounds for differences of opinion.

The interest, however, of some of the leading mahogany manufacturers in obtaining contracts for the delivery of African mahogany is apparent, and while the efforts to induce its purchase and transportation may have been based upon the belief that the wood was better than that available here and that the supply was needed by the Government, the matter is one which should receive consideration in connection with the survey of the industry which has been suggested for the purpose of determining the fairness of the mahogany contracts and of the action taken under them.

### 3. Sabotage Act.—Grand Jury Proceedings

There have been occurrences in various plants indicating efforts to injure war material, or to make it defective, or to conceal defects, but on investigation it has generally been very difficult to find sufficient basis for criminal prosecution, either for lack of evidence as to the particular individual who had committed the act, or because on close examination it appeared that the condition of the material could be fairly attributed to carelessness, and evidence of criminal intent was wanting.

#### Hammondsport Plant of the Curtiss Company

In the course of this inquiry information was received that frequent attempts had been made to conceal defects in motors and their different parts which were in course of manufacture at the plant of the Curtiss Aeroplane & Motor Corporation, at Hammondsport, N. Y. Evidence having been obtained as to specific instances of this practice, there was an investigation in July last before a grand jury in the Western District of New York, John W. Ryan, Esq., of Buffalo, being appointed special counsel for the purpose, which resulted in the return of indictments against Lewis Longwell and Hector Bordeau, sub-foremen in the assembly room of the Hammondsport plant, under section 3 of the Sabotage Act of April 20, 1918. Demurrers to these indictments have been overruled and the cases are awaiting trial.

#### North Elmwood Plant

In view of the conditions found at the North Elmwood plant of the Curtiss Aeroplane & Motor Corporation, there was a special investigation through special agents of the Department of Justice for the purpose of discovering violations of

the Sabotage Act, with the result that evidence was brought before the grand jury in the Western District of New York, John W. Ryan, Esq., acting as special counsel, and indictments were obtained in September against Richard Eastman, foreman of the propeller department; Frank Truett, an assistant foreman, and David Rogovan, a workman, under the Sabotage Act. On Oct. 9 these defendants pleaded guilty and were fined \$500 each.

#### Liberty Iron Works.

Testimony given in this inquiry in relation to alleged irregularities at the Liberty Iron Works at Sacramento, Cal., led to a special investigation in charge of John W. Preston, Esq., Special Assistant to the Attorney-General, before the Grand Jury at Sacramento in September last. Considerable testimony has been taken, but no indictments have been returned.

### 4. Cross License Agreement as to Rights under Airplane Patents.

In view of claims under alleged patent rights, and with the object of facilitating aircraft production by providing for manufacture on a definite basis, a corporation was formed under the laws of the State of New York known as the Manufacturers Aircraft Association, Inc. This corporation entered into an agreement with its "subscribers," that is, its stockholders, called the cross-license agreement. The Government is not a party to the agreement, but it was recommended by the National Advisory Committee for Aeronautics, was endorsed by the Aircraft Board and received the approval of the Secretary of War and the Secretary of the Navy.

By the cross-license agreement, the subscribers grant to each other licenses under all airplane patents now or hereafter owned or controlled by them in the United States, its territories and dependencies (except foreign patents and certain specified patents); the corporation is designated as the agent of the subscribers to execute licenses accordingly; each subscriber agrees that it will not enter into any agreement or arrangement whereby its privileges under United States airplane patents or inventions will be diminished or surrendered so as to exclude or restrict the operation of the agreement, and that it will not grant licenses under any such patents for use in airplanes with reference to which it is receiving royalties under the agreement, to any other person, firm or corporation on more favorable or lower terms of royalty than those provided in the agreement, or which may become more favorable or lower during the term of the license.

Under the agreement in its original form, in providing for the payments to be made by subscribers, it is stipulated that each subscriber shall pay to the corporation \$200 for each airplane sold and delivered by the subscriber until the Wright-Martin Aircraft Corporation and the Curtiss Aeroplane & Motor Corporation (these corporations claiming to hold basic patents) had each been paid the sum of \$2,000,000. A supplemental agreement has since been made modifying the provision for payments by subscribers and providing that the aggregate payments to both the Wright-Martin Corporation and the Curtiss Company should be \$2,000,000 instead of \$4,000,000.

The agreement has been criticized upon the ground that its provisions constitute a hindrance to the progress of invention in the important airplane field and as being in restraint of trade. Whatever ground for criticism exists in this respect is to be found in the terms of the agreement itself, as these are quite definite and determine its operation and effect.

I shall not deal with the question of the legality of the agreement, as the question was specifically submitted by the Secretary of War to the Attorney General whether the association and the agreement were in contravention of the anti-trust statutes of the United States and the opinion was expressed by the Attorney General that they were not. That disposed of the question, in the absence of a contrary decision by the courts, so far as the action of the Executive department is concerned.

To the question whether the patents of the Wright-Martin Company and of the Curtiss Company are basic patents, and whether the payments for which the agreement provides constitute a proper compensation for the rights conferred, it would require an exhaustive examination of the patent situation to give a satisfactory answer, and this inquiry has furnished no opportunity for such examination.

For this reason no opinion is expressed upon the point further than to say that, if the validity of the agreement be assumed, the amount of the payments was a matter of sound administrative discretion, and there is no ground for the conclusion that the amount as fixed in the supplemental

agreement could not fairly be allowed. It is also asserted that the Government is left liable to other claimants, but this also requires an opinion upon the validity of certain patent claims which could not be dealt with in this inquiry.

#### General Conclusions and Recommendations

1. The controlling facts and the conclusions in relation to the matters reviewed have been stated under appropriate headings. It would be impossible to re-state them in a brief summary. The defective organization of the work of aircraft production and the serious lack of competent direction of that work by the responsible officers of the Signal Corps, to which the delays and waste were chiefly due, were matters for administrative correction through unification of effort under competent control. The provisions of the criminal statutes do not reach inefficiency.

It is not within the province of this report to make recommendations with respect to administrative policy, but it should be said that under the direction of Mr. Ryan and Mr. Potter there has been improvement in organization, and progress has been made in gratifying measure.

2. The evidence discloses conduct, which although of a reprehensible character can not be regarded as affording a sufficient basis for charges under existing statutes, but there are certain acts shown, not only highly improper in themselves but of special significance, which should lead to disciplinary measures. The evidence with respect to Colonel Edward A. Deeds should be presented to the Secretary of War to the end that Colonel Deeds may be tried by court martial under articles 95 and 96 of the Articles of War for his conduct (1) in acting as confidential adviser of his former business associate, H. E. Talbott, of the Dayton Wright Airplane Co., and in conveying information to Mr. Talbott in an improper manner, with respect to the transaction of business between that company and the division of the Signal Corps of which Colonel Deeds was the head; and (2) in giving to the representatives of the Committee on Public Information a false and misleading statement with respect to the progress

of aircraft production for the purpose of publication with the authority of the Secretary of War.

3. The absence of proper appreciation of the obvious impropriety of transactions by Government officers and agents with firms or corporations in which they are interested, compels the conclusion that public policy demands that the statutory provisions bearing upon this conduct should be strictly enforced. It is therefore recommended that the officers found to have had transactions on behalf of the Government with corporations in the pecuniary profits of which they had an interest, should be prosecuted under section 41 of the Criminal Code.

4. The Federal Trade Commission should be requested to report upon the proper cost of mahogany for airplane propellers, to the end that upon the coming in of its report the question of the propriety of further action with respect to the transactions of the Mahogany Manufacturers and Importers Association may be determined.

5. It is recommended that the representatives of the Department of Justice should keep in touch with the progress of the re-audit of accounts so that it may be advised of the complete enforcement of the rights of the Government in final settlement of accounts, and that the Government has been fully protected against unnecessary loss through waste and the absence of suitable factory supervision.

6. Permit me also to suggest that a special division, or sub-division of the present Bureau of Investigation, in the Department of Justice should be assigned to the consideration of suggested delinquencies in connection with aircraft production so that the work already done may be appropriately followed up. In particular, it is recommended that the activities in relation to Spruce Production, which being largely centered on the Pacific Coast it was impracticable to embrace in the present inquiry, should be carefully scrutinized.

I have the honor to remain,

Respectfully yours,  
(Signed) CHARLES E. HUGHES.

## Statement by Attorney-General Gregory

October 31, 1918.

THE PRESIDENT,  
The White House.

Dear Mr President:

On May 6 last, you directed me to investigate and pursue charges of dishonesty or malversation in regard to the production of aircraft and, on May 13, you asked Judge Charles E. Hughes to act with me in making this investigation. By far the larger part of the last five months has been consumed in taking testimony. An opportunity has been given to every person claiming to have grievances, charges, or criticisms, to appear and testify in person or produce other witnesses and data.

We spent many weeks in personally inspecting conditions and taking testimony at the larger plants having aircraft contracts with the Government at Dayton, Ohio; Detroit, Michigan; Elizabeth and New Brunswick, New Jersey; and Buffalo, New York. The papers, books, correspondence, accounts and other records in the files of the Signal Corps at Washington, as well as those of the principal contractors and of the Government at these plants, have been critically examined as far as there was reason to believe that they would throw light on the matters under investigation. We have examined nearly three hundred witnesses and taken about 17,000 pages of testimony.

In an effort to make the investigation thorough, we have attempted to go into every phase of aircraft production since our entry in the war in April, 1917, and had recourse to every source of information which appeared available.

Every complaint or charge of wrongdoing has been heard and carefully considered. It is believed that the investigation has been exhaustive, except that full data as to contracts let abroad for planes has not been at hand, and the matter of spruce production on the Pacific Coast has been gone into only to the extent that this could be done by the examination of witnesses at Washington.

From the investigation made, it has been concluded that the taking of the additional time necessary for obtaining complete data from Europe in regard to the contracts in question, or for a trip of investigation to the Pacific Coast where most of the spruce is produced, was not justified. During the period referred to, Judge Hughes has given practically his

entire time to this work and has been in direct charge of the investigation, which has been conducted by him with the cooperation of myself and other officials of the Department of Justice. The investigation has now been completed.

Some three weeks ago, at the conclusion of the taking of testimony, in order that you might have the independent judgment of both, Judge Hughes and I, each without conference with the other, considered the evidence, reached his own conclusion and prepared a report.

On the afternoon of last Saturday, Oct. 26, Judge Hughes handed me a copy of his report, together with a letter asking me to transmit it to you with whatever statement of views I wished to make.

The report consists of 182 printed pages. By far the greater portion is devoted to a remarkably accurate statement of substantially all the transactions had since the beginning of the war in the course of the development of the aircraft program. After carefully examining this statement of the transactions had, I find myself in substantial accord therewith and do not consider it necessary to present to you a somewhat full report which has heretofore been prepared in the Department of Justice. As hereinafter shown, I also find myself in accord with the conclusions presented by Judge Hughes on questions of dishonesty and malversation.

I do not consider it germane to this investigation to enter into criticisms of the program or of mistakes in policy or in the exercise of judgment.

I send you herewith Judge Hughes' report and present herein my conclusions and briefly supplement Judge Hughes' findings of fact in a few instances.

#### General Character of Charges

When the investigation began in May, it was sweepingly charged that \$691,851,866.47, appropriated for the fiscal year beginning July 1, 1917, had been expended with practically no results; that members of the aircraft boards had been financially interested in aircraft contracts; that German and disloyal influences had retarded the progress of the work, and that these influences, together with graft of various kinds, had entered into the transactions involved. It therefore seems desirable to state briefly what sums have been expended and what has been accomplished.

**Amount Expended**

The \$691,851,866.47 appropriated was all for aviation purposes, including many things besides the building of aircraft. Contracts for airplanes and motors let here and abroad, it was estimated, would require \$474,910,706.55, but in May last this amount had by no means been expended. The actual disbursements for this purpose up to the close of the fiscal year ending June 30, 1918, were as follows:

For production in this country .....	\$106,741,490.77
For production abroad .....	25,605,074.31
For experimental and development work .....	1,697,830.19
<b>Total .....</b>	<b>\$134,044,395.27</b>

This amount includes not only the cost of planes and motors delivered, but also large payments for special tools and for labor and materials in planes and motors not then finished. The figures are not now available to show just how much more has been disbursed on this account since June 30, though the total amount disbursed for all aviation purposes between that date and Sept. 30 was \$139,186,661.33.

**Planes and Motors Acquired**

To provide for the needs of the Army until production in this country could be expected, contracts were let, in the summer of 1917, in France for 875 training planes with engines and for 5000 service planes and 8500 service engines, deliveries to begin in November and be completed in June, 1918, and in Italy for 700 service planes with engines. These contracts were not carried out as contemplated, partly because of unavoidable delay by this Government in delivering materials, but largely because the unexpected increase in the needs of the French Government overtaxed the capacity of the manufacturers. However, up to July 31, 1918, there had been acquired under foreign contracts 1617 training and 1512 service, or a total of 3129, planes with engines. The deliveries of planes and engines produced in this country up to July 1, 1918, were:

<b>Planes</b>		
Elementary training .....	4,572	
Advanced training .....	1,046	
Service .....	553	
		6,171
<b>Engines</b>		
Elementary training .....	7,662	
Advanced training .....	2,579	
Service .....	2,392	
		12,633

Since July 1 production has been such that up to Oct. 11, 1918, the figures were:

<b>Planes</b>		
Elementary training .....	5,187	
Advanced training .....	2,137	
Service .....	2,350	
		9,674
<b>Engines</b>		
Elementary training .....	10,256	
Advanced training .....	4,479	
Service .....	9,937	
		24,672

When the 3129 acquired abroad are added, we have total planes 12,803, and 27,801 engines. While the only service planes thus far produced in this country have been observation and bombing planes, those acquired abroad include pursuit and combat planes.

**Conduct of Members of Aircraft Boards**

making of enormous quantities of machinery and tools, and the development of an industry almost unknown in this countless conflicting information from abroad, the proper types of planes and engines, securing responsible and efficient contractors to engage in a new line of work, the designing and

The results, as above set out, in view of the inherent difficulties of hurriedly expanding the Signal Corps from almost nothing to an immense organization, selecting, upon more or try and undergoing constant changes abroad, cannot be said to indicate dishonesty or malversation.

An exhaustive examination into the entire conduct of aircraft matters fails to show that any member of either board has had any desire to retard or delay production, or has done anything intended to accomplish that result, or has intentionally caused the waste of funds, or been actuated by a disloyal motive, or been guilty of dishonesty or malversation, unless there be truth in the specific charges which will now be referred to.

**A. Interest in Contracts**

I agree with the conclusion reached by Judge Hughes that there is no evidence upon which it can fairly be charged that any member of the aircraft boards, including Mr. Howard E. Coffin, General Squier, Col. E. A. Deeds, Col. R. L. Montgom-

ery, Col. S. D. Waldon, Mr. Richard F. Howe, Mr. Harry B. Thayer, Admiral Taylor, and other naval officers, has been unlawfully interested in any contract or transaction relating to aircraft production. Indeed as to this charge, there has, at no time, been ground for a question involving any of these gentlemen except Colonel Deeds.

**B. Form of Contracts**

Growing largely out of the popular understanding that contracts for aircraft provide that the compensation of the contractor shall be a fixed per cent of the cost of production, and thus make it to the interest of the contractor to increase that cost, the charge has been made that these contracts are themselves instruments for practicing frauds upon the Treasury.

The fact is that no such contracts have been made. The Government is to pay the cost of production plus a fixed sum, which cannot be enhanced by increasing the cost of production. On the contrary, it is provided that the contractor shall share in the saving if the actual cost shall be less than an "estimated cost" stated in the contract. Hence, whatever other objections there may be to the contract, it is to the interest of the contractor to keep the cost of production as low as possible. Moreover, the right is reserved to the Government to terminate the contract at any time by repaying the amount expended plus the fixed profit on finished articles and 10 per cent of the cost of labor and materials in unfinished articles. If, therefore, experience should demonstrate that the contract would be unfair, the Government could terminate it unless the contractor would agree to a readjustment of terms.

In the case of the Liberty motor contracts, the practical result has been first a reduction of the estimated cost from \$6,087 to \$5,000 and of the fixed profit from \$913 to \$625, and finally the putting of the contracts on a fixed-price basis when experience had shown what would be a fair price.

In view of the fact that when this form of contract was adopted there was no available data as to what the cost ought to be, it seems to have been devised to protect the interest of the Government. I am unable to see how an inference of bad faith or official dereliction can be drawn from it.

**C. Awarding of Contracts**

There have been charges of unfair discrimination and favoritism in the awarding of contracts. These complaints relate almost entirely to contracts for planes, for which there were many applicants. Selections had to be made. It cannot be said that plausible reasons were wanting for those made. If mistakes were made nothing has been developed which would justify the charge that they resulted from corrupt motives.

**D. Profits of Contractors**

It has been charged that exorbitant profits to contractors have been allowed. On their face, they appear to be unusually liberal, but when it is remembered that 60 per cent or more of them must be paid to the Government as income and excess profits taxes, and that most of the net profits will be invested in buildings and facilities which may or may not be capable of profitable use for an indefinite period after the termination of the contract, my conclusion is that no such profits have been allowed as to justify a charge of bad faith.

**E. Cross-License Agreement**

Whatever may be said of the charge that this arrangement tends to discourage future inventions, one of its results was to enable the Government, through contractors, to secure the use of all the necessary patents at a fixed cost and with little friction. It was not entered into until the Attorney General had given an opinion that it did not conflict with the anti-trust law. I find no basis for the suggestion that in bringing it about the members of the aircraft board were actuated by any unlawful or dishonest motive.

**F. Conduct of Col. E. A. Deeds**

Of all the members of the aircraft boards, the one most severely criticised and against whom most charges have been brought has been Col. E. A. Deeds. The evidence does not disclose any violation by Colonel Deeds of the criminal laws. In the early part of 1918, public statements were issued with official authority purporting to set out the progress which had then been made in the production of engines and planes and the prospects of the immediate future. These publications were not only misleading, but they contained false statements, and were issued in reliance upon information principally furnished by Colonel Deeds, who was acquainted with the actual facts. While the conduct of Colonel Deeds in this



matter was not criminal and cannot be said to have affected actual production, it was inexcusable and reprehensible.

I also find that Colonel Deeds was guilty of censurable conduct in acting as confidential adviser of H. E. Talbott and in conveying information to the latter with respect to transaction of business between the Dayton Wright Airplane Company and the division of the Signal Corps of which Colonel Deeds was the head.

Whether or not Colonel Deeds should be subjected to disciplinary measures for the acts referred to is a matter to be determined by the War Department. I acquiesce in the recommendation of Judge Hughes that the facts be submitted to the Secretary of War.

#### Officers and Employees of the Signal Corps

When war was declared and the carrying out of the aircraft program was entrusted to the Signal Corps, its official personnel was hurriedly increased from a small organization to one of enormous proportions. It has been impossible, of course, to critically examine the conduct of all the military officers and civilians connected with this branch of the service. The official acts of the more prominent ones have been gone into and the general situation has received as much consideration as was possible. The investigation has failed to show, unless the instances hereinafter noted constitute exceptions, that any person, military or civilian, connected with the Signal Corps, has desired to retard or delay production, or has done anything intended to accomplish that result, or has intentionally caused waste of funds, or has been actuated by disloyal motives, or been guilty of dishonesty or malversation. The incidents referred to are as follows:

#### A. Conduct of Lieutenant-Colonel J. G. Vincent, Lieutenant-Colonel George W. Mixter, and Second Lieutenant Samuel B. Vrooman, Jr.

Many successful business men tendered their services to, or were invited to take part in the activities of, the Signal Corps. Naturally the men selected were chosen as far as was practicable from lines of business similar to those in which the Government expected to utilize their services.

With the business interests of the country so largely involved in war work, many of these men, in the course of the performance of their official duties, not infrequently were brought in contact with corporations in which they held stock. It is to their credit that only three instances have been found in which officers or employees of the Signal Corps have apparently transacted business for the Government with corporations in which they were interested.

One of these was Lieutenant-Colonel Vincent, who had been vice-president of the Packard Motor Car Company, in charge of engineering, and who, after he became an officer in the Signal Corps, continued to hold certain shares of stock in that company.

He was one of the original designers of the Liberty motor, held several important positions in the engineering department, and is now in charge of the Airplane Engineering Division of the Bureau of Aircraft Production. Under the circumstances set out in Judge Hughes' report, Lieutenant-Colonel Vincent was instrumental in having certain payments made to the Packard Motor Car Company for drawings, models, tests, etc., and for eleven standardized engines.

The course of procedure which resulted in the payments of this money was without a written contract and otherwise irregular and unusual. I agree with Judge Hughes' conclusion that Lieutenant-Colonel Vincent violated Section 41 of the Criminal Code, which prohibits any person, directly or indirectly interested in the pecuniary profits or contracts of a corporation, from acting as an officer or agent of the United States for the transaction of business with such corporation.

I further agree with Judge Hughes that the evidence does not afford ground for the conclusion that the Government was defrauded, or that there was any intent to defraud on the part of any of the parties concerned, or that the services rendered were not worth the amount paid therefor, or that the estimates of the outlay of the Packard Company were not fair estimates.

Lieutenant-Colonel George W. Mixter held twenty-five shares (par value \$2,500.00) of the preferred stock of the Curtiss Airplane and Motor Corporation. This corporation had important contracts with the Government for the production of airplanes. While holding this stock, Lieutenant-Colonel Mixter was in charge of the organization for the inspection of materials and products at one of the corporation's plants, and visited it from time to time in the exercise of his authority as head of the Inspection Department and as Production Manager.

He stated on examination that he had bought a small

amount of common and preferred stock of the of the corporation mentioned some years before and remembered selling some of it, that he did not remember whether he retained any and had not thought of it after entering the service. It appears that he had parted with ownership of the common stock, but still owned the preferred. I agree with the conclusion of Judge Hughes that this was a violation of Section 41 of the Criminal Code.

Second Lieutenant Samuel B. Vrooman, Jr., was the owner of \$10,000.00 in par value of the stock of the S. B. Vrooman Company, of Philadelphia, which had a contract with the Government for supplying mahogany. While holding this stock, Lieutenant Vrooman was put in charge of the inspection of propeller lumber, including mahogany.

He elected the district officers, who in turn selected the inspectors; he issued instructions to the district officers and visited various plants to see that the inspectors were doing their duty and to pass on disputed points. The plant of the S. B. Vrooman Company was one of those subject to his jurisdiction but he denies that he ever personally inspected its lumber. I agree with Judge Hughes' conclusion that he violated Section 41 of the Criminal Code.

#### B. Conduct of Mahogany Manufacturers and Importers Association.

For a short period of time J. C. Wickliffe, J. Edward McCullough, and Second Lieutenant Samuel B. Vrooman, Jr., while representing the Government in dealing with mahogany manufacturers, received from one or more of these manufacturers salaries in addition to those paid by the Government. I agree with Judge Hughes that under the circumstances this was a gross impropriety on the part of those paying and those receiving the additional salaries, but that there is no statute making it a criminal offense unless a case is made out of bribery or of a conspiracy to defraud the Government. I am likewise of the view expressed by Judge Hughes that whether a charge of the sort indicated could be properly made would largely depend upon whether the terms and prices of the mahogany manufacturers were fair and reasonable, or excessive and the result of improper influence, and that the Federal Trade Commission, with its special facilities for conducting an examination of that kind, should be requested to make a survey of the mahogany industry and the cost of delivering the lumber involved and reach a conclusion as to the reasonableness of the prices paid.

#### C. Matters of Minor Importance

In one office of the Signal Corps there seems to have been discovered petty graft fostered by a civilian employee, and evidence has been brought to our attention tending to establish dishonest inspection on a rather small scale in one of the least important plants. These matters are now under investigation by grand juries and indictments will be found if justified.

#### Contractors

A searching inquiry has been made into the conduct of the work by the principal contracting companies. Agreeing substantially, as I do, with the statement of facts made by Judge Hughes, I am of opinion that it cannot fairly be charged that a managing officer of any contracting corporation has desired or attempted to delay production or been actuated by disloyal motives. To what extent, if any, inefficiency or mismanagement is to be inferred from the facts stated, I do not deem it within my province to determine.

#### German Sympathizers

In some of the factories a considerable number of alien enemies and persons of German birth or descent, who, at least before our entry into the War, were German sympathizers, have been employed. No facts have been developed which would justify the belief that these men have been retained through any willingness on the part of their employers to have production retarded or defective planes produced. On the contrary, the Government itself provided a system of permits under which they could be used.

They were employed and retained because the manufacturer felt that the great difficulty of obtaining skilled laborers in sufficient numbers justified such risk as might be incurred. In some instances the employer had faith in an old employee and was unwilling to discharge him because of mere rumors as to his loyalty. As an illustration of this, the head of the drafting department at the Ford Company's plant was of German birth and there were such persistent rumors that he was pro-German that some of the officers of the company thought it unsafe to retain him.

He had been in the employ of the company for nine years, professed to be loyally interested in the work, and the officers referred to testified that nothing definite could be proved against him. Mr. Ford stated that, at a time when all citizens were called to make sacrifices, one of German birth might do so by helping to produce motors to be used for his adopted and against his native country.

He stated further that he had absolute confidence in this man's loyalty and, in the absence of any proof of disloyalty, refused to discharge him. While this indicated the indicated the application of an almost idealistic policy of being just to employees, results seem to have justified the course pursued.

Though this man has been the object of the greatest watchfulness on the part of officers of the company who suspected him, nothing has been discovered indicating that he has been other than a loyal and efficient employee.

It is fair to say that no sinister or disloyal influence has affected production in the Ford plant. The factory manager testified that there had been no sabotage and no efforts to retard production. Results in the Ford Motor Company compare favorably with those in the best of the companies manufacturing Liberty motors.

Its contract for 5,000 motors was let in November, 1917, nearly three months after contracts had been let to the Packard and Lincoln companies for 6,000 each. Up to October 11, 1918, it had produced 1,868, while the Packard Company had produced 3,864 and the Lincoln Company 2,787. Not a case of sabotage has been reported to the Department of Justice from this plant. Indeed it can be said that but little trouble has been traced to aliens or alleged German sympathizers in any of the plants.

#### Sabotage

To what Judge Hughes has said on this subject, I wish to add that since his report was handed to me I have had the records of the Department of Justice examined for the purpose of ascertaining the number of substantial complaints of sabotage in the factories engaged in manufacturing aircraft, motors, or parts for the Government.

The result shows twelve such complaints. Upon these complaints and the investigations which followed seven men have been indicted, two of whom have pleaded guilty and five of whom are awaiting trial. In this connection, it is interesting to note that during the past eighteen months somewhere between 100,000 and 200,000 laborers have been engaged on Government work in the factories indicated.

Respectfully yours,  
(Signed) T. W. GREGORY,  
Attorney General.

#### Hughes Report a Vindication

(Continued from page 744)

that the plant is a permanent one admirably designed for commercial work, and that there is every prospect that it can be successfully utilized."

In summarizing, the report adds "the large percentage of the contractor's profits which will be taken by the Government in taxation should fairly be taken into account, but the contemplated tax does not justify an extravagant scale of profits which, even after payment of taxes, would permit an excessive return upon the capital invested in view of the greatly reduced risks of the contractor under the cost-plus contracts."

Under the latest revised contract with the Lincoln Motor Co. and others dated July 1, 1918, however, the Liberty engine price has been fixed, according to the report, at \$4,000 per engine, and hence the profits estimated above are accordingly reduced by 20 per cent. On this basis the Lincoln company will earn \$11,250,000 on a contract of 9000 engines to be delivered by April 1, 1919.

Labor conditions were found to be generally unsatisfactory. Turnover at the Packard plant, for example, was found to be at the rate of 400 to 600 per cent a year, 40,000 men coming and going in a year in order to maintain an organization of 10,000 men. Similar conditions were found elsewhere and in a number of plants difficulties caused by labor organizations; objections to women workers was encountered. Where women have been employed the results are pronounced satisfactory.

Extravagant labor costs were found in a number of factories, particularly in the North Elmwood plants of the Curtiss company, and due principally to the employment of more workers than were necessary.

Some alien enemies were found to be employed in the Packard, Wright-Martin and Ford plants, the Ford company having 250 German aliens engaged in war work, operating under special permits granted on the company's recommendation. A few instances of trouble as a result of this have occurred.

Objections are stated in the report to the payment of "exorbitant" salaries to executive officers, and Talbott and Kettering of the Dayton-Wright Airplane company are mentioned as drawing annual salaries aggregating \$100,000, while Mingle of the Standard company, who was to be paid at the rate of \$63,000, has thus far been allowed at the rate of \$15,000 per year.

The Mahogany Manufacturers' and Importers' Association, formed to co-operate with the Government and meet the demands for wood for propeller manufacture, comes in for some criticism due to the prices asked for mahogany and also to the fact that some members of the industry have received money from the association while at the same time accepting compensation from the Government. *There is no criminal act in this, according to the report, but there would be if bribery existed.*

BRITISH experience has demonstrated the value of the piece rate system as an incentive to output. Observations of speed under a piece-rate system also point to the conclusion that maximum production is best secured from women employees by piece-rate payments. Yet this very eagerness to secure high wages and unwillingness to take advantage of rest periods suggest the danger of such an incentive unless proper health supervision is assured.



THE entire lower peninsula of Michigan has been divided into thirteen districts in accordance with plans perfected under the direction of the War Industries Board. A chairman has been appointed for each district to act as the point of contact with the general supervisor, Allen A. Templeton. The entire state organization is styled the Regional Industrial Commission and was organized for the purpose of obtaining war contracts for such manufacturing concerns as were in a position to accept them and had the required facilities for production. According to the War Industries Board fully 60 per cent of the war work in this state is produced in District No. 1 and surrounding territory. About 25 per cent is produced in the Jackson district. This means that 85 per cent of Michigan's output of war work comes from the southeast corner of the state.

# Analysis of Automobile Merchandising in New Zealand

## PART III

### Service Was Started with American Car Sales—Good System of Macadam Roads Linking Cities—Possibilities of Truck Sales—Leading Industries

By G. A. Worrall\*

**A**T the present time there is a remarkable situation existing. Horse feed is extremely high, as well as leather, iron for horseshoes, and labor, which makes the use of the horse almost impossible for carting and hauling at former rates. On the other hand, it costs 40 per cent of the list price to land a truck to-day, gasoline is \$5.50 to \$6 per case of 8 Imperial gallons, and the type of man who can operate a truck is almost impracticable.

In Christchurch, which lies on a level plain, and to which electricity is furnished by water power, the electric truck has become very popular. Garage and maintenance charges for one month are only \$3. With this in mind, we can turn to the City of Melbourne, Australia, which city has sold all of its motor trucks and replaced them by horse drawn vehicles.

On the whole, New Zealand is extremely mountainous, which calls for a motor with plenty of power.

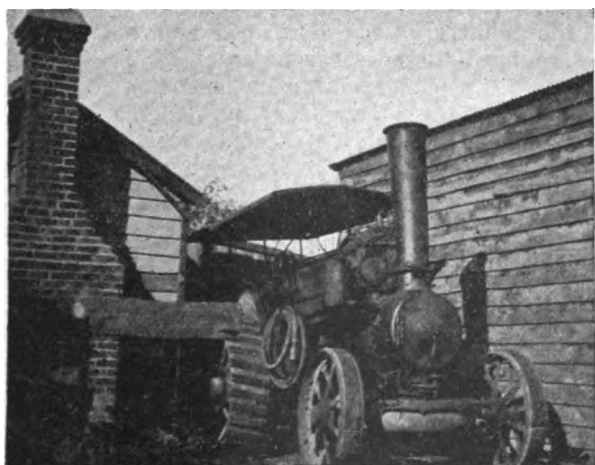
The truck market has only been touched. Up to the present day the demand has been created for them by the city carrier or drayman and the country carrier. Besides the further development of this field there is a much larger field in sight, namely, passenger transportation, sight-seeing, mail and passenger service, and the various merchants engaged in indenting and numerous factories all located in the larger centers. Also the ever-progressing dairying and flax industries are now making demands for rapid transit.

\*Mr. Worrall spent 11 months in New Zealand as special representative of the foreign department of the White Co. He traveled on both islands and studied conditions for automobiles and trucks.

The bulk of the present users handle the wool during the wool season, which runs from November to February. During that period over 100,000 tons or 35,000 loads of wool must be brought to the railway depots from the inland districts, and shipped to large distributing centers, where it is again moved to the shipping docks. The hauls vary from 1 to 50 miles, and the scale of prices varies also. An average example is 70 cents per bale of 336 to 450 lbs. for a run of 14 miles, with a load of seventeen bales. The ideal truck for this work is the 5-tonner, but the bridges will not in all cases support them; therefore 3-ton or 3.5-ton is in general use, equipped with a 35 to 45-horsepower motor.

The season during which the wool is moved is delightful. During this period, while there is plenty of rain to keep the roads in good condition, it is never excessive. However, during the winter months, June to October, there is an abundance of rainfall, which makes many of the roads in the back districts impassable. During this period the carrier must be on the alert to find contracts to tide him over. The country carrier usually transports freshly fallen timber to be used as firewood, or to be sent as material to be used for fence posts, and on his return trips he carries the daily supplies for the farmer, finished fence posts, fertilizer, and building materials for new construction work, while the city carrier must contract for bulk work, or make special prices for general haulage work with large coal or meat companies.

It should be borne in mind that in New Zealand the long ton or 2240 lbs. is in general use, and the short ton used in America is rarely, if ever, used. The American



*Left—Tractor engines were used for drawing wool, but are passing out and the truck is taking their place. New roads are bringing ordinances against these heavy iron tires. Right—Loading truck with wool in bales of 300 to 600 lbs. All station owners have presses for compressing the wool*





*Mt. Egmont in Taranaki, which is the center of the province. There is a 100-mile metal road around it. This is a progressive road area. It is a dairy country*

truck maker must sell his truck on the long-ton rating rather than on the short-ton rating.

Pressed-on solid tires are best for all New Zealand, as all centers of population have tire presses for removing or fitting such tires.

### **New Zealand's Industry**

Wool is the foremost industry of New Zealand. It is transported from the back or interior districts by steam tractors, horse teams and motor trucks. Not infrequently it is brought part of the journey by horses, and, when good roads are reached, transferred to motor trucks. More high-grade wool is exported from New Zealand than from any other section of the world.

To-day all the lumber is brought from the island by steam tractors and horse teams to the commercial centers. Motor trucks have not been able to engage in this work because of road conditions in the interior. Although the two islands have 2800 miles of narrow-gage railroad and an exceptionally long coast line there is still a good opportunity for greatly increased use of motor trucks in the lumber industry.

Possibilities for motor trucks in New Zealand cities are much the same as those in cities of corresponding population in different countries. Auckland, the largest city in North Island, with a population of 102,000, is a distributing and commercial center with large ship-building ways, sugar refineries, pottery factories, timber mills, etc., and offers a field for motor trucks much the same as any city of corresponding population. In this island is Wellington, with 70,000 population, which is a distributing and commercial city operating on a smaller scale. Christchurch in the South Island, with a population of 78,000, is also a commercial and distributing center with many small factories.

The frozen meat industry is an important one and generally the meat has to be transported from the freezing establishments to the wharfs for oversea shipment.

Butter and cheese have to be brought from inland dairy factories, which are numerous, to the cold storage houses at the seaport.

In addition to the larger cities mentioned there are in all of the provinces small cities with populations from 10,500 down. These cities have importance in the motor truck field in that they are shipping points for wool, which is generally transported from the station owner or sheep raiser's farm to these towns or cities.

Although the two islands of New Zealand, having a total overall length not exceeding 1000 miles and the

greatest width 250 miles, would, in ordinary circumstances, be an easy area to distribute over, nevertheless the fact that the country is divided into two islands, the North Island and the South Island, and also due to the fact that there are only 3200 miles of railroad on the two islands, it is impossible to cover the two islands from one distributing center, and the problems of distributing automotive apparatus thus becomes more involved than in many countries of much greater area, where there is one city that can be looked upon as the major distributing center for the entire area.

American manufacturers of any kind of automotive apparatus, such as farm tractors, trucks, cars and accessories, will have to appoint practically four distributors for the two islands and have direct factory connections with each of these four. The two islands are practically the same size, each approximately 500 miles in length, and in the North Island Auckland and Wellington are the two centers in each of which a distributor should be appointed. The South Island has two distributing centers, Christchurch and Dunedin. These are the four leading cities of the island and have distribution facilities to approximate one-quarter of the total area of New Zealand. Three of these centers are served directly by ocean liners which call at Auckland and Wellington in the North Island and Dunedin in the South Island. Christchurch on the South Island receives its shipments by transshipment from Wellington, or in case of large shipments they can be landed at Littleton, which is the seaport for Christchurch.

The territories served by each of the four distributors located in these centers are practically alike so far as the fundamentals of carrying on business are concerned, the carrying of spares, regulations concerning imports, and types of vehicles used. In all four areas the five-passenger touring car is the popular vehicle and the closed car has scarcely started. There is a very limited demand for two- or three-passenger runabouts.

### **Wellington a Big Motor Truck Center**

Motor trucks have at present their biggest field in territory served by Wellington, which is the southern portion of the North Island. This territory has more motor trucks than the remaining three distributing areas combined. This is because the Wellington district is well supplied with railroads. It contains the center of population of the islands and the wool industry, which is the principal one of the islands located in this area. The northern portion of North Island, which constitutes the Auckland distributing area, is a poor motor truck field because the country is not developed and the use of trucks is confined to the areas adjacent to the city of Auckland, with its population of 100,000.

The Christchurch area is roughly the center portion of the South Island, a territory embracing the Province of Canterbury, which is approximately one-quarter of the island. This is largely devoted to agriculture and stock-raising, and the truck field is limited to the city of Christchurch, with its population of 80,000, and to the station owners or sheep raisers whose wool has to be transported to Christchurch for shipment.

Christchurch is particularly well suited for electric trucks because the city is level, being located on a plain. The municipality owns its water power and is prepared to furnish cheap electric current. So low is the electric rate that a 2 or 3-ton truck can be charged and stored for not more than \$3 per month.

The Dunedin distributing area, which is, roughly, the lower quarter of the South Island, is a poor area for motor trucks in that the country is not so well developed. The land is largely pastoral and exports are agricultural

products and frozen meats which call for the limited use of motor trucks in transporting to seaport.

The distributors in each of these four cities have dealer organizations similar to those in any distributing territory in America. For example, the Wellington distributor has in his territory perhaps ten cities of population in excess of 10,000 each, and in each of these has a dealer, agent, or branch where showrooms, garage and repairshop are centered. The stock of spares is generally carried with the Wellington distributor. He reaches practically all of his territory by railroad, the map, printed in a previous installment, giving a good indication of the places served. The Wellington distributor serves the northern part of the South Island or the Province of Marlborough and Blenheim, and these are served by connecting boat lines.

The Christchurch distributor handles his field generally, but has fewer cities of this population. The same applies to Auckland and Dunedin. Like the other countries south of the equator, where the seasons are diametrically opposite to those in the United States, the selling season is reversed. Here it begins in November and the height of the season is reached at the period of maximum wool movement, which comes in January and February. It is during this period that the distributor must have his stock of cars on hand for immediate shipment to dealers and when he must be stocked up with repairs.

The selling propaganda of the passenger car distributor begins late in October and is continued until March. The circuit of local fairs, which has become an important selling factor, begins in October and continues until March.

### Truck Selling Period in New Zealand

The truck selling period is somewhat different. The best selling months are November and December, so that the distributor begins his selling propaganda the latter half of September and early in October. Trucks are sold all months of the year more or less, but the peak comes in November and December, because the wool movement starts in November and continues during November, December, January and February. All New Zealand dealers outside of the four distributing centers stock cars and have them ready for delivery. With trucks this has not been done until very recently, but to-day several of the dealers are stocking. The enterprising distributors in the four large centers are well supplied with repairs, which are carried uniformly during the twelve months of the year.

The majority of motor cars sold in New Zealand during the last few years have been cash transactions, but



*Driving sheep to the slaughter house. They are driven as far as 100 miles*

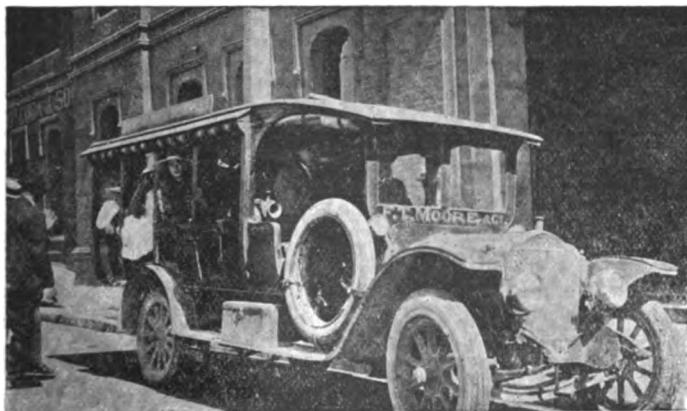
motor trucks are invariably sold on time ranging from 4 to 18 months. Twelve months represents a fair average of the time-payment period on trucks. It is up to the distributor not only to finance his dealers but also to carry the financial burden of time sales.

### Death of Prof. Bertram Hopkinson

COLONEL BERTRAM HOPKINSON, better known to automotive engineers as Professor Hopkinson of Cambridge University, lost his life in an airplane accident some months ago. He was a son of Prof. John Hopkinson, who formulated the law of the magnetic circuit, and was educated at Kings College and Cambridge University. For five years after completing his education he was engaged in consulting engineering work, mainly on electric light and power installations. In 1903 he was appointed professor of engineering at Cambridge. At a somewhat later date he turned his attention to the study of gas engine phenomena and became a member of the committee on Gaseous Explosions, of the British Association for the Advancement of Science.

This committee has done much work in clearing up some of the mysteries connected with the phenomena of explosions in engine cylinders, and a great deal of credit for this work is due Professor Hopkinson. On ignition in a gas engine cylinder, the maximum pressure attained is only about one-half of the figure calculated from the supply of heat energy and the formerly accepted values of the specific heat of the products of combustion. An hypothesis long popular was that the discrepancy was due to dissociation, but the experiments of the committee proved this view to be untenable. Part of the discrepancy was traced to the fact that the specific heats of the products of combustion increase considerably with rising temperatures, but Hopkinson proved that much of the defect of pressure was to be ascribed to radiation phenomena. As the energy lost by radiation varies as the fourth power of the absolute temperature, the loss to the walls becomes very serious at the temperature of the explosion which may reach 2000 deg. C. Measurements made in Professor Hopkinson's laboratory showed this loss to be very large, and an explanation was thus afforded of the fact that in practice the use of extremely rich mixtures had been found unprofitable.

Dr. Hopkinson also helped to clear up another puzzle in gas-engine practice. In Sir Dugald Clerk's early experiments on the explosion of gaseous mixtures, which were made with the gas in a static condition in a closed vessel, an appreciable time was required to effect the explosion. This time was in fact in some cases greater than the total duration of the stroke in motor car engines. There is thus in practice a notable acceleration of the explosion which was traced by Dr. Clerk to the turbulence of the gases consequent on their entry into the cylinder at a high speed, and this view was confirmed by Professor Hopkinson, who found that with a 10 per cent mixture of coal gas and air in an explosion vessel the time of explosion could be accelerated by stirring up the mixture by means of a fan. Thus with the fan stationary, the time of the explosion was 0.13 sec., and this was reduced to 0.02 sec. when the fan was run at 4500 r.p.m.



*There is a great deal of passenger service by bus outside of Wellington, Christchurch and Napier. These lines run 40 miles out*



# The F O R U M



## Diesel and Similar Engines

By Harold B. Wilson

*Engineer, Kwang Tung Electric Supply Co., Canton, China*

I HAVE just received the War Number of AUTOMOTIVE INDUSTRIES. It was a banner number for the engineer in a far country who wants reliable information on war activities.

There was one point discussed at the S. A. E. meeting that I do not believe was given careful consideration, namely, the naughty air compressor on a Diesel engine.

In the early stages of Diesel development the air compressor did give no end of trouble. To concerns just starting in the Diesel building game the air compressor will probably give trouble, but the old builders have solved their difficulties with this piece of machinery. We have five different makes of compressors in our power plant and only one of them gives trouble. That one has a very poor mechanical design. Some of our compressors are ten years old, so there is no question as to their reliability and wearing qualities.

From the discussion before the S. A. E. one would get the impression that air injection was detrimental to combustion, power output and economy. Not one of those points is borne out by facts.

A common method of clearing up the exhaust in Diesel operation is by raising the pressure of the injection air.

All experiments with solid injection (that have come to my knowledge) have shown a loss of power per unit of piston displacement and a loss in economy.

### Fuel Consumption Data

Makers of four cycle Diesel engines guarantee a fuel consumption of not over 0.45 lb. per b.h.p. at full load and not over 0.5 lb. per b.h.p. at half load. For small two cycle engines these figures are 0.5 to 0.6 lb. respectively. The thermal efficiency of the average engine in operation is 38 per cent as compared with the 30 per cent of the Hvid engine on a special test.

Compare the Hvid engine discussed before the S. A. E. with the Wisconsin Junkers 60-hp. marine engine. The latter has two cylinders 6 x 14 in. and operates at 400 r.p.m., each piston having a 7 in. stroke. The Wisconsin engine is rated at 3.06 ft.<sup>3</sup> per horsepower, giving a mean useful pressure of 75 lb. per in.<sup>2</sup> In practice it will probably do better.

The Hvid engine 5 1/4 x 9 in. developed 7 1/4 hp. at 300 r.p.m. on a special test. That figures out to 3.56 ft.<sup>3</sup> piston displacement or about 64.5 lb. per in.<sup>2</sup> mean useful pressure. Place the fuel consumption of the Wisconsin engine at 0.5 lb. per b.h.p. and show where solid injection has produced more power and better combustion.

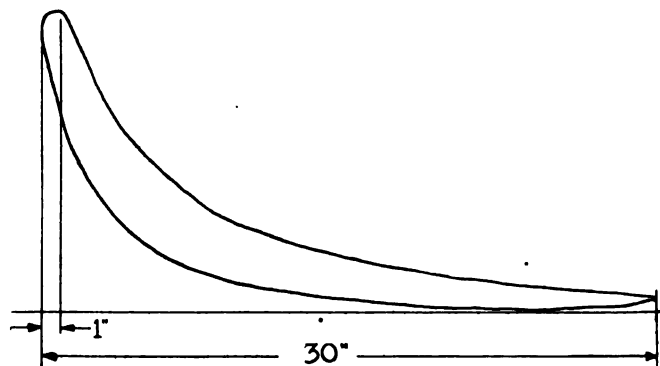
Air injection does cause a slight refrigeration, but it is so slight as to be negligible. A glance at an indicator card will show that. The Diesel is the only combustion engine that gives a card approaching the ideal steam engine card. The injection air is so well mixed with the finely pulverized fuel that combustion takes place instantly. The fuel is burned just as it enters the combustion chamber, causing an even expansion instead of the explosion that takes place in other types of combustion engines.

I wish to submit a card taken from one of the engines in our station. You will note that the fuel has been burning as steadily as the flame of a blow torch during 22.5 deg. of the 27 deg. total opening of the fuel valve. That allows just 2.5 deg. for the opening and 2.5 deg. for the closing of the fuel valve. This steady complete burning of the fuel as it enters the combustion chamber accounts for the high economy of the Diesel. This high economy is not an occasional feature, under special conditions, but a reliable every day feature.

In gas, gasoline or surface ignition oil engines the ignition is started at from 17 deg. to 25 deg. and even 30 deg. before top center. The combustion begins with a slow burning and

ends in an explosion, causing a great rise in pressure. The Hvid approaches the Diesel cycle more nearly than the others, as the fuel is blown through small holes, by high pressure gas, in a more or less steady stream. Its lack of economy is probably due to the fact that the fuel is not so finely pulverized and is not mixed with air when it enters the cylinder.

Now for varying the speed of a Diesel engine. This can be done by varying the lift of the fuel valve with the fuel pump, without greatly injuring combustion. Marine engines must have variable speeds, and this feature has already been worked out.



*Indicator diagram from Diesel engine*

Data of machine from which card was taken: Three cylinders, 21 in. bore, 30 in. stroke. Speed, 180 r.p.m. Spring, 400 lb. p. in. Fuel valve opens 2.5 deg. b.t.c., closes 25 deg. a.t.c. Total opening, 27.5 deg.;  $\phi$ , 22.5 deg. Load, 500 hp. M.e.p. 84 lb. p. sq. in. M.u.p. 70.7 lb. p. sq. in. Pounds fuel per b.h.p. 0.42. Fuel B.t.u. p. lb. 18,984

Understand me, I am not knocking the Hvid engine. It is a wonderful little machine. Its test records show up much better than the oldest of its rivals, the surface ignition engine. It is certainly much simpler than any other combustion engine on the market. Diesel engines are too complicated and expensive to ever seriously compete with it in small sizes. The Hvid will hardly compete in sizes from 200 hp. up, the main field of the Diesel.

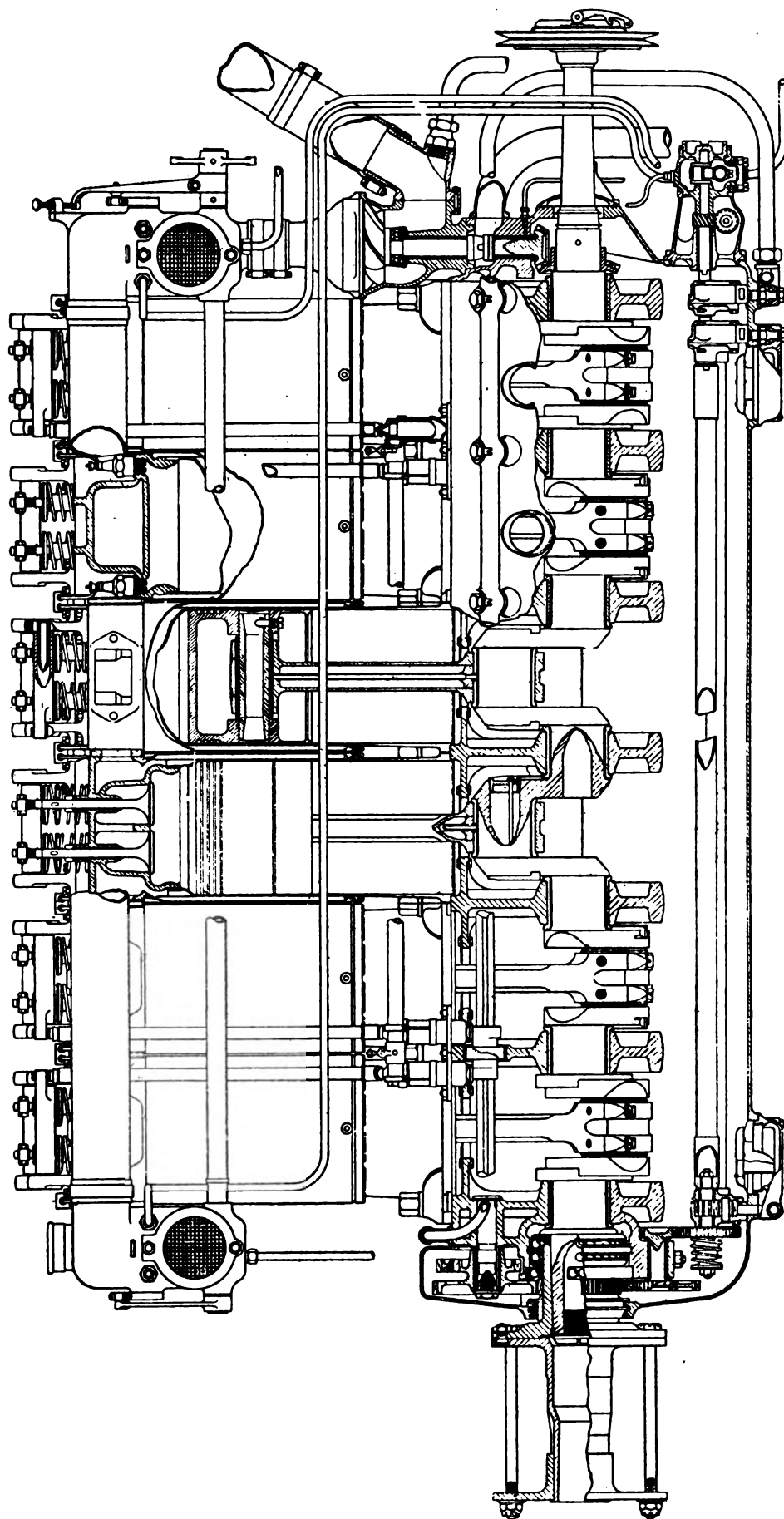
I'm wondering just why nobody builds a two cycle Hvid. If it is to be a factor in the automotive field the two cycle engine looks more promising than the four. It would weigh just a little more than half as much per horsepower and should give nearly as good economy. The two cycle should throttle better than the four cycle engine on account of the greater number of power strokes. The chief trouble in throttling a two cycle gasoline engine does not occur in injection engines. There is no carbureter and its attendant trouble making mixture.

## Improvement in Liquid Metal Spraying

IN a new adaptation of the Schoop liquid metal spraying process the metal stock used, instead of being melted by the oxy-hydrogen flame, is fused electrically, which is said to be both cheaper and better. The pistol apparatus is employed as before; but two ends of the wire are placed in the pistol, instead of one, and they are approached to one another as electrodes of an electric circuit. When the arc strikes, the wire fuses, and the electric current tears the fine metallic particles away. Zinc sprays in particular have been produced in this way. The electric heating may be simple, but the prevention of the oxidation of the sprayed metal will probably be as difficult as before.



## Maybach 300-Hp. Six-Cylinder Aircraft Engine



## [Principal] Specifications

Cylinder Dimensions, 165 x 180 mm.  
 Normal speed, 1500 r.p.m.  
 Brake m.e.p., 117.7 lb. at 1400 r.p.m.  
 Max. brake m.e.p., 120.5 lb. at 1200 r.p.m.  
 Compression ratio 5.95:1.  
 Crankshaft diameter, 66 mm.

Valve clear diameter, 48 mm.  
 Total weight of engine, 911 lb.  
 Weight per horsepower, 3 lb.  
 Piston speed, 1654 ft. per min. at 1400 r.p.m.  
 Mechanical efficiency (calculated) 86 per cent.  
 Brake thermal efficiency, 28.9 per cent.

# The 300-Hp. Maybach Aircraft Engine

Technical Description of the Largest German Aircraft Engine Model, Issued by the Technical Department of the British Air Ministry

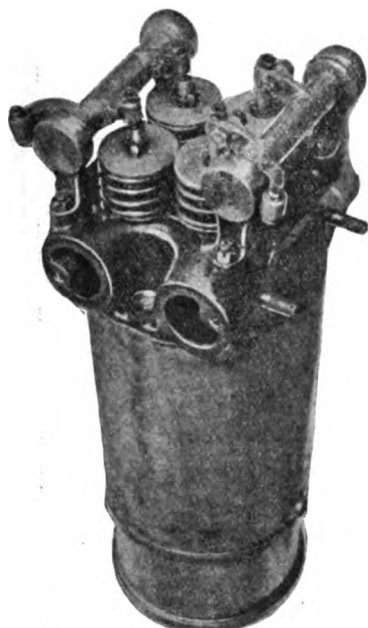


Fig. 2—Cylinder and head

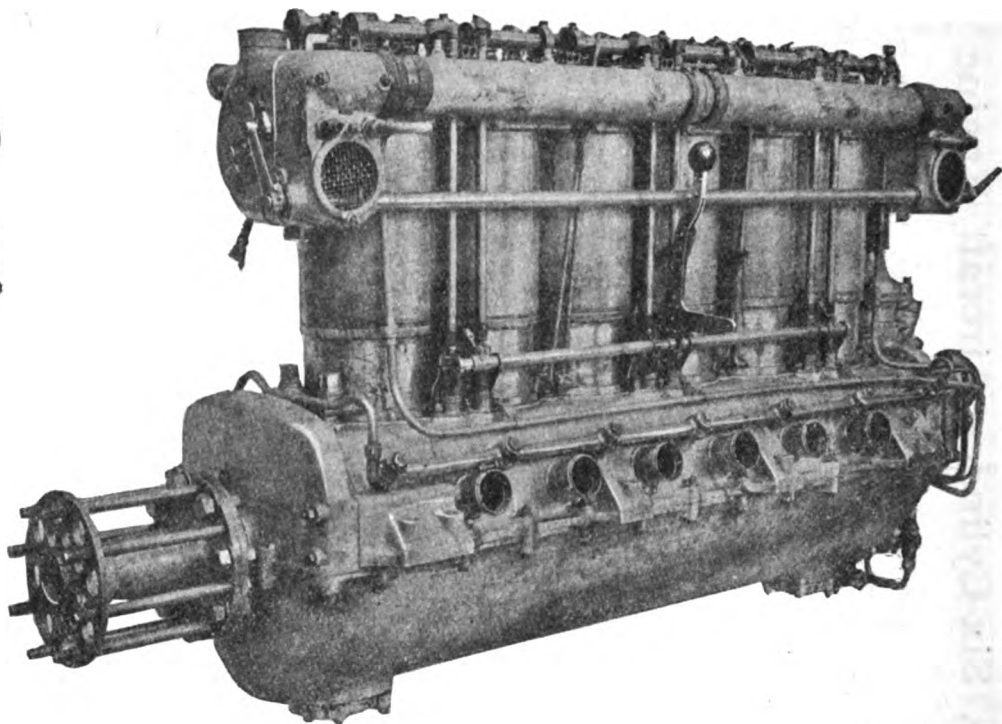


Fig. 3—Right hand side of Maybach 300-hp. engine

**T**HE general distinctive features of the design of the Maybach aero engines are as well known among aeronautical engineers in Great Britain as any of the enemy aero engines in service; firstly, by reason of the adoption of the old Wolsley-Maybach aero engines, the design of which was acquired before the war for airship work, and which was based on the design of the original Maybach engine; and, secondly, through the publication of the somewhat incomplete details of construction of the Zeppelin-Maybach engines and their installation, which were collected under great difficulties from the remains of the several Zeppelin airships brought down during the war.

These engines, in almost every case, were so badly damaged by fire that it was found almost impossible at the time to compile any really detailed report of their design, or of their power and general performance.

A new and more powerful type of Maybach engine is now being used in service by the enemy, which, according to French reports, develops over 300 hp., and which possesses great efficiency.

During the past few months several of the latest type of Rumpler machines have been captured fitted with the new 300-hp. Maybach engines.

The following report on the design of the 260-300 hp. Maybach engines is based on a detailed examination of engine No. 1261, taken from a Rumpler two-seater biplane (G.120), known as the C.4 type. This machine was brought down in France on Jan. 18, 1918, by a shot which perforated the carburetor and water pump. The machine was, unfortunately, completely destroyed by fire on landing, but the

engine was captured intact and little damaged. After slight repairs this engine has been put into running condition and tested for power, consumption, etc., at R. A. E. The results of these tests are given in the following report, together with metallurgical analysis and mechanical tests of materials and alloys used in the principal parts of the engine.

A complete list of the details of the design is given in the various data at the end of this report, including the percentages of weights of all parts, and the results of separate tests carried out on the carburetor and a new design of gasoline pump which is used in conjunction with the interesting high-altitude carburetors.

A brief description of the Rumpler C.4 and 5 type aeroplane in which these new 300-hp. Maybach engines are fitted will, no doubt, be of some interest here. Full details of this machine, however, have already been issued in a published report by the *Section Technique de l'Aéronautique Militaire*.

The Rumpler C.4 machine is a two-seater biplane, corresponding, more or less, to the D.H.4, and is generally fitted with a 260-hp. Mercedes engine. These machines are designed for long-range artillery reconnaissance and photography, and are armed with two guns—one Spandau fixed in front of the pilot's seat, firing through the propeller, and a swivelling gun mounted in the observer's seat behind. A two-bladed air screw is fitted, and a semicircular honeycomb radiator of unusual design is slung above the engine from the center section.

These machines are generally flown, according to report, at high altitudes—i.e., from 15,000 to 17,000 ft.—until over the lines, and from the French reports, the new 300-hp. May-

back engines are more flexible and regular in running than the 260-hp. Mercedes engines, and are generally preferred by the German pilots.

Compared with the 260-hp. Mercedes engines fitted in these machines, the new Maybach engines are credited with attaining an increase of 200 r.p.m. at altitudes above 2000 ft., and also possess greater efficiency in speed and climb in the Rumpler biplanes.

The total weight of the machine fully loaded is approximately 3439 lb.

#### General Features

The 300-hp. Maybach presents several unusual and interesting details, and as compared with the old 240-hp. Zeppelin-Maybach design, the new engines are undoubtedly a great improvement. The quality of the workmanship of every part, including the exterior finish throughout, is exceptionally good, and the working clearances are carried to very fine limits. Compared with any of the types of enemy engines, the workmanship is undoubtedly of a very much more finished nature; every part, nevertheless, shows the usual German characteristics of strength and reliability, combined with standardization of parts and ease of manufacturing, in preference to the saving of weight.

The general lay-out of this engine follows the usual German six-cylinder vertical type. The compression ratio is exceptionally high, viz., 5.94:1, which necessitates the use of very heavy pistons and connecting rods. In these particulars this engine follows the previous Maybach practice, but the adoption of a cast-iron floating bush in the little end bearing is an interesting development.

Four overhead valves per cylinder are fitted, i.e., two inlet and two exhaust. These are operated by rocker levers mounted on roller bearings in brackets fixed to the cylinder heads, as shown in Fig. 2, and by push rods on each side of the cylinders actuated by separate inlet and exhaust cam-shafts.

The camshafts run in plain bronze bearings in the crank-chamber, and lubrication is by splash.

Little alteration has been made in the design of the massive crankshaft, which runs on plain white-metal lined bearings throughout, and is provided with the well-known Maybach type centrifugal pressure lubrication system to the crank-pins, thence to the piston pins through small pipes inside the hollow connecting-rods.

The three separate and detachable gear oil pumps, which are situated in the bottom of the base chamber, are of new design.

The pump driving shaft at the front end is driven through a ratchet gear on the front scavenger pump, apparently with the object of preventing an air lock in the lubrication system in the event of back-firing.

A double-acting, oil-sealed gasoline pump of unusual design is now fitted. This is driven off an extension of the main oil pump spindle at the rear end of the base chamber, and works, of course, in conjunction with the two separate carbureters. These are of the well-known Maybach type, and have been only slightly modified. As shown in Fig. 3, they are attached, as in the Zeppelin engines, to the front and rear cylinder water jackets. A full description of the functions and workings of this interesting type of carbureter is given toward the end of this report.

The well-known Maybach induction type starting gear is fitted, but is slightly modified in design.

The whole of the induction system and the oil condensing crankcase ventilating system is an interesting point in the design of this engine, as is also the method of attaching the propeller-hub driving flange on the tapered front end of the crankshaft.

Practically no alteration has been made to the general design of the very simple and efficient type of water pump, which delivers directly into the bottom of the rear end carbureter water jacket as in the old Maybach engines. Ignition is by two Z.H.6 types Bosch magnetos, which are driven

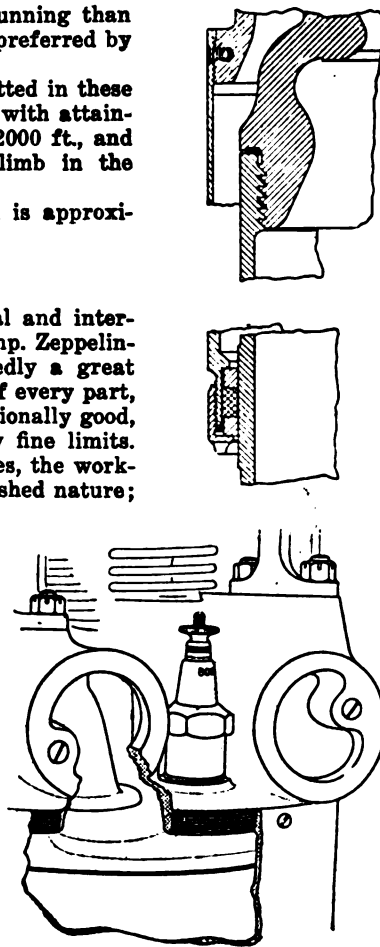


Fig. 4—Showing water jacketing of valves

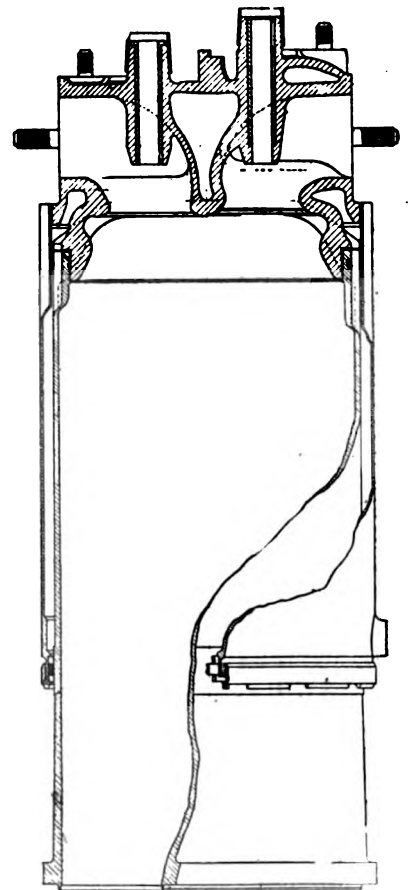


Fig. 5 (above on left)—Detail of jacket joint  
Fig. 6—Maybach cylinder and head, in section

directly off the rear ends of the camshafts; the position of the spark plugs in the cylinder heads is a point of interest dealt with in detail in the following description.

**Cylinders.**—In comparison with the Zeppelin-Maybach engines, the cylinders of the new 300-hp. Maybach engines are of very much lighter construction; and, as will be seen from the sectional drawings, are of a wonderfully clean design. Each cylinder shows practically a rectangular view from almost any point of view, with no excrescences or extensions. The whole construction of the cylinders, and particularly the formation of the cylinder head, presents many interesting details of design.

Referring to the sectional drawing, Fig. 6, it will be seen that each cylinder is built up of a thin steel barrel, machined and ground to 165 mm. bore, and machined on its outer surface to a thickness of 3 mm. The thickness is increased from 3 mm. at the bottom of the water jacket to 4.5 mm. at the cylinder base flange. Into the top of the cylinder barrel is screwed the cylinder head, which is of cast iron. A detailed sketch of this screwed joint is shown in Fig. 5. The screw thread, it will be noted, is 2.3 mm. pitch, buttress thread. A soft brass washer is fitted at this joint between the cylinder head and the top face of the threaded portion of the cylinder barrel.

The bottom of the cylinder barrel extends only 3.5 mm. below the base flange into the registering joint of the crankcase, and the bore of the cylinder is very little chamfered.

The design of the cylinder heads and the formation of the water passages round the twin inlet and exhaust valves is unusual, and the double inlet and outlet water connections between each pair of cylinders are of new design. The formation of these twin water connections is clearly shown in the detail sketch of the cylinder head (Fig. 4), together with the water passages cast round the spark plug bosses; the latter are somewhat inaccessibly situated in the space between the two cylinder head water joints. The two semicircular



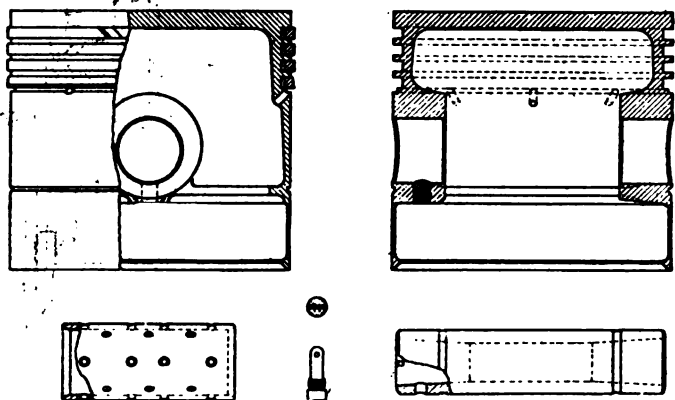


Fig. 7—Piston and piston pin

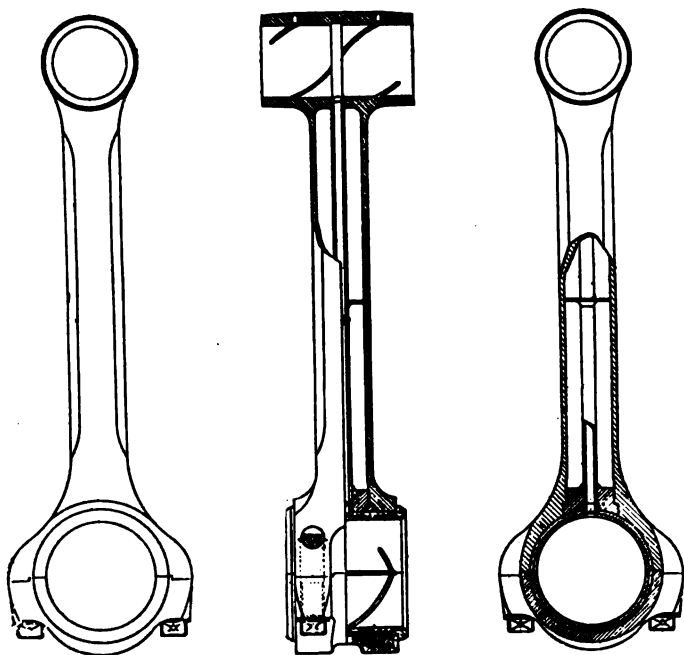


Fig. 8—Connecting-rod

bosses which are cast on the sides of the cylinder water joints are provided for the attachment of the two carbureters, which are fixed to the front and rear cylinders by long studs screwed into these bosses in the water joints. To allow for the interchangeability of the cylinders, these holes are drilled in every cylinder; when the cylinder is not assembled at the front or rear, they are plugged with brass grub screws as shown in the sketch.

An interesting point of design in these cylinders lies in the fact that no water connections between the cylinders are made other than the twin head-joints referred to. (This principle is similar to that used in the cylinders of the Zeppelin-Maybach engines; these were provided with one large water joint, 5 in. in diameter, between each pair of water jackets, which was an extension of the cast-iron head. The cylinder barrels were also of cast iron, and were fitted with two inlet and three exhaust valves per cylinder.)

The exhaust valve pockets are provided with an additional water passage above the exhaust port, and cast so as to give a free water space completely round the center portion of each exhaust valve-stem guide.

The valve guides cast in the cylinder heads are fitted with cast-iron bushes pressed into position. The exhaust bushes do not extend the full length of the guides as the inlet does, but are kept back a distance of 10 mm. from the bottom of the guide, so that they are protected from the hot gases. As a further precaution against seizing, the diameter of the bottom of the exhaust bush is slightly reduced so that the bush has room to expand.

Contrary to the usual German practice of building up the

water jackets of sheet steel acetylene-welded at the joints, the water jackets are machined from cylindrical steel forgings, which, as shown in Fig. 5, are screwed on to the flange machined on the cylinder head; the pitch of this thread is 1 mm. This threaded joint is finally sweated in position with soft solder, the whole depth of the threaded portion having apparently been previously tinned; the joint is locked with four 6 mm. grub screws.

The whole of the water jacket is machined both on the inside and also on the outer surface to a thickness of 1 mm. The water jackets extend to 104 mm. from the base of the cylinders, or roughly to two-thirds of the total length of the cylinder barrels; but, as will be noted, the water space is exceptionally narrow—i. e., 7 mm.

The only water passages from the cylinder head to the annular water space of the water jackets are through the openings or passages cast in the cylinder heads encircling the spark plug bosses, and situated directly below the twin water connections. The formation of these water passages leading from the head of the jacket is made clear in the perspective sketch (Fig. 4).

The water jacket capacity of one cylinder = 1284 C.C.S.

Fig. 5 shows an enlarged view of the lower joint between the cylinder barrel and the water jacket. This joint consists of a soft rubber composition packing ring, compressed in position between two steel rings by a large ring which screws on to the bottom of the water jacket by a fine pitch thread in the manner shown in the sketch. This joint is, to a certain extent, flexible, and allows for the relative expansion between the cylinder barrel and the water jacket.

Small drain plugs are provided at the bottom of each cylinder water jacket; these are screwed into bosses welded into the water jackets on the exhaust side. The combustion chamber is circular, but it is slightly recessed below all of the four valve seats, which are all of the same diameter, i. e., 54 mm.

The area of both the inlet and exhaust ports is 30.15 sq. cm. = 4.66 sq. in.

The clearance volume of one cylinder = 778.9 cub. cm. = 47.54 cub. in., giving a compression ratio of 5.94:1.

Short pieces of aluminum tube are fitted over the top ends of the lugs in the cylinder heads forming the valve stem guides. These are shown in Fig. 6, and are apparently provided for lubrication purposes. Thin sheet steel plates are bolted to the inlet and exhaust ports of the cylinder heads to stiffen up the engine.

**Pistons**—Very little alteration has been made to the general design of the piston in comparison with the smaller Maybach engines. The pistons are of cast-iron, and weigh 12.3 lb. each, complete with rings. Four rings are fitted, all above the piston pin, the lower one being a scraper ring. All the rings are concentric, and are 6.5 mm. wide (vertically) and 5.5 mm. deep, the depth of the ring grooves being 6 mm.

The pistons, as will be seen in Fig. 7, are quite flat on both the top and bottom surfaces of the crown, which is 10.5 mm. in thickness. Eight 4 mm. return oil holes are drilled through the piston below the scraper ring in the usual way.

The rings are cut diagonally at 45 deg., no locating pegs being fitted; and the width of the ring gap in the cylinder is 1.39 mm. = 0.055 in.

All the piston rings are machine-hammered on their inner surfaces. This process, which is now extensively used, and is well known, consists of subjecting the inside face of the ring to a series of mechanical hammer blows at gradually increasing distances apart. The process shows a large number of small transverse depressions, extending nearly the width of the ring on the inner surface. These depressions caused by the hammer are approximately 1 mm. apart at the back portion of the ring, i. e., the part of the ring farthest from the gap—and increase in mathematical progression to about 4 mm. apart toward the front of the ring up to about 1 in., on either side of the gap. This mechanical hammering of the inside ring has the effect of giving the desired uniform pressure to the concentric ring against the cylinder wall.

The holes for the piston pin are bored eccentrically in the piston pin bosses, giving a thickness of metal of 14 mm. above and 9 mm. below the piston pin. An oil groove is cut in the piston skirt below the piston pin, evidently to assist

the scraper ring and the piston lubrication. The inside of the skirt is machined up as far as the bottom of the piston pin bosses, and a beveled lip is turned on the bottom flange of the skirt. The inside of the piston is also machined flat across the head, and down as far as the top of the piston pin bosses with 15 mm. radius; an annular rib is cast on the inside of the skirt to reinforce the piston bosses.

Other details of the design of the pistons are given in the section drawing Fig. 7.

**Piston Pins**—The piston pins are 159 mm. long, slightly beveled at the end, and are fixed in position in the piston by a single cheese-headed 9 mm. set screw in the usual way and locked with a split pin.

The piston pins are hardened and ground to three parallel outer diameters, being made of smaller diameter at one end than the other. The center portion which makes the small end bearings is 38 mm. diameter, and the two ends which fit into the piston pin bosses are 37.5 and 38.25 mm. diameter respectively.

The piston pins are bored 23 mm. diameter in the center, tapering to 28 mm. at each end.

Floating small end bushes are now fitted to the piston pin in the connecting-rod smaller ends. These floating bushes are made of cast iron of a very soft nature. The effective bearing length of the floating bushes is 93 mm., and their external diameter is 44.3 mm. For lubrication purposes a number of 4 mm. holes are drilled and countersunk on the outside.

The projected area of the small end bearing surface on the piston pin = 35.35 sq. cm., and the bearing surface in the connecting-rod small end = 39.9 sq. cm.

The weight of each piston pin = 1.75 lb., while the cast-iron floating bushes weigh 0.62 lb. each.

Details of the piston pins and the floating connecting-rod small end bushes are given in Fig. 7.

**Connecting-Rods**—Following the usual Maybach design, the connecting-rods are of square section beveled at the four cor-

ners, and bored up the center from the big end with a 28 mm. diameter hole, which is threaded and plugged, as shown in Fig. 8.

The big end bearing cap is secured by four 14 mm. bolts, which are threaded 1.5 mm. pitch into the top half of the connecting-rod big ends.

The inner surface of the big end bearing shells are machined with a screw-cutting tool which leaves a fine pitch screw thread.

No lock nuts are fitted to the big end bolts, but the square heads of the bolts are drilled, and prevented from becoming unscrewed when in position by a 4 mm. diameter pin, which is long enough to pass through the heads of each pair of bolts.

Two helical grooves 2 mm. wide are cut in the big end bearings. These oil grooves intersect each other on the center of the bottom half of the bearing, as shown in Fig. 8; the oil ways cut in the top half of the big end bearing metal are only taken half way on each side.

The little end floating bushes already referred to are lubricated by a 5 mm. steel pipe, which is fixed in the center of the hollow connecting-rods, and the holes drilled in the floating bushes communicate with helical grooves cut in the small end. An annular groove is cut round the center of the small end bearing, which communicates with the central oil pipe. The method of securing this oil pipe at each end inside the rod, and the steel disk, which supports the center of the oil pipe in the bore, are shown in the sectional drawing.

The total side clearance of the big end bearing between the sides of the crankwebs = 0.44 mm. and the float of the small end = 11.8 mm.

Total weight of the connecting-rod complete with floating bush = 8.93 lb.

Weight of big end = 5.625 lb.

Weight of little end = 3.305 lb.

Length of connecting-rod between centers = 310 mm.

(To be continued)

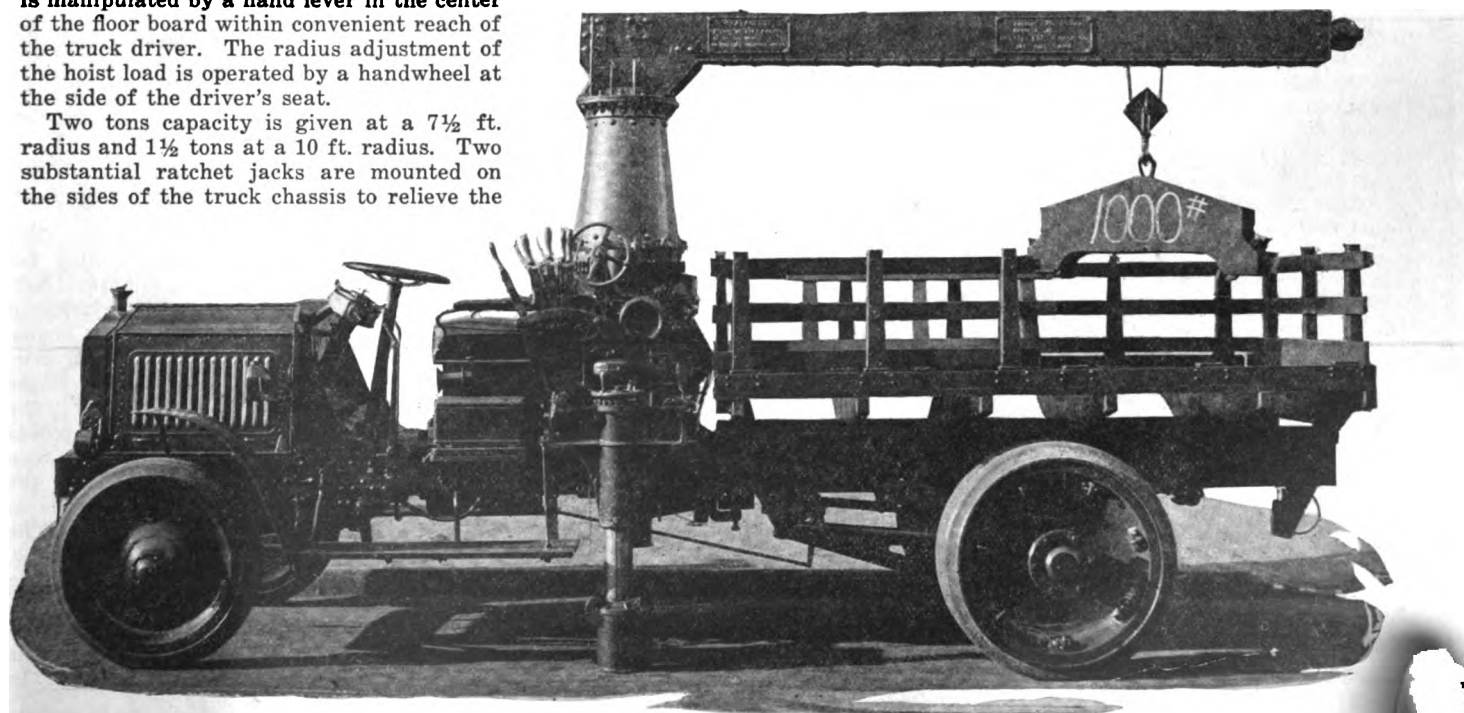
## Crane Hoist on Motor Truck

A NOVEL crane hoist, one of the first of its type to be mounted on a motor truck, has just been delivered to the U. S. Marine Corps by the Packard Motor Car Co.

The apparatus consists of a 10 ft. boom mounted upon a hollow steel mast. The hoist and slew, either to right or left, are operated from the Packard standard power take-off. This is manipulated by a hand lever in the center of the floor board within convenient reach of the truck driver. The radius adjustment of the hoist load is operated by a handwheel at the side of the driver's seat.

Two tons capacity is given at a 7½ ft. radius and 1½ tons at a 10 ft. radius. Two substantial ratchet jacks are mounted on the sides of the truck chassis to relieve the

frame from strains while the crane is in use. The truck in the illustration is a Packard standard 5-ton chassis, with 9 ft. 5 in. stake body and steel disk wheels, the entire outfit being painted the olive-drab of the Marine Corps. Two more Packards of 6-ton capacity each have been ordered by the Marine Corps, to be equipped with similar crane hoists.



# Twin Disk Clutch and Clutch Pulley

Specially Designed Tractor Components to Be Manufactured  
in Racine, Wis.—Features of the Clutch Are Its  
Floating Disks and Ease of Adjustment

**A**N interesting design of clutch specially adapted for tractor service is the Twin Disk. A sectional view and a rear view of the clutch are shown herewith. The clutch comprises one driving disk, which may be driven by means of four driving pins pressed into the flywheel web, and two driven disks, of which one is keyed to a clutch sleeve. Between the driving disk and the two driven disks there are disks of asbestos fabric, which latter are not fastened to any of the metal disks, but float between them. The driving torque taken by the

rearward driven disk is transmitted to the forward disk by means of four inner driving pins, pressed into the driven disk that is keyed to a clutch sleeve.

In drill holes of this latter disk midway between the inner driving pins are located four coiled springs which press the disks apart immediately the clutch is released. The various disks are pressed together for engaging the clutch by means of four clutch fingers which are pivoted on a four armed spider, screwed over the clutch sleeve. The clutch fingers are deeply carbonized and hardened, and they act against a hardened steel ring set into one of the driven disks. The clutch is engaged by pressing a steel cone between the ends of the clutch fingers.

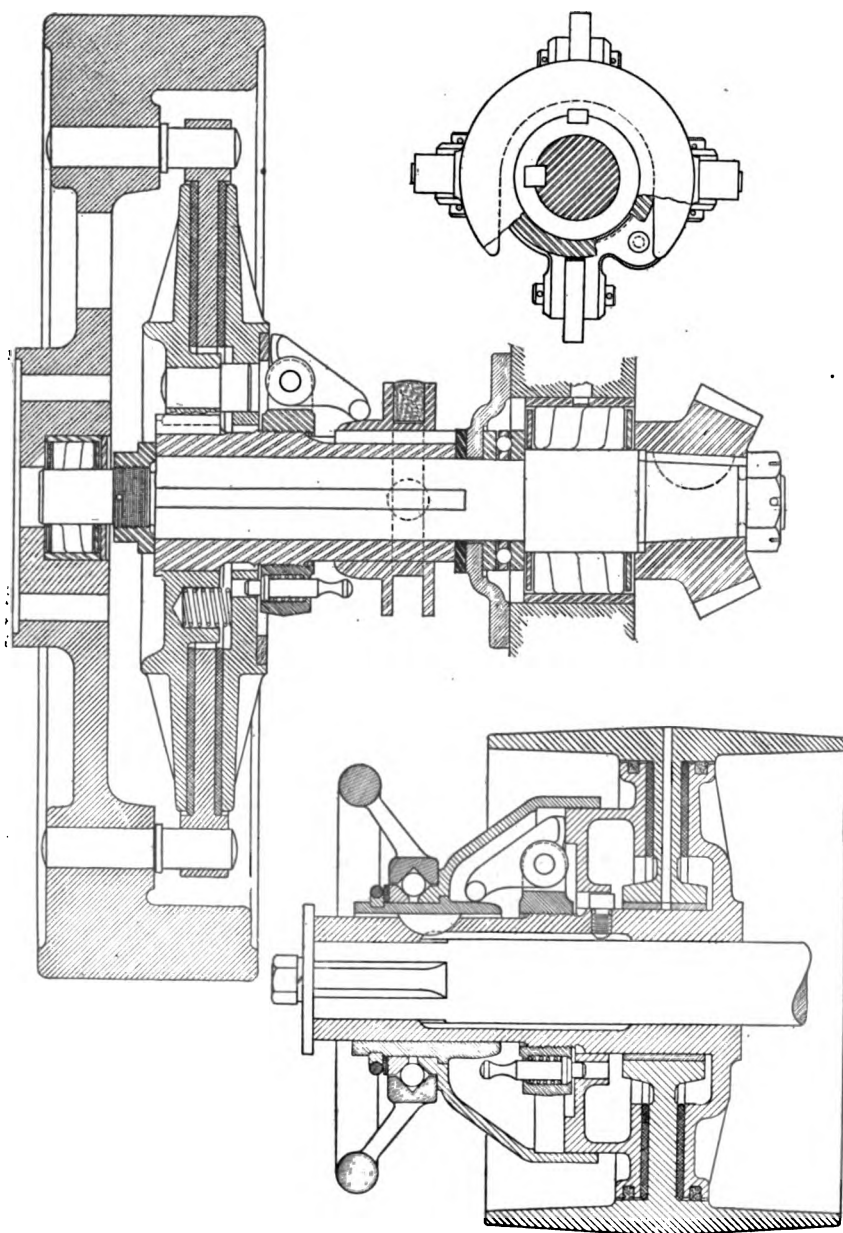
A feature of the clutch is the ease with which adjustments can be made. This is accomplished by turning the four-armed spider on the clutch sleeve, after the spring-retained locking pin has been withdrawn. There is a circle of twelve equally spaced holes in the rearward driven disk for this locking pin, and very fine adjustments are therefore possible. These adjustments can be made without the use of tools, and even while the engine is running, though the latter procedure is not recommended.

This clutch can be secured to the flywheel without the use of cap screws; in fact no screws are used in the whole clutch, except when the latter is used in connection with a standard S. A. E. ring. In that case eight screws are used, to fit the regular tapped holes, and these screws hold the regular S. A. E. ring with the driving pins pressed into it. It is claimed for the clutch that it absolutely does not jerk, and that it has great pulling power. In substantiation of this latter claim it is stated that when mounted on a Wallis tractor, a three-bottom plow set to plow 8 in. deep could be started with the clutch pressed in with the little finger.

The illustrations show a typical mounting, the flywheel, driving pinion and bearings being, of course, no part of the clutch.

In addition to the clutch the Twin Disk Clutch Co. manufactures a clutch-pulley for tractors; that is to say, a combination belt pulley and friction clutch. In the majority of tractors the power for the belt drive is transmitted and controlled through the regular friction clutch which also controls the power to the driving wheels; but a few tractors, notably the Moline Universal, do not take the belt power through the regular clutch. It will be seen from the sectional view herewith that the clutch used in connection with the pulley is of the same type as that described above. The clutch is engaged by means of a steel cone, which is operated by a hand wheel containing a ball bearing, so that the operator may retain his grip of it whether the clutch is engaged or not. The same adjusting means is provided as on the larger diameter clutch. In

(Continued on page 780)



Sectional view and partial rear view of Twin Disk tractor clutch.  
Sectional view of Twin Disk clutch pulley



# What Langley Did for the Science of Aviation

Later Experiments with Quarter-Size and Man-Carrying Aerodromes Were But Partially Successful—No Sustained Flights Were Accomplished

## PART III

LANGLEY felt, when he had finished his work with models and had demonstrated the possibility of mechanical flight, that his work in the field was ended. He was tempted to proceed and to enlarge his efforts with a view to the construction of a man-carrying machine, but after careful consideration he decided not to do so. His original object had been to take up the subject of flight academically, to demonstrate that it was possible, and to determine and formulate the principles governing its accomplishment.

However, the natural desire to go on, coupled with the influence of pressure brought to bear upon him by some of those close to him, and more particularly by the Board of Ordnance of the United States Army, eventually induced him to undertake the construction of a machine capable of carrying a man. President McKinley was impressed with the possibilities of the flying machine as a military aid, and he, too, urged Dr. Langley to continue. He appointed a joint board of army and navy officers for the purpose of investigating and reporting on the plans which Dr. Langley had employed in obtaining flights with his models. This board returned a favorable report to the Board of Ordnance and Fortifications of the War Department, and Langley was formally requested to undertake the building and testing of a large machine, from which it was hoped to learn enough so

that a practical machine of military value might subsequently be constructed.

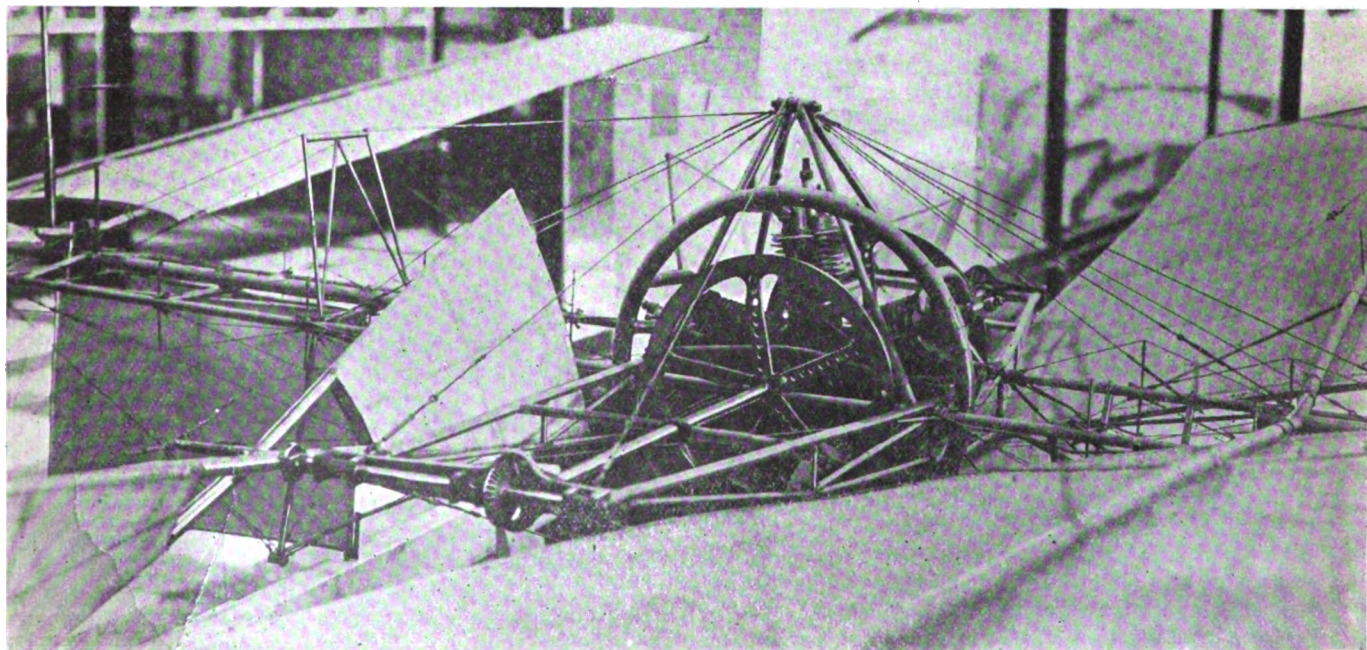
Even in the construction of small models, the matter of providing power plants which would generate sufficient power and not be of excessive weight had presented difficulties which were not easily surmounted. But Langley was able to overcome these difficulties by means which he clearly saw could not be employed on a larger scale to provide the necessary amount of power to drive the large plane contemplated.

It was also realized that there was small likelihood of finding the solution of the problem in any sort of a steam plant, and Langley was therefore forced to turn to the internal combustion engine, with which he had very little experience.

It was decided that a 12-hp. engine, which should weigh not exceeding 100 lb., was what should be obtained, and a contract was entered into with S. M. Balzer of New York in December, 1898, to build such an engine.

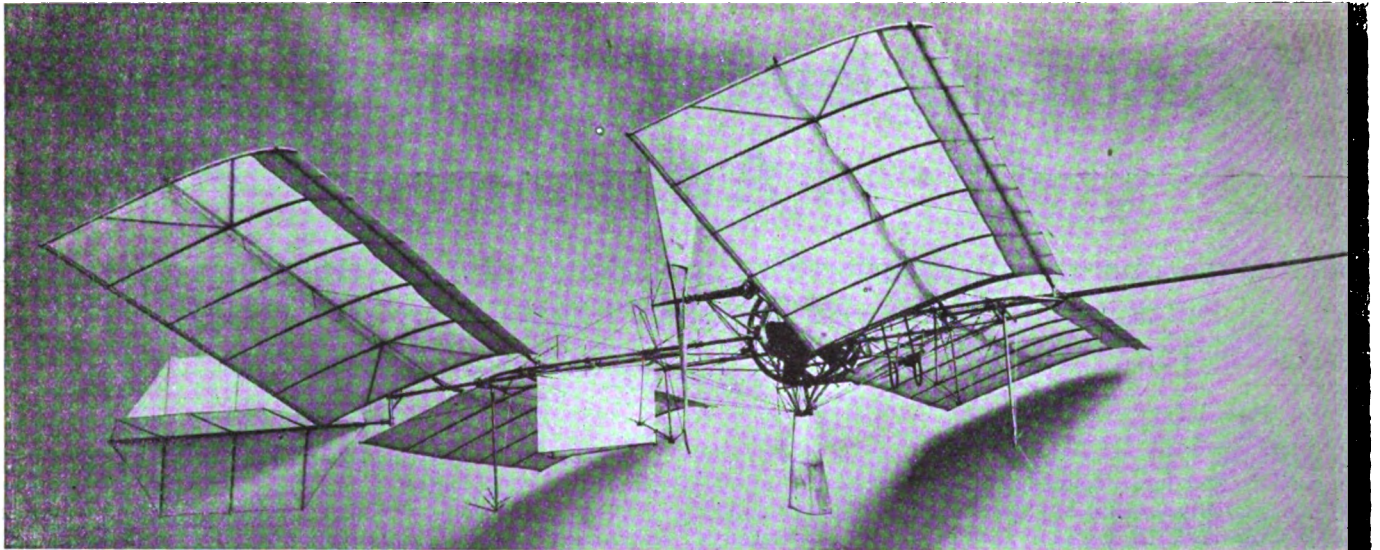
Langley did not feel that this would be of sufficient power to actually attain flight with a man-carrying machine, but he hoped with it to obtain results sufficient to furnish him with necessary data on such points as balancing and the best method of construction for a launching device.

In arriving at the size of the man-carrying machine,



*Engine used with the quarter-size model aerodrome. Cylinders were machined with integral radiating ribs, but, unfortunately, overheating continued*





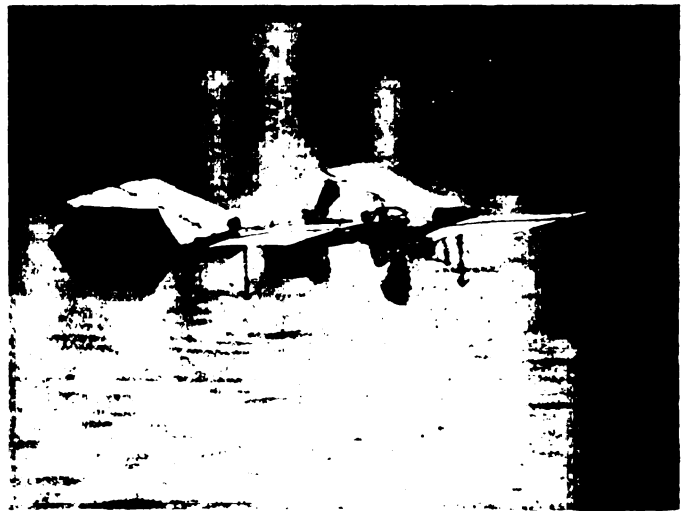
*Three-quarter elevation of quarter-size model aerodrome. This is the type with "single-tier" wing surfaces which proved efficient but were not sufficiently strong*

the assumption was made that models Nos. 5 and 6, which, it will be recalled, were the most successful of the large number of models which Langley constructed, were capable "of transporting a load of approximately 10 lb. more than their weight." And, "since the supporting surface of any aerodrome," to quote from the Langley Memoir, "would increase approximately as the square of the linear dimensions, in order to carry a man the aerodrome would need to be approximately four times the linear dimensions of these models. Calculations based on the results accomplished in the construction of the models, indicated that such an aerodrome would need to be equipped with engines developing 24 hp. The best that could reasonably be hoped for was that these engines would not weigh over 200 lb., and, therefore, allowing 40 lb. for fuel and the fuel tanks, it becomes necessary to bring the weight of frame, supporting surfaces, tail, rudder, propellers and other accessories within 250 lb., if the total weight of the machine, including 150 lb. for the aeronaut, was not in excess of 640 lb., or 16 times the combined weight of the model and its load of 10 lb. Although the problem of constructing the frames, wings and other parts within the limit of 250 lb. seemed indeed formidable, it was believed that the greatest obstacle in the production of such a machine would be that of securing a sufficiently light and powerful engine at the period.

The work of constructing the frame and wings proceeded almost to completion before the engine was delivered. The contract called for the completion of the engine on Feb. 28, 1889, but after that date, and even into May of 1900, the builder was forced to make a continuous series of changes in it. He experienced almost endless trouble in getting it to function properly.

The engine was of the rotary cylinder type. Tests made by Charles M. Manly or Dr. Langley in New York, in the shop of the builders in May of 1900, disclosed the fact that it would develop only 2.83 hp. and that even this output could not be maintained for more than a few minutes. Later changes increased the output to 4 hp., but it became apparent that no better results were to be obtained, and that there was no hope of using this engine in the experiments with the man-carrying plane.

When the construction of the frame and wings had reached the point where it became necessary to have the engine on hand, and the completion of the engine was not yet in sight, Langley decided that it would be best



*Quarter-size model aerodrome in actual flight, August 8, 1903*

to construct a model on the exact lines laid down for the large machines, but of  $\frac{1}{4}$  size. With this model he hoped to obtain data regarding the relative positions of the center of pressure, center of gravity and line of thrust, to be used in checking the conclusions arrived at theoretically. It was also hoped that this quarter-sized model could be constructed and tested out without interfering with the progress of the construction of the large machine. It was decided to have an engine of about  $1\frac{1}{2}$  hp. constructed on lines exactly similar to those of the larger engine which was then being constructed.

Further difficulties in securing successful operation of the larger engine finally persuaded Langley not only to have both the large and the small engine built in the shops of the Smithsonian Institution, but also to lay aside work on the large machine temporarily until the quarter-sized model could be completed and tried out.

The difficulty in obtaining exact information and worthwhile outside assistance from those who knew more of the science than he did, were encountered by Langley when he attempted the construction of the gasoline engine as had previously been encountered in working out the steam power plants for the small models.



Charles M. Manly, who was then with Langley and in charge of the experimental work, in writing of the difficulties encountered, said:

"At the time that this engine was being developed, it was practically impossible to obtain any outside information regarding the proper way of constructing it. The little that was then known had been learned through laborious experience, and at great cost, by the experimenters who were attempting to build automobiles, and was zealously guarded in the hope of preventing their rivals from utilizing the results of their labor. It was the known custom, however, of all engine builders at this time to use a separate spark coil and a separate contact maker for each cylinder of an engine, no matter how many cylinders there were.

"This multiplication of spark coils, which at that time were very heavy, not only added greatly to the weight but also had the same defect that the wipe-spark type of sparking arrangement had of being exceedingly difficult to so adjust that all of the contact makers would perform their functions at exactly the same point in the cycle for each cylinder."

To obviate these difficulties, Mr. Manly devised what was at that period a new multiple-sparking arrangement whereby only one battery, one coil and one contact maker were used for causing the spark in all five cylinders at the proper time. This form of sparking arrangement worked so satisfactorily that it was adopted for the engine of the quarter-size model and also for a new and larger engine which was built subsequently. Almost insuperable difficulties were encountered in obtaining suitable coils, spark plugs and other parts as the development of electric ignition had not progressed to any appreciable extent, and such parts as were ultimately available were very crude productions.

As a result of unremitting effort and the utilization of some of the parts of the engine which had been condemned, an experimental engine for the man-size aerodrome, was actually running on Sept. 18, 1900. As the cylinders were not water-jacketed they were provisionally

cooled by wrapping wet cloths around them, a makeshift which proved sufficient to keep the engine cool for but three or four minutes as a maximum.

This short time was, however, sufficient to enable brake tests to be made, the brake hp. developed under these conditions being  $18\frac{1}{2}$  at 715 r.p.m. The engine, with the cloths, weighed 108 lb.

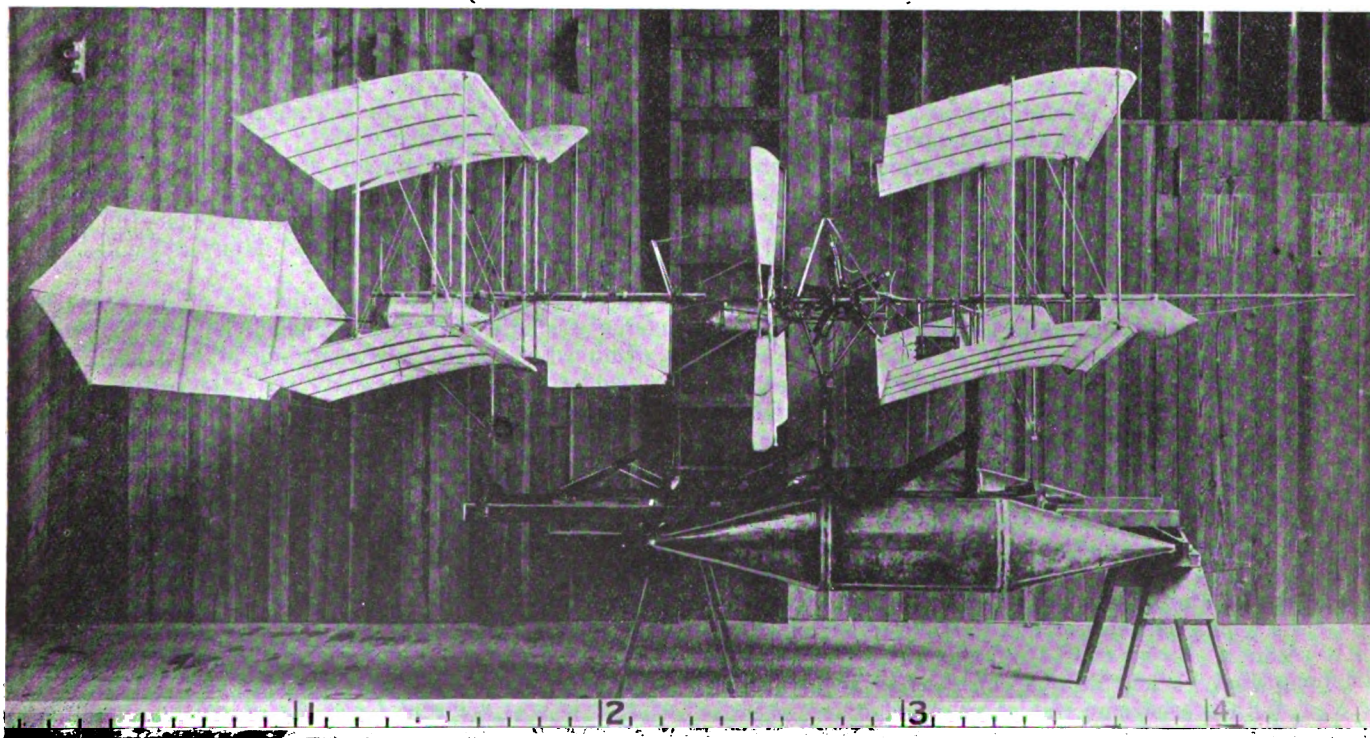
Of course the use of the wet cloths was but a temporary expedient, but the results proved so unsatisfactory it was decided to water-jacket the cylinders and test it out over more extended periods.

It proved impossible to braze the water-jackets directly to the cylinders and they were attached by means of stuffing boxes, a method which resulted in trouble from leaks, but when the work was done it was found that the engine developed  $21\frac{1}{2}$  hp. at 825 r.p.m., the total weight of the engine being 120 lb.

During the construction and testing of this engine it was proved that there were many parts which could be reduced in weight and for this reason it was decided to build an entirely new and larger engine and to install it in a man-carrying machine.

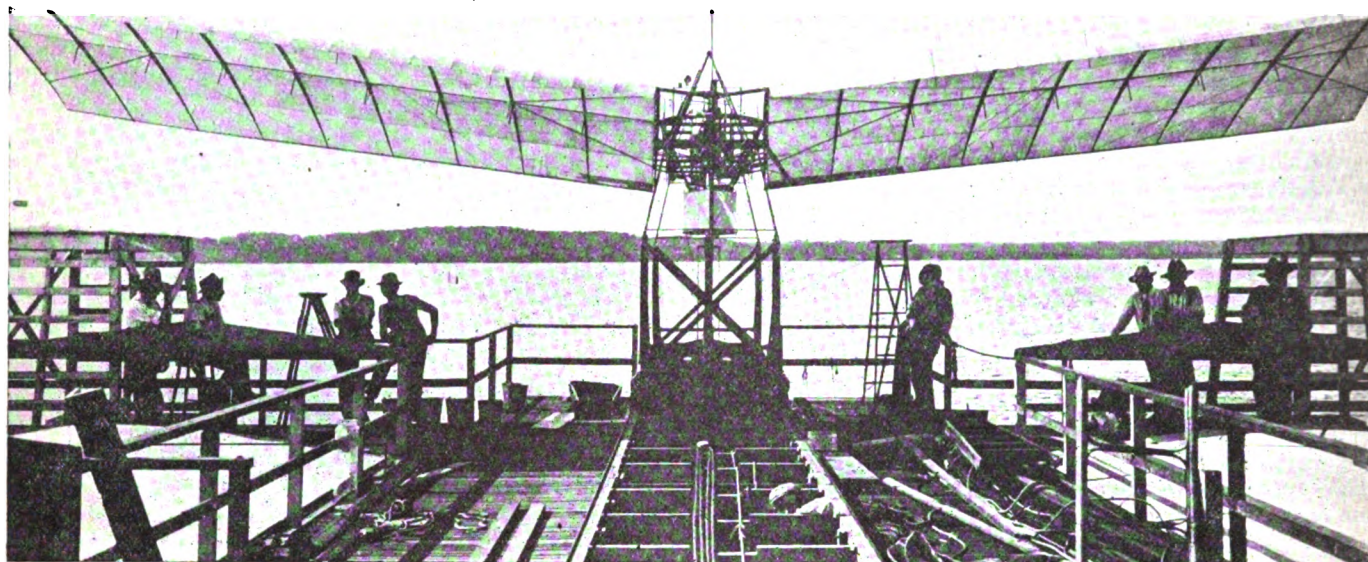
Before this point was reached in the development of the large model, as has already been intimated, the frame and wings of a quarter-size model were in course of construction. In originally planning this model the intention was to make all its linear dimensions exactly one-fourth of the large (or man-carrying) machine, but before the designs were completed it was realized that departures from the scale would be necessary both in the frame and in the propellers, which were increased in size to accommodate the engine and the lifting power. The frame, with these modifications, was completed in June, 1900, but no engine was ready.

As the result of much labor and the utilization of available parts from the small engine which the New York builder had failed to complete a reconstructed engine with stationary instead of rotating cylinders was produced. This developed, when working at its best, between  $1\frac{1}{2}$  and 2 hp., as measured by absorption dynamom-



Quarter-size model aerodrome equipped with superposed surfaces. Note the floats attached to the launching car. The plan of starting from the water does not seem to have been actually tried





*Man-carrying aerodrome on launching car with front wings in place and guy-wires adjusted. This machine made very brief flights on two occasions*

eters, but unfortunately it was found impossible to maintain this power steadily for more than 30 seconds. It was thought possible that by having everything ready for a flight the aerodrome might be launched before the cylinders began to heat seriously and thus the increased cooling caused by rapid motion through the air would enable a sustained flight sufficient to show whether the balancing was correct or not to be made.

Adhering to his theory that where a successful method of conducting an experiment has been discovered only after a long series of failures it is best to continue to use that method rather than to change to some untried plan, Langley decided to keep to his original plan of launching the aerodrome from the top of a houseboat, but in this instance he so far deviated from his rule as to construct floats which were to be attached to the launching car of the quarter-size model in such a way as to convert it into a catamaran raft. These floats are clearly shown in one of the illustrations. In the same photograph may be seen the superposed wing-surfaces which had proved stronger than the single-tier surfaces in the tests of models 5 and 6, referred to in part II of this series.

It was originally planned to use these superposed surfaces without guy-posts, but as it was found that in this case they would have to be made with rigid instead of hinged joints it was eventually decided to use the latter and retain the guy-posts.

After many delays, due to a variety of causes, the quarter-size model was tested from a houseboat on the Potomac in June, 1901. The launching equipment worked perfectly, the aerodrome started on an even keel straight ahead against a light wind. When it had traveled about 100 ft., however, it began to descend slowly, maintaining an even balance and finally touching the water about 150 ft. from the houseboat. The aerodrome was in the air for between 4 and 5 seconds. On a second trial, made when the wings had been dried, it traveled about 350 ft. in 10 seconds. It was considered that these tests, though disappointingly brief, showed conclusively that the balancing of the aerodrome was correct and it was accordingly returned to Washington for the purpose of making new cylinders for the engine.

The new cylinders were constructed from steel tubing finally  $\frac{1}{2}$  in. thick, machined with integral radiating

ribs and having combustion chambers screwed and brazed on. With these cylinders the engine was kept relatively cool, but the valves were so small that the gas could not get in and out rapidly enough to enable the engine to furnish full power. The addition of an auxiliary air valve did not improve matters so far as prolonged running was concerned, heating and premature ignition occurring after running about 2 minutes. Before overheating occurred the engine developed 3.2 hp. on the brake at 1800 r.p.m. and even reached 5.1 hp. for a few seconds when running at 3000 r.p.m.

These changes and repairs were completed by October, 1901, but nothing further was done with the quarter-size model until April, 1903. Instead, it was realized that work on the large man-carrying aerodrome was so much more important that the quarter-size model in its completed condition was put aside and the construction and testing of the new large engine for the man-carrying machine were proceeded with.

It was decided to employ steel wherever possible in the engine and this was done with all parts except the bronze bushings for the bearings, the cast-iron pistons and the cast-iron cylinder liners. Many difficulties were encountered.

The engine consisted primarily of a single crankshaft having a single crankpin, the shaft having bearings in a drum which consisted essentially of two heads. Arranged around the crankshaft and attached at equidistant parts of the drum were five cylinders. Innumerable troubles were encountered with overheating, ignition, etc., and were overcome in turn. The finished engine, with two flywheels and cooling water weighed practically 207½ lb. and in its second series of tests it developed 51 hp. at 935 r.p.m. At tests in preparation for St. Louis Exposition the engine was run on three separate trials for a period of ten hours with a constant load of 52.4 hp. at 950 r.p.m. These tests were continuous except for a ten-minute stop to renew the supply of lubricating oil and to change the sparking batteries. As a matter of fact it was not sent to St. Louis as the engine tests were abandoned owing to lack of competition. Further shop tests were made during 1902 and during the early spring of 1903.

On June 14, 1903, everything for the field test being



readiness, the houseboat was towed to its mooring buoy in the middle of the Potomac about 40 miles from Washington. The flying weight of the aerodrome was 830 including the weight of the venturesome airman, Charles Manly. The total area of the wings or supporting surfaces was 1040 sq. ft.

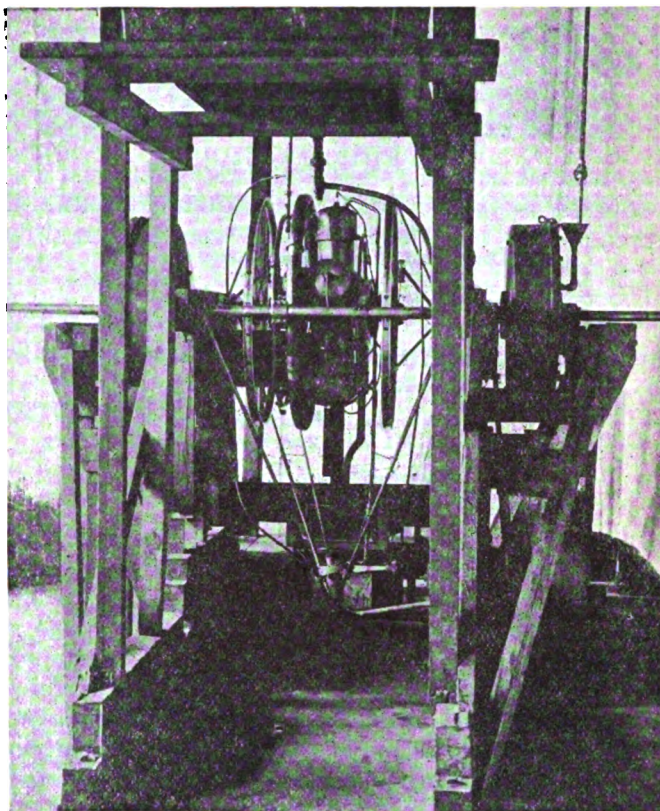
Many weeks of disappointing delay were caused by weather conditions, and it was not until Sept. 3 that it was considered feasible to make a test flight. On that day the metal frame of the aerodrome was hoisted to the top of the boat and placed on the launching car and wings, rudder, etc., made ready, but unfortunately the engine refused to start, owing to deterioration of the cells caused by damp weather, and it was necessary again to postpone the test.

It was also found that the glued joints in the cross-ribs of the large wings had been softened by the moisture from the fogs, and it became necessary to re-glue them and to bind the strips together with surgeons' tape. The guy-wires were readjusted to correct the warping of the wings.

### Actual Flight at Last

When hope of another calm day was almost abandoned, meteorologically ideal conditions came with Oct. 7, when the wind was blowing at the rate of about 12 m.p.h. The launching track pointed down the river, tugboats were in readiness to pick up the daring flier should he meet with an accident, and the aerodrome was then released down the sixty feet of track.

Mr. Manly, in describing his sensations, writes: "Just as the machine reached the end of the track the pilot felt a sudden shock, immediately followed by an indescribable sensation of being free in the air. This had hardly been realized before the important fact was intuitively felt that the machine was plunging downward at a very sharp angle, and he instinctively grasped the control which controls the Pénauud tail and threw it to its utmost extent in an attempt to depress the rear of the machine and thereby overcome the angle of the descent." Unfortunately Manly was unsuccessful in this, and, realizing he could not avoid a plunge into the river, he braced himself for the shock. The front wings were completely demolished as they struck the water, and Manly extricated himself from the machine by pulling himself up with the aid of the guy-wires. The aerodrome was rescued in a damaged condition, and inspection indicated that the primary cause of the failure was the fact that owing to the distortion of a metal cap on the front guy-post was not actually free from the launching car at the moment of starting, thereby causing the front edge of the front wings to be depressed and bend the metal framework.



*Dynamometer test of large engine for the man-carrying aerodrome*

Weather conditions continued to grow worse and storms interfered with the work, but eventually the houseboat reached Washington on Oct. 12 and the work of making the necessary repairs to the aerodrome was commenced.

Another attempt at flight was made on Dec. 8, when the river was studded with large blocks of floating ice. The wind was gusty, causing great delay in assembling the wings, and darkness was approaching before the actual attempt could be made. Unfortunately the flight was of brief duration, the aerodrome on leaving the track shooting upward in the air, assuming a vertical position with its bow upward, and then, being driven backward by the force of the wind toward the houseboat, where it turned over and came into the water on its back. Manly, who wore a cork-lined jacket which caught in the framework of the machine, had a narrow escape from drowning, but succeeded in freeing himself and getting to the surface, where he was picked up by a boat. The aerodrome was salvaged by tugboats, but was so seriously injured in the process that it was impossible to determine the precise cause of the accident.

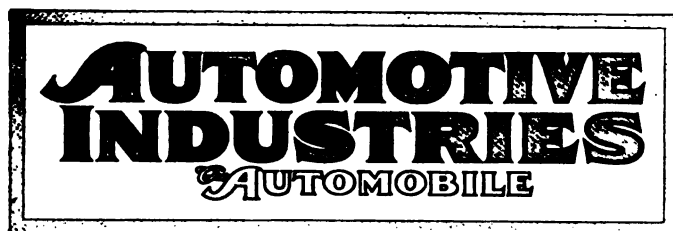
Professor Langley at this point felt he could not approve of further expenditures from any Smithsonian fund, Mr. Manly's efforts to obtain financial assistance for purely scientific work proved unsuccessful, and for these reasons, and although success seemed about to crown the efforts of years, experiments were reluctantly abandoned. Langley, the genius who believed implicitly in the possibility of flight with a heavier-than-air machine, unfortunately did not live to see its accomplishment.

That Langley was fully justified in his faith in the possibility of flight in a heavier-than-air machine was demonstrated to the full seven years after his death, when his man-carrying aerodrome rose in the air, piloted by Glen H. Curtiss.

*(To be continued)*



*First of the two flights of the man-carrying aerodrome. Charles M. Manly was the pilot*



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## Extension of the Aerial Mail Service

A MOST gratifying piece of news comes from Washington, namely, that immediately upon the conclusion of the war an aerial mail line will be established between Chicago and Denver, which may be extended to the Pacific Coast. From all reports the aerial mail service between New York, Philadelphia and Washington, which has now been in operation for practically half a year, has been an all-around success, and the only thing which prevents the immediate establishment of new lines is the inability to spare pilots and machines from the military establishment. But with the coming of peace this obstacle to the expansion of aerial mail service will be eliminated and the aircraft industry will certainly do its best to provide machines of the most suitable type, for the carriage of important mail matter is the most promising peace-time application of airplanes now in sight.

From Chicago to Denver is a distance of approximately one thousand miles, and at the same rate of speed as is maintained between New York and Washington should be covered in about 12 hr. The country between the two cities is for the most part level and makes for ideal conditions in aerial navigation. Difficulties will be encountered when it is attempted to extend the line from Denver west to the Coast, as then two mountain ranges will have to be crossed, but with the present development of aerial equipment these should not be a serious obstacle.

The Post Office is to be congratulated upon the success it has made of the New York-Washington line and the foresight it is showing in planning new lines at the present time for use at the end of the war, so that our aircraft industry may be switched from war-work to peace production with the least disturbance and at the same time the country's commercial interests may at the earliest possible time enjoy the advantages of high-speed aerial mail service.

## Encouraging Research Work

ONE effect of the war has been to bring strongly to public attention the great value of scientific and industrial research. It was the extensive research done by large firms in Germany that enabled that country to build up world-wide monopolies in such industries as aniline dyes, optical glass, etc. England previous to the outbreak of the war was dependent upon Germany for products of many kinds which were absolutely indispensable in warfare, and the awakening when it was realized that all sources of supply for these products had suddenly been cut off was a rather rude one. It was then realized that not sufficient attention had been paid to scientific work as related to industrial processes, and that if England wanted to maintain its position as a leading industrial country she would have to mend her ways. As a result, during the past two or three years British engineering papers have devoted much space to the subject of research, and especially to co-operative research by associations of firms in particular industries.

Research work is necessarily expensive, and only very large industrial organizations can afford to maintain a competent staff with proper equipment. Probably one of the reasons why England has lagged behind in this development is that the great majority of her manufacturing concerns are of moderate size. Naturally, all of the firms engaged in the same line of industry are confronted by much the same problems and if some of these problems can be investigated on a co-operative basis it will be of advantage all around. Heretofore industrial concerns have done their research and experimental work individually and have jealously guarded the results.

Strictly scientific research work has in the past been confined almost entirely to the universities, and it must be admitted that most of the great scientific discoveries have been made in university laboratories or at least by men connected with such insti-



tutions. Recently the complaint has often been made that the staffs of the universities, as a rule, are not in sufficiently close touch with practical developments to enable them to produce the results desired by the industries. They often pursue scientific work for its own sake and not because the results may be of practical value.

Government encouragement of scientific research is not by any means a new development, for such government-supported institutions as our own Bureau of Standards, the British National Physical Laboratory and the German Imperial Physical-Technical Institute have done much work that has been helpful in the development of industrial processes and products. During the war the activities of these institutions have been greatly extended, war requirements having made it necessary to get quick solutions of many important industrial problems. But instead of there being a let-up in this work at the close of the war, there will most likely be further expansion of it. Many industries that formerly were conducted by rule of thumb methods are getting onto a scientific basis and this will emphasize the need for research work.

The British scheme of industrial research associations provides for this. A fund of a million pounds sterling has been voted by Parliament from which grants will be made to such associations for work approved of by the Advisory Council on Scientific and Industrial Research. One of the great problems which will be attacked by one of these associations is that of a home produced motor fuel. The organization of the committee and the voting of the fund marks a step in government encouragement of industry of which we are likely to see much more after the war.

## Tractor Sizes

**I**NCREASING evidence is accumulating that the big demand in the tractor field in the future will be for a three-plow machine. There has been in the past a tendency to cut up farms into smaller ones, which was perhaps a direct result of the increase in population, but it is very much to be doubted whether this will continue if farming is revolutionized by the general adoption of power methods. This opinion is based not merely on theoretical reasoning but is supported by the experience of large numbers of tractor-owning farmers. A three plow tractor is the smallest size which is capable of delivering sufficient belt power for operating a separator, and this is a most important point, now that small "individual" threshers are rapidly ousting the large steam-operated custom outfits. Moreover, the three-plow tractor does so much more work than a two-plow horse outfit that the saving in operator's time is quite an item. Just at present the greatest inducement to the farmer in buying a tractor is the saving in manpower which it makes possible, and the three-plow is really the smallest outfit that affords an appreciable saving in this respect. Aside from the saving in operator's time there is undoubtedly a gain in mechanical efficiency because the two-plow trac-

tor, for instance, has to propel itself a 50 per-cent greater distance per acre plowed than the three-plow, and unless it weighs one-third less, which it seldom does, the energy spent in moving the tractor around the field is greater in the case of the smaller machine.

Every theoretical argument that can be advanced in favor of the three-plow machine, as compared with smaller ones, holds equally when applied to the four-plow, and where the farmer has sufficient acreage a four-plow and even larger outfit is advisable. But it appears from the testimony of farmers who have been using tractors that a three-plow outfit can handle the work of the average corn belt farm, of 160 to 320 acres, very well.

## "Rearing" of Tractors

**A** TRACTOR in its make up is very much like an automobile, only it is geared down much more, and consequently the force component of the power at the driving wheels is much greater and the speed component correspondingly smaller. Like all other machines of great weight and power, it involves certain dangers to the operator, and while in an automobile the risks of personal injury are intimately connected with the speed of the machine, in the tractor they are more related to the enormous torque impressed upon the driving wheels.

It has long been known that in a tractor, when the power is applied to the drive, weight is automatically shifted from the front to the rear wheels and the machine has a tendency to "rear." Under all ordinary conditions of operation the turning moment due to this torque reaction is not equal to the opposing weight moment around the rear axle, and there is no other result than that the steering may become somewhat erratic owing to the front wheels being pressed insufficiently against the ground.

However, in the case of extra hard pulls the forward part of the tractor may possibly "rear up," and such an occurrence naturally involves serious risks for the driver. The chance of rearing is closely connected with the distribution of weight and with the wheel base. It is less the greater the proportion of the weight that normally rests on the front axle and also the longer the wheelbase.

Rearing, of course, is also influenced by the hitch or drawbar attachment, for if the line of drawbar pull passes above the rear axle center line it tends to promote rearing, whereas if it passes below it tends to prevent it.

This question of the lengthwise stability of tractors demands the serious consideration of designers. It would be possible to provide safeguards, such as skids extending rearwardly and downwardly from the rear end of the frame. However, the provision of sufficient inherent stability by making the wheelbase fairly long and placing an ample amount of weight forward would seem to be preferable. A study of weight moment around the rear axle in tractors of different horsepower ratings should be profitable in this connection.

# □ Latest News of the

## Wright-Martin Earns \$540,678

Operations for 13 Months—  
Hispano Engine Production  
to Be 750 Per Month

NEW YORK, Oct. 31—The Wright-Martin Aircraft Corp. made net profits of \$540,678 during the 13 months ending June 30, which is looked upon as a substantial profit in view of the fact that the company's operations in the 7 months from May 31 to Dec. 31, 1917, showed a deficit of \$189,000. In the following 6 months, however, net profits were \$729,678, wiping out the loss and making a net profit for the period as given. The report points out that because operations are on a cost-plus basis it is difficult to show the amount of gross business in a given period.

During this 13-month period practically the entire resources of the company have been used to produce Hispano-Suiza engines for the United States Government. About a year ago the production of Simplex automobiles was discontinued and this work will not again be taken up until after the war. An order for 450 Hispano-Suiza engines for the French Government was completed about a year ago and since July, 1917, the company has received orders from the United States Government for 7500 engines of the same general type to be produced at the New Brunswick plants and for 5000 of the new 300-hp. engines to be produced in another factory prepared at the expense of the Government. Including the original French order, the company has produced approximately 4000 engines with spare parts. At present the output of the New Brunswick plants is about 600 engines per month, and it is estimated that the maximum output of 750 per month with spare parts will be reached early in 1919.

"For the production of the new 300 hp. engine," says the report, "the Government has provided the company with the use of the factory previously owned by the General Vehicle Company at Long Island City, N. Y. These facilities have been very much enlarged and equipped with thoroughly modern machinery. The tooling is now nearly completed for the initial deliveries which will start at an early date, and the volume of production from this factory will reach large proportions by the summer of 1919. These facilities have been provided entirely at the expense of the Government and are its property.

"In addition to these two factories, exclusively operated upon Hispano-Suiza motors, the Pierce-Arrow Motor Car Company of Buffalo, N. Y., has been sub-licensed at a reasonable rate of royalty to produce a considerable number of the 300 hp. motors for

the United States Government. The greater part of the facilities of the H. H. Franklin Manufacturing Co. of Syracuse, N. Y., will also be engaged in making parts for these contracts as a sub-contractor.

"In order to obtain the output of 150 hp. and 180 hp. motors required, extensive additions to the company's factory at New Brunswick have been necessary. The last of this development work will be completed by December of this year and will provide one of the best equipped aeronautical motor factories in the world. When this work is completed, the company will have a plant investment of something over \$5,500,000, made up of about \$2,000,000 pre-war plant and the remainder of increased facilities provided for the performance of these contracts. The contracts with the Government provide for either special depreciation or liquidation of such increased facilities, so that when final adjustments under the company's contracts have been completed the company will not be burdened with an undue plant investment.

"The company's interests are also adequately protected in the event of any or all of these cost-plus contracts being cancelled.

"After the period of experimental development on the 150 hp. motor had been passed, the company set up as a deferred charge a reasonable portion of the cost of this development which it is absorbing at the rate of \$180 per motor." All directors were re-elected.

### PROFIT AND LOSS STATEMENT

Income .....	\$2,216,574
Depreciation .....	366,869
Amortization of patents .....	329,650
Hispano-Suiza motor development written off .....	479,577
Balance .....	\$1,040,678
Reserve for war profits, income and other taxes .....	500,000
Net profits .....	\$540,678

### CONSOLIDATED BALANCE SHEET

	Assets	
	June 30, 1918	May 31, 1917
Property and plant acc't. ....	\$3,408,504	\$2,332,933
Cash .....	2,102,682	2,573,959
Accts. and notes receiv. ....	584,605	262,112
Due from U. S. Gov't. ....	4,388,039	
Inventories .....	384,927	1,819,887
Investments .....	50,884	16,000
Deferred charges .....	72,114	178,281
Patents .....	675,338	1,004,271
Hispano-Suiza motor, dev. costs .....	689,704	1,110,730
Total .....	\$12,356,797	\$9,298,173

### Liabilities

*Common stock .....	\$4,542,855	\$4,014,566
Preferred stock .....	5,000,000	5,000,000
Simplex Co. outstanding shares .....		1,800
Res. for war taxes, etc. ....	500,000	13,575
Accounts payable .....	1,644,736	242,017
Accrued wages, etc. ....	669,206	26,215
Total .....	\$12,356,797	\$9,298,173

\*\$97,558 shares, no par value.

### To Make Airplane Parts

DETROIT, Oct. 29—The newly incorporated B. & H. Machine Products Co., 1161 Ellery Street, will confine its efforts to government machine production work entirely, manufacturing parts essential to airplane and truck engines.

## American Exporters Convene

Building Up of Foreign Trade  
Requires Education, Financial  
Help and Advertising

NEW YORK, Oct. 31—The necessity for proper and adequate financial assistance, the need of thorough education both of foreign buyers and those who come in contact with them, and the value of systematic advertising were the keynotes of the ninth annual convention of the American Manufacturers Export Association which opened here yesterday. The gathering was one of the largest in the history of the organization, nearly 1500 delegates being in attendance. For the first time the meeting was thrown open to the general public, having heretofore been closed to members of the association.

Questions of adequate financial assistance are paramount in the opinion of Lewis E. Pierson, president of the Irving National Bank, who presided at one of the sessions; and most important under this subject comes the more general use of the trade acceptance.

"We all realize that the demands of the future will require that national resources be kept in a most highly available condition," said Mr. Pierson, "but at the same time we continue the employment of commercial credit practices, among which the open account is a conspicuous illustration, which in their operations tend to render a large portion of these resources unavailable for the business purposes they are supposed to serve, while the acceptance method, of obvious merit in this connection, only during the past year has been able to demand serious consideration from American business and finance."

Foreign trade will never be built up to assume proportions which will insure American leadership without proper education, according to W. W. Nichols of the Allis-Chalmers Mfg. Co. Mr. Nichols said in part:

"It requires no argument to prove that the kind of farm trade which the U. S. establishes will depend upon the character of the education it employs in cultivating ideas and creating a wise appreciation adequate to an enterprise of such moment to the welfare of the nation. Education should be divided into two parts: The education of public opinion from its birth comes foremost because public opinion will shape all federal legislation to make or break our enterprise. And second, the peculiar education of the individual whose life work will be foreign trade."

"Unless a firm is prepared to set aside a certain sum of money for export advertising, map out some kind of a plan to spend it, and then go ahead and spend it, the matter is better left alone," said David L. Brown, manager of the Goodyear Tire & Rubber Co.

(Continued on page 769)

# Automotive Industries



## Can Sell Parts for Repairs

### War Industries Board Permits Sale When Used for Passenger Cars

WASHINGTON, Oct. 31—Following conferences here between members of the automobile industry and the War Industries Board, the board has decided that regardless of pledges exacted from electrical and ball bearing makers to sell their products to essential consumers only, manufacturers will act within the meaning of the pledge if they sell the parts to dealers and jobbers to be used for the repair and maintenance of passenger automobiles.

The conference was held because many manufacturers who had signed the pledge felt that it would be a violation of it to sell parts for the up-keep of passenger cars which are not on the essential list. The decision of the War Industries Board stating that Class C priority will be provided for parts for the repair and for replacements on passenger cars removes the restrictions from manufacturers and they may now make sales accordingly. In answer to a request that priority also be given to materials to be used in making repair parts for passenger cars, the board stated that since current requirements are being cared for, it would prefer to take the matter up at a later date prior to Jan. 1, 1919.

The conference with the board was preceded by a meeting of the various representatives of the industry at the National Automobile Chamber of Commerce offices in Washington, which was attended as well as the War Board conference by:

Hugh Chalmers, Detroit, vice-president, National Automobile Chamber of Commerce; Alfred Reeves, Washington, general manager, National Automobile Chamber of Commerce; Sidney F. Beech, Chicago, president National Association of Automobile Accessory Jobbers; N. H. Oliver, Chicago, Manufacturers' Division, National Association of Automobile Accessory Jobbers; F. W. A. Vesper, St. Louis, president National Automobile Dealers' Association; Bart J. Ruddle, Milwaukee, National Automobile Dealers' Association; C. E. Thompson, Cleveland, vice-president, Motor and Accessory Manufacturers' Association; J. G. Utz, Cleveland, Motor and Accessory Manufacturers' Association.

Automobile taxes and the possibilities of passenger car production after Jan. 1, 1919, were also discussed at the N. A. C. C. offices and will be taken up again in

the near future. Following are the decisions of the War Industries Board in complete text:

1. We have considered your suggestion provision be made for giving a degree of preference for materials for making repair parts for passenger automobiles in service, in addition to the provision which has been made for passenger automobiles and repair parts pursuant to letter of the War Industries Board of date, Aug. 24, 1918.

2. This division is advised by the Automotive Products Section that your current requirements of materials for repair parts are being taken care of, and that being so, this division would prefer not to change the current arrangement until the expiration of the period covered by the letter.

3. Prior to Jan. 1, 1919, you are invited to take the matter up again with this division and at that time, war conditions permitting, we will endeavor to give a degree of preference to you for materials to take care of repairs for all cars in service from that date forward.—Rhodes S. Baker, Assistant Priorities Commissioner.

1. We have given consideration to the matters which you have brought up relating to repairs to passenger automobiles and repairs and replacements to equipment to same.

2. Supplement No. 2, issued Oct. 15, 1918, to Circular No. 4, issued July 1, 1918, by this division, among other things provides Class C priority rating "for all necessary repairs to equipment, vehicles, implements and machinery of every nature whatsoever."

3. This division rules that repairs to passenger automobiles and replacement of parts, material and equipment therefor are included in the foregoing language; and that the making of repairs to such automobiles and the furnishing of parts, material and equipment to repair same is authorized.—Rhodes S. Baker, Assistant Priorities Commissioner.

### American Exporters Convene

(Continued from page 768)

"An appropriation for a given period of time and a schedule, are just as important abroad as they are in this country."

George Edward Smith, Royal Type-writer Co., was elected president, other officers elected being: vice-presidents, William Ingersoll, Robert Ingersoll & Bros.; H. L. Willson, Columbia Graphophone Co.; J. S. Lawrence, Lawrence & Co.; Julius Goslin, Joubert, Goslin Mfg. Co.; George H. Meyercord, Meyercord Co. Directors: H. S. Demarest, Greene, Tweed & Co.; F. S. Seiberling, Goodyear Tire & Rubber Co.; F. A. Taylor, S. S. White Dental Mfg. Co.; C. K. Anderson, American Wire Frabric Co.; J. A. Farrell, U. S. Steel Corp.; E. M. Herr, Westinghouse Electric & Mfg. Co.; A. C. Bedford, Standard Oil Co.; W. W. Nichols, Allis-Chalmers Mfg. Co.; W. C. Durant, General Motors Export Co.; W. L. Saunders, Ingersoll, Rand Co.; R. A. Shaw, National Aniline Chemical Co.

## Nation's Fuel Supply Adequate

### Fuel Administration States There Is More Coal Stored Than at Any Previous Time

WASHINGTON, Oct. 29—The nation's fuel supplies, assembled in preparation for an unusual winter, are adequate and well distributed, according to a statement made to-day by the Fuel Administration. Continued economy, however, will be necessary.

More domestic coal is in the hands of consumers at present, says the statement, than at any corresponding period of the previous year. The upper Great Lakes districts, which usually suffer from coal shortage, have received the greatest proportionate supplies, and all sections of the country, in fact, are stocked up with more coal than at the corresponding period in pre-war years.

### Expect to Save 50,000,000 Tons

Twelve million seven hundred thousand tons have been saved for war purposes by curtailment of less essential industries. For the first half of the coal year it is expected that 50,000,000 tons will be saved during the entire year.

"The Fuel Administration," stated Dr. Garfield, "approaching the winter season, was organized with stocks of coal on hand far in excess of stocks of other years. We are ready for an unusually severe winter, but we are still and shall continue to be dependent upon the co-operation of the people of the United States in conserving fuel, and upon the several agencies concerned in the production and transportation of fuel to enable us to carry through our program to the end of the year."

### Oil Shortage Caused by Overseas Demand

The oil situation, according to the report, will be somewhat acute this winter owing to the steadily increased domestic and overseas demands. Stocks on hand show 6,000,000 gal. of gasoline and naphthas and 9,400,000 gal. of kerosene for Sept. 1, 1918, as compared with 6,025,000 gal. of gasoline and naphthas and 11,600,000 gal. of kerosene on hand Sept. 1, 1917.

The solution of the oil problem is one of transportation. Tank ships are scarce and existing pipe lines are operating at capacity. Additional pipe line capacity is being built in Texas, but the transportation of this oil to the North Atlantic ports from the Gulf ports involved additional tank steamers which are not now available.



# Set Standards for Women Workers

## War Labor Policies Board Establishes Rules Governing Employment—Equality of Wages With Men and One Day Rest in Seven Required

WASHINGTON, Oct. 28—Labor standards for women engaged in war work have been established by the War Labor Policies Board. They include stipulations for 1 day rest in 7, 8-hour working days, equal wages with male workers, sanitary working conditions, one-half holidays on Saturdays, regulations for hazardous work and methods of employment of women. The standards are based upon past experiences observed by the board and are closely in accord with recommendations issued early in the war by the Quartermaster Department. All contracts of the federal departments will hereafter, by direction of the War Labor Policies Board, contain clauses requiring full compliance with State labor laws. Officials of the State Labor Department in each State will be deputized by the heads of the contracting departments of the Federal Government to co-operate with federal agencies in enforcing these provisions of the contracts. Following is the summary of the required standards:

### B. STANDARDS RECOMMENDED FOR THE EMPLOYMENT OF WOMEN.

#### 1. Hours of Labor

1. **Daily Hours**—No woman shall be employed or permitted to work more than 8 hours in any one day or 48 hours in any one week except that in cases of emergency women may work overtime provided that the total working day, inclusive of overtime, shall not exceed the legal working day in the state and shall never exceed 10 hours as a maximum, and provided that the total working week, inclusive of overtime, shall not exceed the legal working week in the state and shall never exceed 55 hours as a maximum. The time when the work of women employees shall begin and end and the time allowed for meals shall be posted in a conspicuous place in each room and a record shall be kept of the overtime of each woman worker.

2. **Half Holiday on Saturday**—Observance of the Saturday half-holiday should be the custom.

3. **One Day of Rest in Seven**—Every woman worker shall have one day of rest in every seven days.

4. **Time for Meals**—At least one-half hour shall be allowed for a meal if the working day is 8 hours or less. If the working day is longer than 8 hours at least three-quarters of an hour shall be allowed for a meal.

5. **Rest Periods**—A rest period of 10 minutes should be allowed in the middle of each working period without thereby increasing the length of the working day.

6. **Night Work**—No woman shall be employed between the hours of 10 p. m. and 6 a. m. unless the plant holds a special certificate issued for this purpose by the Secretary of War or the Secretary of the Navy with the approval of the Secretary of Labor.

#### II. WAGES

1. **Equality With Men's Wages**—Women doing the same work as men shall receive the same wages with such proportionate increases as the men are receiving in the same industry. Slight changes made in the pro-

cess or in the arrangement of work should not be regarded as justifying a lower wage for a woman than for a man unless statistics of production show that labor cost of the job in question is higher when women are employed than when men are employed. If a difference in cost is demonstrated the difference in the wage rate should be based upon the difference in production for the job as a whole and not determined arbitrarily.

2. **The Basis of Determination**—The minimum wage rate should cover the cost of living for a family and not merely for the individual.

#### III. WORKING CONDITIONS

1. **Comfort and Sanitation**—State labor laws and industrial codes should be consulted with reference to provisions for comfort and sanitation. Washing facilities, with hot and cold water, soap and individual towels, should be provided in sufficient number and in accessible locations to make washing before meals and at the close of the work day convenient. Toilets should be separate for men and women, clean and accessible. Their numbers should have a standard ratio to the number of workers employed. Workroom floors should be kept clean. Dressing rooms should be provided adjacent to washing facilities, making possible change of clothing and the care of clothing outside the workrooms. Rest rooms should be provided. Lighting should be so arranged that direct rays do not shine into the worker's eyes. Ventilation should be adequate and heat sufficient. Drinking water should be cool and accessible with individual drinking cups or bubble fountains provided. Provisions should be made for the workers to secure a hot and nourishing meal eaten outside the workroom, and if no lunch rooms are accessible near the plant, a lunch room should be maintained in the establishment.

2. **Posture at Work**—Continuous standing and continuous sitting are both injurious. A seat should be provided for every woman employed and its use encouraged. It is possible and desirable to adjust the height of the chairs in relation to the height of machines or work tables, so that the worker may with equal convenience and efficiency stand or sit at her work. The seats should have backs. If the chair is high a foot rest should be provided.

3. **Safety**—Risks from machinery, danger from fire, and exposure to dust, fumes or other occupational hazards should be scrupulously guarded against by observance of standards in State and Federal codes. First aid equipment should be provided.

4. **Uniforms**—Uniforms with caps and comfortable shoes are desirable for health and safety in occupations for which machines are used or in which the processes are dusty.

#### IV. HOME WORK

1. No work shall be given out to be done in rooms used for living or sleeping purposes or in rooms directly connected with living or sleeping rooms in any dwelling or tenement.

#### V. EMPLOYMENT MANAGEMENT

1. **Hiring, Separations and Determination of Conditions**—It has been demonstrated that the most effective results in the relationship between a company and its employees depend upon a personnel department

charged with responsibility for selection, assignment, transfer or withdrawal of workers and the establishment of proper working conditions. This is especially important at a time when the withdrawal of men for military service necessitates changes in personnel, including the more extensive employment of women.

2. **Supervision of Women Workers**—Where women are employed, a competent woman should be appointed as employment executive with responsibility for conditions affecting women. Women should also be appointed in supervisory positions in the departments employing women.

#### VI. CO-OPERATION OF WORKERS IN ENFORCEMENT OF STANDARDS

1. The responsibility should not rest upon the management alone to determine wisely and effectively the conditions which should be established. The genuine co-operation essential to production can be secured only if definite channels of communication between employers and groups of their workers are established. The need of creating methods of joint negotiation between employers and groups of employees is especially great in the light of the critical points of controversy which may arise in a time like the present. Existing channels should be preserved and new ones opened if required, to provide easier access for discussion between an employer and his employees.

#### VII. INTRODUCTION OF WOMEN INTO NEW POSITIONS

1. **Analysis of Occupations**—When the introduction of women into new positions is contemplated, each occupation in the plant should be carefully analyzed to determine whether women may be employed under existing conditions or what changes should be made to adapt it to women. This analysis should show what the job is, what it requires of the workers in strength, nervous energy, posture, skill and education, what the working environment is and what hazards can be eliminated or reduced. Attention should be centered especially on the following conditions which would render the employment of women undesirable if changes are not made:

- A—Constant standing or other postures causing physical strain.
- B—Repeated lifting of weights or other abnormally fatiguing motions.
- C—Operation of mechanical devices requiring undue strength.
- D—Exposure to excessive heat, that is over 80 degrees; or excessive cold, that is under 50 degrees.
- E—Exposure to dust fumes or other occupational poisons not inherent in the essential nature of the processes.
- F—Isolation employment or conditions involving moral hazard.

2. **Selection of Workers**—When the occupations have been selected in which it is desirable to introduce women, the selection of workers best adapted to these occupations through physical capacity, experience and other qualifications is as important as the determination of the conditions of the work to be done.

3. **Training**—Opportunities for training should be provided, since experience shows that the employment of women without preliminary training results in high labor turnover and reduction of output.

#### VIII. CO-OPERATION WITH OFFICIAL AGENCIES

The United States Government and State and local communities have established agencies to deal with conditions of labor, including standards of working conditions, wages, hours, employment and training. These should be called upon for assistance, espe-

cially in the difficult problems of adjustment brought by war conditions with the resulting necessity for greatly extending the employment of women.

Inquiries regarding the employment of women may be addressed to the Woman in Industry Service, Department of Labor, Washington, D. C., and these will be dealt with directly or referred to the official Federal or State Agency best equipped to give the assistance needed in each instance.

### Searching for Oil Pools

WASHINGTON, Oct. 28—The Mid-Continent, Texas, Gulf Coastal Plain and Wyoming regions are regarded as containing the greatest number of undiscovered oil pools in this country by the United States Geological Survey, Department of the Interior. In Wyoming the survey is mapping out anticlines and domes that probably contain oil, and the land in these areas will be opened to prospecting as soon as the bill before Congress providing for the leasing of such lands in the public domain is passed.

In the Mid-Continent field the Osage Reservation in Oklahoma is said to give promise for rapidly increasing the available oil supplies of the country. Examinations in this region by the survey are nearing completion and show the presence of many untested anticlines and domes, most of which will be found to contain commercial deposits of oil. Many good pools have already been developed in this section, but not half of the reservation has yet been leased for oil, and more than 1,160,000 acres belonging to the Indians remain to be opened. The Office of Indian Affairs is arranging to lease this land for development.

### Copper Price Unchanged

WASHINGTON, Oct. 28—The President has approved an agreement made between the copper producers and the War Industries Board that the maximum price of copper will be continued at 26 cents per pound, taking effect Nov. 1, 1918, and subject to revision after Jan. 1, 1919. This price is f.o.b. cars or lighters at Eastern refineries, f.o.b. cars or lighters at Pacific Coast refineries for Pacific Coast destinations, and f.o.b. cars or lighters at New York for shipping to Eastern or interior destinations from Pacific Coast refineries and from refineries in the interior of the United States. All shipments made after Jan. 1, 1919, are subject to any change in price taking effect after that date as made by the Price Fixing Committee of the War Industries Board. The maximum price of 26 cents is subject to the additional changes on copper shapes approved by the Price Fixing Committee on June 5, 1918.

### Chicago Office for "Kepuruber"

CHICAGO, Oct. 28—The Rubber Preserving Co., manufacturer of "Kepuruber," a liquid to prevent the deterioration of tires and other rubber articles, has established sales offices at 752 Otis Building, Chicago.

## Government's Prices for Trucks

### Complete List of Contracts Placed for "B" Trucks and "A" and "B" Bodies

WASHINGTON, Oct. 25—Following is the complete list, together with prices paid, of orders placed by the Quartermaster Department for class B trucks, class A truck bodies and class B truck bodies. In each contract on the B trucks the Government furnished the eleven major units:

#### B Trucks—Chassis

United Motors Co., Grand Rapids, Mich., 500.....	\$892.00
Signal Truck Co., Detroit, 500.....	960.00
Vim Motor Co., Philadelphia, Pa., 500	1,069.83
Winthrop Motor Truck Co., Winthrop Harbor, Ill., 500.....	1,147.50
Brookway Motor Truck Co., Cortland, N. Y., 1000.....	1,137.00
Denby Motor Truck Co., Detroit, 1500	1,132.57
Lewis Hall Iron Works, Detroit, 500.....	1,137.00
Republic Motor Truck Co., Alma, Mich., 2000.....	1,138.00
Bethlehem Motor Truck Co., Allentown, Pa., 1500.....	1,162.50
Diamond T Motor Car Co., Chicago, 2000.....	1,150.00
Rowe Motor Mfg. Co., Lancaster, Pa., 500.....	1,200.00
J. C. Wilson Co., Detroit, 500.....	1,200.00
Sterling Motor Truck Co., Milwaukee, Wis., 750.....	1,187.50
Indiana Motor Truck Co., Marion, Ind., 1500.....	1,162.50
Clyde Cars Co., Clyde, Ind., 500.....	1,200.00
Maccar Co., Scranton, Pa., 500.....	1,200.00
United States Motor Truck Co., Cincinnati, Ohio, 1500.....	1,162.50
Gramm-Bernstein Motor Truck Co., Lima, Ohio, 2000.....	1,500.00
Service Motor Truck Co., Wabash, Ind., 750.....	1,187.50
Standard Motor Truck Co., Detroit, 750.....	1,187.50
Atterbury Motor Car Co., Buffalo, N. Y., 750.....	1,187.50
Midland Motor Truck Co., Oklahoma City, Okla., 500.....	1,200.00
Velle Motor Corp., Moline, Ill., 2000.....	1,150.00
Selden Motor Truck Co., Rochester, N. Y., 2000.....	1,150.00

#### Class A Bodies

	Prices include troop seats and export crating.
Auto Body Co., Lansing, Mich., 3000.....	\$112.75
Dort Motor Car Co., Flint, Mich., 1000.....	135.50
Hercules Buggy Co., Evansville, Ind., 2000.....	143.00
Mitchell Motors Co., Racine, Wis., 1500.....	143.00
Grand Rapids School Equipment Co., Grand Rapids, Mich., 1500.....	143.00
International Harvester Co., Chicago, 2000.....	143.00
Glascock Bros. Mfg. Co., Muncie, Mich., 1500.....	143.00
Kuhlman Car Co., Cleveland, Ohio, 1000.....	143.00
Field Mfg. Co., Owosso, Mich., 500.....	143.00
Mulholland Co., Dunkirk, N. Y., 500.....	143.00
Highland Body Co., Cincinnati, Ohio, 500.....	143.00

#### Class B Bodies

	Price of body troop seats crated for export
Buick Motor Co., Flint, Mich., 3000.....	\$130.97
W. E. Stewart Body Co., Flint, Mich., 3000.....	130.97
Dunbar Mfg. Co., Chicago, 3000.....	132.00
Chevrolet Motor Co., N. Y., 3000.....	139.50
Biddle & Smart Co., Amesbury, Mass., 3000.....	141.00
Beaudette Co., Pontiac, Mich., 3000.....	150.00
Grand Rapids School Equipment Co., Grand Rapids, Mich., 3000.....	150.00
International Harvester Co., Chicago, 3000.....	150.00
Griswold Motor & Body Co., Detroit, 1000.....	150.00
Dort Motor Car Co., Flint, Mich., 1000.....	150.00

Monroe Body Co., Pontiac, Mich., 1000.....	150.00
Keystone Vehicle Co., Reading, Pa., 5000.....	150.00

### Immense Store of Manganese Ore

WASHINGTON, Oct. 26—More than 250,000 tons of manganese ore has been located by experts of the United States Geological Survey, Department of the Interior, in Jackson County, Oregon. The Survey has been examining deposits of manganese and manganiferous ores in various parts of the United States for the last two years, because of the limitation of shipping facilities which has reduced manganese ore imports from all sources other than the West Indies and Central America in 1918 one-third below those of 1917. There is a prospect that there will be further import limitations imposed in 1919.

The importation of the iron-manganese alloy ferromanganese has decreased in greater proportion and will probably soon be stopped entirely. To offset this decrease of manganese deposits in this country and the West Indies the Geological Survey has been examining them with the view of determining the availability of the ore. Domestic producers responding to the increased demand have raised production from 27,000 tons in 1916 to 116,000 tons in 1917 and it is probable that production in 1918 will be 185,000 tons.

Investigations in Oregon show the manganese oxides in quantities ranging from 15 per cent to 52.8 per cent in the ore collected in Jackson County. Car samples of two shipments of the concentrate ran 47.5 and 48.5 of manganese and assays of other samples of concentrates are reported as follows:

	Gold	Silver	Iron	Manganese	Phosphorus
1.....	0.08	11.1	1.2	52.5	0.09
2.....	.08	14.5	1.4	46.5	.207
3.....	.16	11.15	.9	52.8	.174

About 1500 tons of ore containing at least 15 per cent of manganese is "in sight." In addition, incomplete prospecting by drilling and by open cuts indicates that at least 4 acres are underlain by 10 ft. of ore, about 120,000 tons, containing probably 10 per cent of manganese. The surface indications in other parts of the district warrant an estimate that they may yield 130,000 tons of ore carrying at least 10 per cent of manganese, so that the probable reserves of ore of this grade amount to more than 250,000 tons.

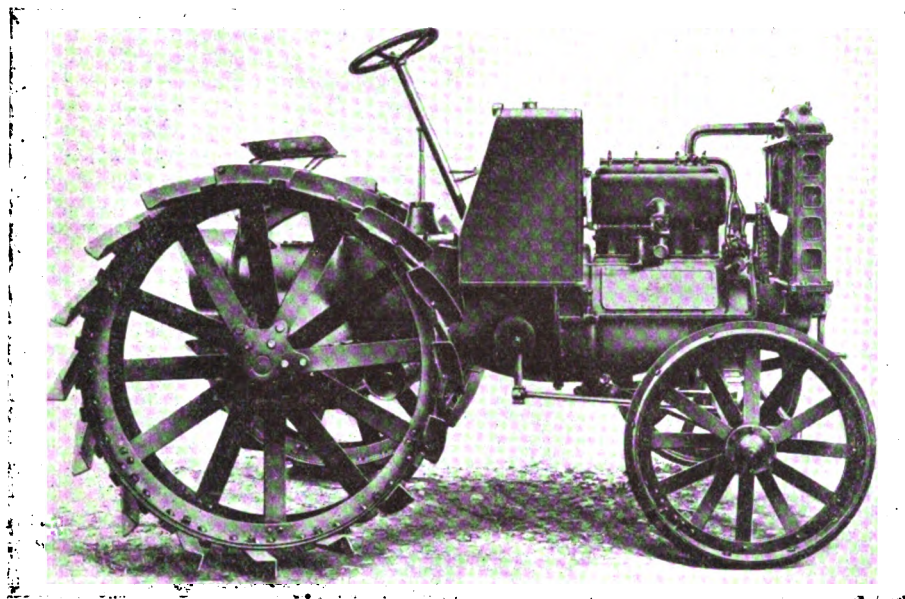
Manganese is one of the vitally important metals used both for war and non-war work. In the form of ferromanganese it is alloyed with steel to make manganese steel and the manganese dioxide is used in the manufacture of dry batteries. More than 95 per cent of all the manganese consumption in this country, however, is used principally in making all Bessemer and open-hearth steels, in which it is incorporated in the form of iron-manganese alloys, which serve as deoxidizers and purifiers of the molten metal.

The Lake Creek district of Jackson County, Oregon, where the greatest deposits have been found, has just lately undertaken the mining of manganese.

## Fiat Develops Worm-Drive Tractor

Four-Wheel Machine with Four-Cylinder Vertical Engine of Standard Type—Design Built Around Three Main Castings—Motor Car Construction Closely Followed

By W. F. Bradley



*Fiat kerosene farm tractor showing the use of three main castings and the elimination of any frame. The engine is an exceptionally clean design. The power pulley is at the rear end of the gearset*

**TURIN, ITALY**—Special Correspondence—It is an open secret that numbers of European automobile concerns will jump into the tractor field as soon as circumstances permit. The first to come out openly in this line is the Fiat Co. of Turin, whose production will be examined with interest not only on account of its intrinsic merit, but because the firm back of it has secured the position of the biggest purely automobile factory in Europe.

In laying out this tractor, the Fiat company appears to have been governed by

local conditions, which are of a most diversified nature. These run all the way from immense plains with hardly a pimple on them to little patches of land on the mountain side only accessible with great difficulty by anything on wheels.

The machine is of the four-wheel tractor type, with motor in front, front end suspended, rear end without springs and drive to the rear wheels by means of overhead worm and live axle. One of the outstanding features of this machine is that there are no frame members. Instead there are three main castings: an

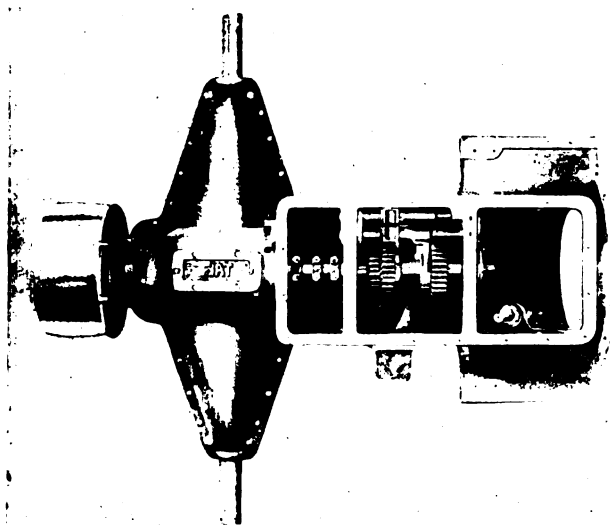
upper and lower half engine base, and a combined clutch, transmission and rear axle housing, this latter being bolted to the former, thus making what is virtually a one piece housing for the entire power plant and transmission.

The motor is the Fiat 3½-ton truck type, and although interesting, there is nothing new in its design, for it is a type which has been built in thousands for trucks supplied to all Allied armies. The cylinders are a 4-cylinder monobloc L-head casting of 100 by 180 mm. (3.9 by 7.08 in.) mounted on a horizontally divided cast-iron base. The magneto is driven off a transverse shaft, with the pump at the opposite end of the same shaft. Big aluminum inspection plates are bolted on the sides of the basechamber. Lubrication is under pressure to the three main bearings, the connecting rods and the wrist pins.

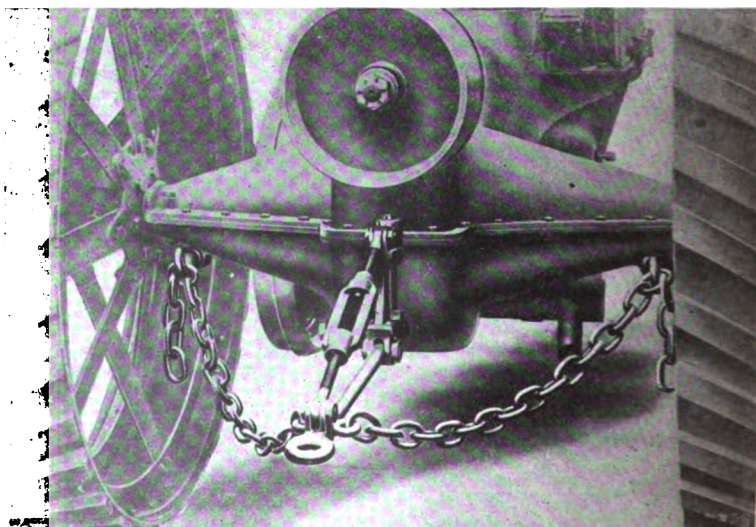
The carburetor is a Fiat type, as used on the trucks, bolted up to the right side of the cylinder casting and delivering its mixture through an integrally cast manifold. All the air is drawn in through the valve stem chamber, which is enclosed and fitted with wire gauze strainers for the admission of air. A special heating apparatus is fitted to the carburetor, enabling it to handle kerosene, which is the fuel generally used.

Gasoline is employed for starting only, and the small gasoline tank is carried inside the main kerosene tank mounted on the metal dash. A centrifugal governor limits the motor speed to 1100 r.p.m. Cooling is by means of a tubular radiator with bolted together header and base tanks; the cooling is assisted by a four-blade belt-driven aluminum fan.

In the second housing, which is bolted up to the engine basechamber, are contained a multiple disk clutch, the worm and sector steering gear, a three speed and reverse selective transmission and finally an overhead worm and worm wheel. The upper portion of this housing over the clutch, steering gear and transmission is removable for inspection purposes. Although one and the same casting, the rear axle housing is divided

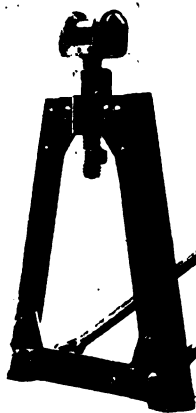


*The single casting which serves to house the transmission mechanism, rear axle and steering gear*

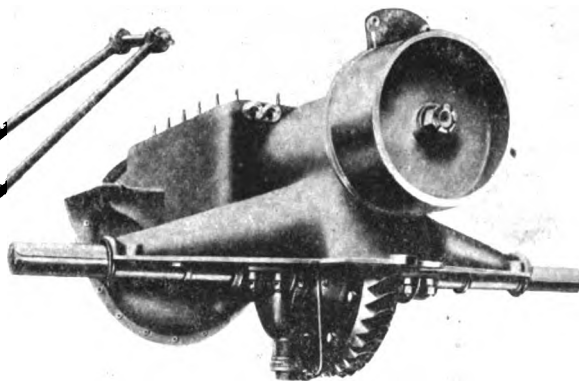


*Rear axle, drawbar attachment and arrangement of the power pulley on the Fiat agricultural tractor*

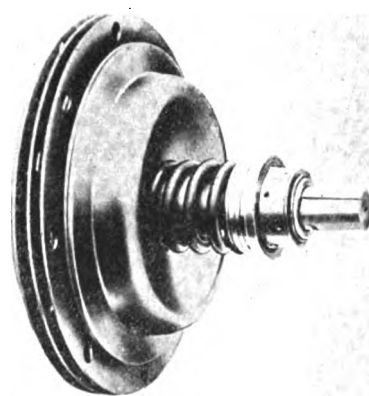




Permanent adjustable jack for removing one rear wheel to expose the power pulley



Fiat transmission mechanism in detail showing the mounting of the worm wheel and power pulley and the arrangement of the gear lubricating pump



Type of easily adjustable disk clutch used on the Fiat tractor

horizontally, the lower portion, which is attached to the upper by a series of bolts, being removable without in any way interfering with the axle. This gives complete accessibility to the worm wheel and the drive shafts. On the top of the housing there is an inspection cover immediately above the worm.

The rear wheels are built-up metal type of 51 in. diameter by 12 in. in width attached to the drive shafts by cone and key and made detachable. At the extremity of the worm shaft there is a 14-in. diameter pulley, with face width of 6½ in. This also serves as a brake drum with internal shoes. The big diameter wheels makes it impossible to use the drum. Thus a permanent adjustable jack is mounted under the axle, and after this has been lowered one of the wheels is withdrawn, making the pulley available for belt connection to any stationary machinery.

Spherical ball bearings are employed in the transmission, while the rear axle shafts are carried in bronze bushes, the lubrication of the entire rear axle being by pressure from a pump driven off the worm wheel.

The front of the tractor is suspended by a transverse inverted semi-elliptical spring. Automobile type steering is made use of, as on Fiat trucks, with the transverse tie bar in front of the axle. The only peculiarity is that the steering gear is inside the clutch housing. No wood is made use of in the construction of the tractor. There is a single seat, spring mounted on a steel column; ignition point is fixed, and throttle control is on one side of the metal cowl surrounding the fuel tank. The only instrument is a pressure indicator for the oil mounted on the top of the dash.

Rear wheels have a diameter of 51 in. and are fitted with detachable strakes. As these wheels are detachable, it is interesting to note that they weigh 600 lb. each, with the strakes. The front wheels, which are of same type as those at rear have a diameter of 32 in. and a width of 5 in. Total weight of the tractor is 5300 lb. Its maximum speed is 3.7 m.p.h.; on second gear speed is 2.1 m.p.h., and on bottom the tractor makes 1.2 m.p.h.

This tractor has already been submitted

to public trials in Italy, where it gave a very good account of itself. It operated on very heavy ground with three plows at an average speed of 2.4 m.p.h., when the average tractive effort was 2600 lb. On a very difficult portion of the ground the tractive effort was increased to 4600 lb. without the tractor showing any inclination to stall. The rate of plowing was 4550 sq. yd. per hr. to a depth of 7.8 in. Hauling an Osborne reaper and binder the tractor traveled at the rate of 3.7 m.p.h. and covered an area of 8370 sq. yd. in the 60 minutes.

#### Republic Truck Earns \$985,084

ALMA, MICH., Oct. 28—Earnings of the Republic Motor Truck Co. for the year ending June 30 were \$985,084; the Torbensen Axle Co. earned \$368,218 in the same period. These figures are after setting aside \$900,000 for excess profits and income taxes. Net sales of the Republic company totalled \$20,522,380, with manufacturing costs \$17,749,549, leaving a gross profit of \$2,772,831. The net profits, before deduction for taxes, amounted to \$1,485,083. Torbensen net sales were \$4,828,216 and the manufacturing costs \$3,750,012, leaving gross profits of \$1,064,115. The net profit before deductions for taxes was \$768,219.

#### INCOME ACCOUNT

Net sales .....	\$20,522,380
Manufacturing cost, etc.....	17,749,549
Gross profit .....	\$2,772,831
Other income .....	166,407
Total income .....	\$2,939,238
Expense and interest charges.....	1,454,155
Net profits .....	\$1,485,083
Preferred dividends .....	70,000
Balance .....	\$1,415,083
Previous surplus .....	1,304,081
Total surplus .....	\$2,719,164
Provision for war taxes.....	735,689
Exp. common stock issue written off .....	115,415
Profit and loss surplus.....	\$1,868,060.

The balance sheet of the Republic Motor Truck Co., Inc., as of June 30, 1918 (including Republic Motor Truck Co. of California), shows as follows:

#### ASSETS

	1918	1917
Plant, equipment, etc..	\$1,786,216	\$1,734,879
Investment .....	1,409,111	.....
Inventories .....	6,096,417	4,541,971

Accounts receivable ...	668,352	581,518
Due from officers and employees .....	.....	17,794
Notes receivable .....	35,314	13,347
Customers' deferred notes	116,281	51,969
Liberty bonds .....	36,175	3,160
Cash .....	421,460	441,035
Deferred charges .....	102,923	16,804
Total .....	\$10,672,249	\$7,402,467

#### LIABILITIES

Preferred stock .....	\$1,000,000	\$1,000,000
Common stock (no par value) .....	3,612,514	1,007,455
Mortgage payable by Cal. Co. ....	100,000	.....
Capital liabilities subordinated company .....	.....	726,500
Notes payable .....	700,000	770,000
Accounts payable .....	1,632,941	2,087,948
Accrued payrolls .....	69,873	88,898
Accrued commissions, bonuses .....	115,500	71,032
Accrued local taxes .....	84,992	42,955
Dealers' deposits .....	41,864	94,009
Due to Torbensen Axle Co. ....	946,505	.....
War tax provision .....	500,000	.....
Surplus .....	1,868,060	1,513,669
Total .....	\$10,672,249	\$7,402,467

#### Flies 4000 Miles in Zigzag Course from Gulf to Great Lakes

WASHINGTON, Oct. 29—Four thousand miles in the air in a zigzag course from the Gulf to the Great Lakes is the distance traveled by an Army flyer from Ellington Field near Houston, Texas, to Mt. Clemens, Mich. and return. The total hours of actual flight was 64. Nine days elapsed from the time he left Ellington Field until his return. Lt. John E. Davis was the pilot and he made the trip alone without mechanic and without changing plane or engine. He carried an extra gasoline tank in his plane, making the total capacity 50 gal.

Starting Friday at 1 p. m., Lt. Davis made Dallas for the night. From Love Field, Dallas, he flew to Memphis. Sunday at 8 p. m. he made Indianapolis by following the Mississippi north to St. Louis and swinging east by way of Springfield and Rantoul, Illinois. Here he was forced to take the ground in the dark without landing lights. The next morning he flew to Cincinnati and the day following to Mt. Clemens, Mich., by way of Dayton.

# Switzerland Has 6140 Vehicles

More Than Half Are Imported  
—Of Total, 4934 Are Cars  
and 1206 Trucks

NEW YORK, Oct. 7—At the end of 1917 there were 6140 motor vehicles in Switzerland, of which number 4934 were touring cars and 1206 motor lorries. Of the total, 2565 motor cars were of Swiss origin and 3575 were imported vehicles.

According to these statistics, for which the Automobile Club of Switzerland is responsible, there were 15 motor car firms in the Helvetic confederation. The number of foreign makes represented in that country is 43. The foreign firm having the largest number of cars in service in Switzerland is Fiat with 283 touring cars and 15 motor lorries. Although it is an Italian firm which heads the list with a big margin, France is first in the list of nations, with Germany second, America third, Italy fourth, and Belgium fifth. British built cars are not listed separately.

The following are the detailed figures, showing the number of cars according to make and country of origin:

## MOTOR VEHICLES IN SERVICE IN SWITZERLAND AT THE END OF 1917

Make and Country	No. of cars	No. of lorries
<b>Switzerland</b>		
Arbenz .....	5	87
Automobilwerke .....	2	74
Ajax A. G. ....	37	5
Berna .....	9	206
Clem Stella .....	58	14
Fischerwagen .....	89	10
Martini .....	635	77
Moser .....	16	..
Orion .....	6	70
Piccard-Pictet .....	428	20
Saurer .....	54	261
Sigma .....	92	2
Soller .....	..	2
Tribelhorn .....	112	57
Turicum .....	90	12
Others with less than 15 cars .....	20	15
	1653	912

<b>Germany</b>		
	No. of cars	No. of lorries
Adlerwerke .....	82	9
Benz .....	95	26
Bergmann .....	17	1
Loreley .....	25	..
Mathis .....	51	..
Mercedes .....	86	5
N. A. G. ....	27	5
Nekarsulm .....	15	..
Opel .....	143	13
Piccolo .....	25	1
Stoever .....	92	1
Others with less than 15 cars .....	104	10
	762	71

<b>France</b>		
	No. of cars	No. of lorries
Berliet .....	53	16
Brasier .....	65	18
Charron .....	42	2
Chenard & Walcker .....	29	1
Clement-Bayard .....	92	13
Cottin & Desgouttes .....	54	2
Darracq .....	20	9
De Dion Bouton .....	84	4
Delahaye .....	27	12
La Buire .....	44	14
Mors .....	20	..
Panhard & Levassor .....	26	6
Peugeot .....	220	11
Renault .....	221	35
Lorraine-Dietrich .....	25	4
Rochet-Schneider .....	125	10
Unic .....	25	6
Zebre .....	15	..
Zedel .....	175	2
Others with less than 15 cars .....	155	15
	1376	160

<b>Belgium</b>		
	No. of cars	No. of lorries
F. N. ....	78	4
Minerva .....	98	1
Others .....	2	..
	178	5
<b>Italy</b>		
	No. of cars	No. of lorries
Bianchi .....	94	8
Diatto .....	18	..
F.I.A.T. ....	283	15
Itala .....	29	4
Scat .....	24	2
Other firms with less than 15 cars .....	38	6
	486	35
<b>America</b>		
	No. of cars	No. of lorries
Buick .....	24	..
Ford .....	143	3
Hupmobile .....	29	..
Oldsmobile .....	2	..
Studebaker .....	34	1
Willys-Overland .....	24	..
Other makes .....	49	3
Make not indicated .....	175	16
	480	23

## Exports to Russia

WASHINGTON, Oct. 19—Applications will now be considered by the War Trade Board for the exportation of all commodities to Russia. A limited amount of cargo space will be available for shipments from the Pacific Coast direct to Vladivostok, and in allocating the space preference will be given to material covered by licenses issued on and after October 7, 1918, under conditions which the War Trade Board in Washington will define and discuss with exporters. Due consideration will be given to each particular transaction. In order to facilitate the consideration of applications, exporters are requested to state definitely on each application if the material is made up and ready for shipment and if so, its present location.

## U. S. Wants Tire Tape

WASHINGTON, Oct. 25—The Post Office Department has asked for bids for ½-in. tire tape in ¼-lb. rolls for use on Government-owned motor trucks. If the price does not hold good for the present fiscal year, the bidder is required to state the period of time it will hold good.

## Cleveland Galvanizing Changes Name

CLEVELAND, Oct. 30—Chain Products Co. is the new name of the Cleveland Galvanizing Works Co. There have been no changes in the personnel or management of the company.

# Petroleum Products Exports

September Figures Show Increases in All Items Except Lubricating Oil

WASHINGTON, Oct. 28—A study of the figures covering exports of petroleum products for the month of September last and for the nine months ending September of this year indicate a steady increase both in quantities and values, with the solitary exception of a slight reduction in the quantity of lubricating oil shipped abroad.

Taking the entire group of mineral oils as a unit, our exports for September, 1918, show an increase of 31.4 per cent as compared with September, 1917. Comparing the respective values, the increase is much more marked, it being no less than 80.2 per cent for the period in question.

A comparison of the exports by groups for the 9 months ending September, those for this year show substantial increases both in quantities and values.

Taking the gasoline and naphtha group alone for this 9-months period, the 1918 figures show an increase of 44.4 per cent in quantity and 64.9 per cent in value. Although the quantity of lubricating oil exported shows a slight reduction, its value for the 9 months of 1918 has increased by over 46 per cent.

## Bus Line for Tokio

TOKIO, JAPAN, Aug. 15—An extensive motor bus service is to be started in Tokio by Dec. 1 for both freight and passenger traffic. Eventually the service will be maintained by 180 passenger cars, each carrying 16 persons, and by fifty motor trucks for freight. The passenger fare will be 4½ cents with an extra half cent for transfers if needed. The route of the motor bus system will follow the principal street car lines of the capital of Japan. The company announces it is planning to buy the initial fleet of motor buses from American manufacturers by Oct. 1. Later the company will build its own buses at Tokio.

## Exports of Petroleum Products for Nine Months of 1918

	SEPTEMBER		NINE MONTHS ENDING SEPTEMBER	
	1918	1917	1918	1917
<b>EXPORTS BY GROUP</b>				
Mineral oils, gal. ....	263,841,657	200,687,535	2,090,563,381	1,896,220,077
Mineral oils, value. ....	\$30,304,963	\$16,809,054	\$257,775,115	\$171,740,585
<b>EXPORTS BY PRINCIPAL ARTICLES</b>				
Crude mineral oil, gal. ....	21,525,770	10,827,854	154,075,061	119,332,055
Crude mineral oil, value. ....	\$1,265,096	\$464,615	\$8,732,039	\$5,303,555
Lubricating oil, gal. ....	18,654,347	20,429,365	194,411,398	199,986,249
Lubricating oil, value. ....	\$6,393,658	\$4,096,455	\$56,025,872	\$33,361,187
Gasoline, naphtha, etc., gal. ....	44,994,857	20,050,699	422,618,927	292,648,681
Gasoline, naphtha, etc., value. ....	\$10,886,906	\$4,643,432	\$104,412,097	\$63,377,146

## Plan Chicago-New York Airplane Mail Service

WASHINGTON, Oct. 28—The New York-Chicago air mail route will start between Dec. 1 and Dec. 15, according to an announcement made here by Postmaster General Burleson. The city of Cleveland has established Woodland Hills Park as the air mail field and will construct a hangar costing \$10,000. Chicago has given the use of Grant Park as an aviation field, and the Aero Club of Illinois has tendered the use of Ashburn Field for hangars, workshops and bunk houses for the mechanical forces. The Chicago Association of Commerce has appropriated \$15,000 for the construction of the air-mail hangar. Bryan, Ohio, the intermediary stopping point between Chicago and Cleveland, has furnished the Post Office Department with suitable ground and hangar.

The New York-Chicago route will be laid out in 3 legs, the first from New York to Bellefonte, Pa., a distance of 215 miles, with an emergency station and machine midway at Lehigh; the second leg from Bellefonte to Cleveland, a distance of 215 miles, with an emergency station at Clarion, Pa., a distance of 87 miles from Bellefonte; the third leg from Cleveland to Chicago, a distance of 323 miles, with an intermediate mailing station at Bryan.

The plan of operation during the unfavorable winter months contemplates the airplanes leaving Chicago and New York at 6 o'clock each morning, with a capacity of about 20,000 letters, and making the trip, including all stops, within a period of 10 hours.

### 103 Planes Bomb Los Angeles

WASHINGTON, Oct. 28—One hundred and three airplanes leaving March Field, Riverside, Cal., in battle formation made a flight of 160 miles without accident. This large squadron bombed Los Angeles with Liberty Loan literature. The total mileage of the trip was 16,000, made without a fatality or the loss of a plane. Accompanying the air fleet was a hospital plane and another plane carried an official photographer, who made moving pictures while en route. This is the largest number of planes that ever visited an American city. All of the planes were of the Curtiss JN-4D training type. Approximately 3000 gal. of gasoline were consumed.

### Chicago-Denver Airplane Mail

WASHINGTON, Oct. 25—The aerial mail service operated by the Post Office Department will be extended immediately after the war to include a route between Chicago and Denver, with a possible extension to San Francisco.

### Five Aviation Fatalities

WASHINGTON, Oct. 28—During the week ending Oct. 19 there were reported five fatalities in aviation training fields in the United States. Two deaths oc-

curred at Payne Field, West Point, Miss., and there was 1 each at Carruthers Field, Benbrook, Tex.; Langley Field, Hampton, Va., and Post Field, Fort Sill, Okla. There were no deaths from flying accidents reported from any of the other 23 fields. Each death represents 3544 hours of flying, or 283,620 miles of air travel.

### Godman Field in Kentucky

WASHINGTON, Oct. 28—The aviation field at Camp Knox, Stithon, Ky., has been named Godman Field in honor of First Lieutenant Louis K. Godman of the Air Service, who was killed in an airplane accident recently.

### Hendee Profits \$645,225

NEW YORK, Oct. 28—During the fiscal year ending Aug. 31 the Hendee Mfg. Co., Springfield, Mass., earned undivided profits of \$645,225, as against \$1,142,250 during the previous year. At the same time good will, which last year was capitalized at \$8,300,000, is this year put down for \$7,000,000. Following is the condensed balance sheet comparing last year with this year:

Assets		1917	1918
Real estate, buildings, etc. ....	\$1,546,483		\$1,556,944
Good will .....	8,300,000		7,000,000
Investments .....	908,766		670,816
Inventories .....	2,562,718		3,083,085
Due from customers...	758,885		1,017,968
Due from branches....	102,729		234,380
Cash .....	171,100		171,127
	\$14,350,676		\$13,734,320
Liabilities		1917	1918
Common stock .....	\$10,000,000		\$10,000,000
Preferred stock .....	2,200,800		1,845,700
Due to trade creditors.	607,257		854,255
Pay roll accrued.....	35,652		54,057
Reserve for taxes, etc.	64,717		51,450
Reserve for pref. stock.	300,000		102,683
Undivided profits .....	1,142,250		645,225
Notes payable .....			180,950
	\$14,350,676		\$13,734,320

### Fordson Distributors Organize

PROVIDENCE, R. I., Oct. 28—The Fordson distributors of the United States are banded together in the Fordson Distributors Association of America, with headquarters of the organization in this city. The object of the association is to promote the interests of those concerned. The organization was formed in Des Moines in July. The officers are: President, Clyde L. Herring, Herring Motor Co., Des Moines; treasurer, Thomas J. Northway, Rochester, N. Y.; secretary, Harvey J. Flint, this city.

### Revoke Tin Import Licenses

WASHINGTON, Oct. 25—Licenses heretofore granted for importation of tin have been revoked by the War Trade Board and all future imports will be granted only on licenses issued to cover shipments consigned to the United Steel Products Co.

## Glenn Martin Develops 180-M.p.h. Bombing Plane

WASHINGTON, Oct. 28—A bombing plane designed by Glenn Martin which is said to have developed a speed of 180 m.p.h., is receiving the attention of both the Senate Military Affairs Committee and the Bureau of Aircraft Production. This plane was mentioned in conference between the members of the War Department and the committee late last week. There have been rumors here that there was a new high-powered plane designed, and that it would supersede the Handley-Page and Caproni in our program. Although the report of a new plane has been confirmed in the acknowledgment that Mr. Martin has designed one, nothing definite can be learned at this time regarding its superiority over the Caproni or Handley-Page.

At the conference between the War Department and the committee officials it was said that the Caproni had passed the various tests satisfactorily. The committee was also informed that 2000 airplanes have been shipped to France.

### Department of Labor Wants Cars

WASHINGTON, Oct. 28—The Department of Interior asks for bids for three 5-passenger cars. Bids should be submitted to the United States Indian Service, Rosebud, South Dakota, before Nov. 6, 1918. Illustrations should be submitted with full specifications, and each bid amounting to more than \$500 must be accompanied by a certified check or draft equal to 5 per cent of the amount involved.

### Shipping Mobile Laundry Units

WASHINGTON, Oct. 28—Twenty-six mobile laundry units have been shipped overseas and manufacturers are now making shipments at the rate of about four per week. Each mobile laundry unit consists of a steam tractor, four trailers which carry the laundry machinery and equipment, and one supply truck. The steam tractor hauls the laundry unit to the point where it operates and then furnishes steam and power for the four trailers, which constitute the laundry. The arrangement of the units permits their disassemblment and movement to a new location 30 minutes after the laundry ceases to operate.

### Complaints Against Accessory Concerns

WASHINGTON, Oct. 25—The Federal Trade Commission has issued complaints against the Baltimore Hub-Wheel & Mfg. Co. and the Holland-Baden-Ramsen Co., both of Baltimore, because, according to the complaint, these concerns for more than 2 years have "sought to induce and compel manufacturers to refuse to recognize certain competitors as jobbers or wholesalers and as entitled to the benefit of jobbers' or wholesalers' prices and terms. The concerns were cited to appear before the commission at Washington Nov. 29.



# Aeronautical Experience Will Profoundly Affect Motor Car Practice

President of British Institution of Automobile Engineers Predicts No Return to Pre-War Designs—Necessity for Greater Standardization and More Research Work Paramount

LONDON, ENGLAND, Oct. 3—Special Correspondence—Predicting that the automobile industry will never return to a pre-war basis, President A. A. Remington, of the Institution of Automobile Engineers, prophesied at the last meeting of that body that, without doubt, the valuable aeronautical experience which manufacturers have had as a result of the war will have a profound effect on automobile design after the war. There will be great changes in our automobile factories, and whereas the technical man in the engineering industry heretofore has been subordinate to the equivalent commercial man, it seems likely that these positions will be almost completely reversed.

Standardization and the necessity for a greater amount of research are of vital importance, stated Remington, and urged that the following researches be undertaken:

1—An investigation to establish the most economical application of the laws relating to conductivity, heat transference and diffusivity, as affecting motor car radiators, so as to enable the smallest or lightest radiator for a given case, to be determined, including amongst suitable proportions for the provision of air draft, the most suitable rate of air draft and the rate of flow of the water.

2—An investigation to determine the factors making for comfort in suspension—including inter-relations between such factors, as

a—Vertical periodicity of the front and rear springs respectively in relation to each other.

b—Rolling periodicity.

c—Pitching periodicity.

d—Metacentric height.

e—Wheelbase.

f—Weight distribution.

"It can now be seen that the war will vitally affect the conditions of industry in almost every direction," said Mr. Remington, "and it is impossible to think that at the end of the war, when our normal industry is reorganized, I might almost say re-started, we shall revert to pre-war ideals and methods, either in connection with commerce, manufacture or design. Much has happened during the course of the war to change our ideas on those, in common with other subjects, and without doubt the automobile industry will with most industries, and, in fact, it is to be hoped, with the country and the world in general, ultimately reap much benefit from these changes in idea and method.

"At times we hear the suggestion that no one will be able to afford motor cars after the war, and this argument is so persistently advanced that one is sometimes tempted to wonder what degree of truth there can be in such a statement. The motor car has long since developed from being solely a vehicle of sport, and

while it still suffers under the undesirable name of 'pleasure car' it is now recognized on all sides as essential means of transport for passengers as the lorry or motor van is for goods.

"After the war we shall doubtless suffer from severe taxation and high cost of living, but as the automobile is a time-saver, it seems that the adverse conditions of life will accentuate rather than diminish the necessity for it, and it will be more than ever a necessity and money-maker. Therefore, although high cost of living will mean high costs both for material and labor, the motor car business must and will flourish notwithstanding.

"The question of the types of vehicle for which there will be a market will have to be carefully considered; undoubtedly there will be in the future a market, and a large one, for the cheap car, but in the automobile industry, as in every other branch of life under normal circumstances, a man gets what he pays for; therefore, as long as proper value is given for money, as we have seen that there will be a big demand for cars for all purposes, it follows that there must be a market for every class of vehicle for which there was a market before the war. Naturally there may not be a market for the same proportion of vehicles in every category as there was before the war, but it will be necessary for the industry in organizing itself to proportion its output as a whole in such a manner that it will meet the needs of the buyers; a statement that is easily made, but it will probably involve a lot of hard thinking and possibly some bitter experiences, before the industry will have so adjusted itself to meet the needs of the public.

"It yet remains to be seen to what extent it will be policy for the automobile engineer to take advantage of his aeronautical engine experience. We are all aware that the aeronautical engine has a much higher mean effective pressure, higher mechanical efficiency and lower specific fuel consumption than even the most advanced pre-war automobile engine, but the requisite characteristics for the two classes of work are so different that while aeronautical engine experience can with advantage be used to some considerable degree in the automobile engine, it is difficult to say just how far results will warrant this utilization.

"But in my opinion much of the aeronautical engine experience that has been gained by our automobile engineers during the war will be found to have a profound effect on their post-war automobile productions, and an examination of the extent of this effect, when such a

course becomes possible, will be extremely interesting. I am looking forward to great strides in the development of automobile efficiency (using the term efficiency in its broadest sense of meaning more useful for its ultimate purpose) as a result of the war experience of British automobile engineers.

"In the past the technical man in the engineering industry has always been subordinate to the equivalent commercial man, perhaps because it was supposed that the technical knowledge could be obtained from books, whereas so-called commercial knowledge was composed of some indefinable sort of rare instinct coupled with experience; but it is not difficult to discern that the change is taking place, and it is certain that in years to come the technical positions will cease to be subordinate in the same way as formerly. The application of more and more science to all branches of business, by increasing the necessity for scientific knowledge, will render such knowledge more general; also in future the workshop trained man who has had no real scientific training will, because of the more general existence of scientific knowledge, no longer be able to pose as scientific. The requirements of the higher positions on the scientific side of industry will necessitate the employment of many more highly-trained scientists to fill them, and it is to be hoped that ultimately all management positions in our engineering industries will be filled by men possessing scientific knowledge as well as business experience.

"The war has been the means of causing almost every British pre-war motor car factory to be greatly enlarged, and it is therefore to be expected that after the war the output of each factory in this country will be greatly increased, and this will mean that greater standardization will not only be possible, but profitable. It is therefore highly desirable that we should all, in our mutual interests, do everything we can to forward the work of standardization for the automobile industry.

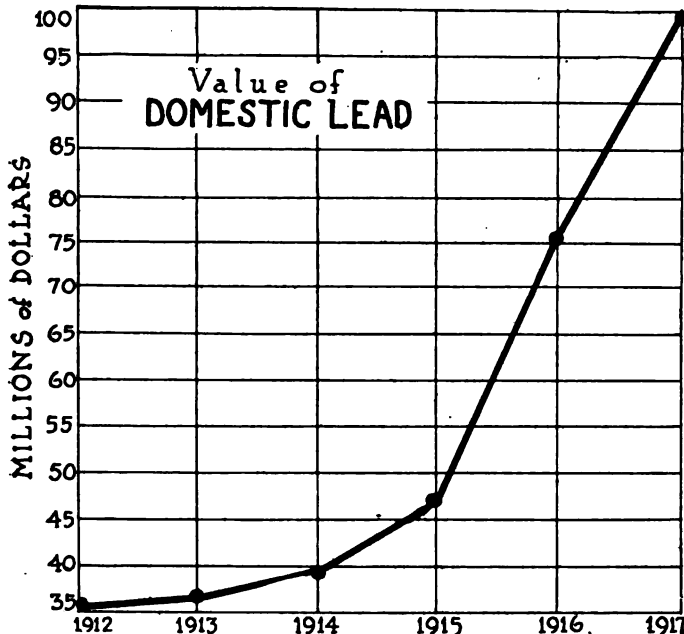
"It is probable that the examination of post-war models will, as previously referred to, show that the motor car engine has absorbed a lot of the practice that has been developed for the immediate advantage of its sister—or shall I say child?—the aeronautical engine. It must be considered, however, that the requirements of the aeronautical engine, apart from the necessity for lightness, partake more of the character of the marine than of the motor car engine, although the development of power-weight ratio in aeroplanes, resulting in more rapid climb and greater altitude with its consequent reduction in atmospheric pressure, now practicable for regular flying, is bringing the conditions of operation of the aeroplane engine into closer analogy with the conditions that obtain for the motor car engine."

The Crompton medal, which is awarded annually by the institution for the best paper, has been awarded to Major H. P. Philpot for his paper on "Some Experiments on Notched Bars."

## AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids</b>		<b>Sulphuric</b>	
Muriatic, lb.....	.02	8 oz., yd.....	12.4 -15.85
Phosphoric (85%)..	.35	10 1/2 oz., yd.....	14.6 -18.6
Sulphuric (60), lb..	.008		
<b>Aluminum</b>		<b>Copper</b>	
Ingot, lb.....	.33	Elec., lb.....	.25
Sheets (18 gage or		Lake, lb.....	.26
more), lb.....	.40	Fabric, Tire (17 1/2 oz.):	
Antimony, lb.....	.13	Sea Is., combed, lb.	1.65-1.70
		Egypt, combed, lb.	1.25-1.35



Although the production of lead from domestic ores decreased in 1917, its value advanced from \$76,000,000 to \$99,000,000

Egypt, carded, lb..	1.20-1.30
Peelers, combed, lb.	1.05-1.20
Peelers, carded, lb.	.95-1.05
Fibre, (1/4 in. sheet base), lb.....	.50
<b>Graphite:</b>	
Ceylon, lb.....	.07 1/2-.25
Madagascar, lb. ...	.10 -.15
Mexican, lb.....	.03 1/2
Lead, lb.....	.08 -.09
<b>Leather:</b>	
Hides, lb.....	.18 -.35 1/2
Nickel, lb.....	.40
<b>Oil:</b>	
Gasoline:	
Auto., gal.....	.24 1/2
68 to 70 gal.....	.30 1/2
<b>Lard:</b>	
Prime City, gal..	2.50
Ex. No. 1, gal....	1.70
Linseed, gal.....	1.61-1.62
Menhaden (Brown), gal. ....	1.30-1.31
Petroleum (crude), Kansas, bbl.....	2.25
Pennsylvania, bbl.	4.00

<b>Rubber:</b>	
<b>Ceylon:</b>	
First latex pale crepe, lb.....	.60 1/2
Brown, crepe, thin, clear, lb.....	.53
Smoked, ribbed sheets, lb.....	.58 1/2
<b>Para:</b>	
Up River, fine, lb.	.64
Up River, coarse, lb.....	.55
Island, fine, lb....	.36 1/2
Shellac (orange), lb.	.74 -.75
Spelter .....	.09 -.09 1/2
<b>Steel:</b>	
Angle beams and channels, lb.....	.03
Automobile sheet (see sp. table).	
Cold rolled, lb.....	.06 1/2
Hot rolled, lb.....	.03 1/2
Tin .....	.76 1/2-.77 1/2
Tungsten, lb.....	2.45-2.50
Waste (cotton), lb...	.12 1/2-.17

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping.....	6.20	6.10
Automobile body stock, extra deep stamping .....	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
Black Sheet Extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Bituminous Output Affected by Epidemic

Both anthracite and bituminous coal suffered a setback during the week ended Oct. 19, owing to the epidemic of influenza in the mining regions. The 11,523,000 net tons of soft coal produced in the week under review, though 800,000 net tons behind the output of the week ended Oct. 12, exceeded by 1,300,000 net tons the production during the same period of 1917. Reports show that influenza caused a decrease in the shipments of soft coal from all fields except western Pennsylvania. The epidemic has not helped the anthracite situation. Production of hard coal during the week ended Oct. 19 totaled 1,715,000 net tons compared with 1,955,000 net tons the preceding week. The total output of anthracite from April 1 to date is estimated at 57,573,000 net tons, as against 56,736,000 net tons for the same period of 1917.

Though the country as a whole is rather well supplied with bituminous coal, the necessity still exists for the exercise of the strictest economy. The quantity of anthracite distributed so far this year to those sections which are permitted to burn hard coal is greater than in normal

years. The demand for domestic sizes, however, shows no signs of a let-up.

Prepared sizes of anthracite, such as egg, stove and chestnut, are scarce. Many consumers have been advised to purchase the smaller sizes, and mix it with the larger grades. The small sizes of anthracite are plentiful and several shippers have been cutting the prices to move surplus stock.

Summed up concretely, the coal situation can be said to be generally satisfactory. There is no prospect of a serious shortage in bituminous, and the belief is expressed that domestic consumers will receive their share of anthracite before November closes.—*Coal Age*.

## Build Experimental Ruby Tractor

EAU CLAIRE, WIS., Oct. 28—The United States Switch Co., Eau Claire, Wis., manufacturing automatic railroad signals and switch units and motor railroad tractors, is completing work on an experimental model of a large farm tractor for the Ruby Tractor Co., Minneapolis. The tractor will weigh about 7 1/2 tons, a single casting used in its construction weighing 1671 lb.

## Federal Taxicab for Washington

WASHINGTON, Oct. 28—A federal taxicab service under the operation of the Motor Transport Corps will be inaugurated here this week for the special benefit of army officers. It is designed to facilitate the transportation of officers between the various Government departments, to expedite Government business and at the same time to save money.

## War Service Members Meet

WASHINGTON, Oct. 28—More than 300 industrial war service committees will meet at Atlantic City Dec. 4, 5 and 6, under the auspices of the War Service Executive Committee, Chamber of Commerce of the United States. The meeting will bring together about 3000 industrial leaders to discuss industrial war problems. A more centralized scheme of organization will be one of the topics.

## La Crosse Tractor Price Advances

LA CROSSE, WIS., Oct. 31—The price of the La Crosse Happy Farmer tractor has been advanced from \$975 to \$1,150, the new price to be effective Nov. 1. This applies to both the models, F and P

**Sheldon Building New Shop**

NEW YORK, Oct. 28.—Rapid progress is being made in the erection of the new Sheldon all steel and concrete, two-story machine shop which is expected to increase production at least 30 per cent. The floor area will be 85,152 sq. ft., which is about twice the floor space of the present machine shop. It is expected that the new building will be completed by January 1, and partly in operation about the same time as the machinery is being installed as the building is being erected. Only machining of axle parts will be handled in the new building.

**Templar 90 Per Cent War Work**

CLEVELAND, Oct. 25.—The Templar Motors Corp. is at present on a 90 per cent war basis, manufacturing a large order of 155 m.m. shells. The company is producing a few cars each month, and has enough material on hand to build several hundred more cars. The Templar plant is being greatly enlarged by the addition of two more stories on the present building, which is 500 by 72. This is in addition to several smaller one-story buildings, and when completed will triple the capacity of the plant

**McDole Increases Capacity**

KALAMAZOO, MICH., Oct. 25.—C. B. McDole is preparing to increase the capacity of his sheet metal plant by the installation of another large press, also other equipment for the manufacture of automobile truck fenders. In addition to the large orders already secured, he has also been urged to bid on several contracts for the Emergency Fleet Corp.

**To Make Propeller Material**

HAYWARD, WIS., Oct. 28.—The American Veneer Co. has been organized at Hayward, Wis., with a capital stock of \$100,000, and will erect and equip a new plant for the manufacture of airplane veneers, propeller material, gun stocks and similar hardwood products for military and naval purposes. George C. Glover, head of the Willow River Lumber Co., Hayward, is president and general manager of the new concern.

**Matthews to Make Propellers**

MILWAUKEE, Oct. 28.—The Matthews Bros. Mfg. Co., 65-75 Fourth Street, Milwaukee, a large maker of office furniture and interior finish, has been awarded a Government contract for 200 airplane propellers of a new type and for 25 pontoons for seaplanes.

**To Train Tractor Operators**

MADISON, WIS., Oct. 28.—A special course of training in farm tractor construction, maintenance and operation will be given Dec. 2 to 21 by the agricultural engineering department of the University of Wisconsin at Madison. The course is open to women as well as men, and no limit of age will be set. The number of students in the three weeks' course is limited to 50, and as indications already are that there will be an overflow, it is

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

planned to repeat the course early in January. The course will be directed by F. W. Duffee and E. C. Suave, and tractor men of national reputation will give lectures.

**Exportation of Second-Hand Articles**

WASHINGTON, Oct. 28.—On and after Nov. 1 applicants for licenses to export second-hand articles composed of iron or steel will be required to state on Form X that the commodity to be exported is "second-hand." Failure on the part of the applicant to describe second-hand material as such will be regarded as an inaccurate description of the goods and the applicant will be subject to the prescribed penalty therefor.

**Canadian Johns-Manville Company**

MONTREAL, Oct. 23.—The Canadian Johns-Manville Co., Limited, has been formed here with a capital stock of \$2,500,000.

**Capital Increases**

The Lansing Forge Co., Lansing, Mich., has increased its capital stock from \$100,000 to \$300,000.

The American Machine Products Co., Detroit, has increased its capitalization from \$10,000 to \$40,000.

**Dividends Declared**

National Acme Co., Cleveland, quarterly cash dividend of 1½ per cent (or 75 cents a share), payable Nov. 30.

Cleveland Automatic Machine Co., Cleveland, a dividend of 1½ per cent on common stock, par of which is \$50, payable Nov. 26.

Pressed Steel Car Co., Cleveland, quarterly dividend of \$2 a share on the common stock, payable Dec. 4; also regular quarterly dividend of \$1.75 on preferred, payable Nov. 26.

Auto Investment Co., Detroit, initial dividend of 4 per cent, payable Nov. 1.

Michigan Drop Forge Co., Pontiac, has declared the monthly dividend for October of 15 cents per share and an extra dividend of 10 cents per share on common stock.

**Canadian Agent for Pasco Wheels**

BUFFALO, Oct. 28.—The Northern Electric Co. has been appointed Canadian agent for Pasco wire wheels and will handle them in all its Canadian branches.

**Auction Smith Truck Assets**

CHICAGO, Oct. 29.—The assets belonging to the estate of the Smith Motor Truck Corp., which was declared bankrupt in August, will be sold at auction by Samuel L. Winternitz & Co. at Clearing, Ill., Nov. 15. The inventory value is placed at \$1,500,000 and the assets to be sold include \$150,000 of standard hardware and 2000 tons of cast iron, malleable gray iron, steel machine cast forgings and castings, 200 tons of 1 15/16-in. shafting, 50,000 13 to 24-in. steel sprocket blanks, etc. Included in the specialties for Fords listed in the sale are 10,000 vanadium steel axles in the rough. A large stock of tractor parts will be auctioned off also together with fixtures, etc.

**Moller & Schuman Becomes Hilo**

BROOKLYN, N. Y., Oct. 28.—The Moller & Schuman Co., paint and varnish maker, has altered its corporate style to Hilo Varnish Corp. The personnel of the company remains unchanged.

**Milwaukee Ford Branch Locates**

MILWAUKEE, Oct. 26.—The Milwaukee branch of the Ford Motor Co. has leased a building with 40,000 sq. ft. of floorspace from the Val. Blatz Brewing Co. for a period ending one year after the close of the war, for the accommodation of its parts, service, warehouse and office departments during the time the Government occupies the Milwaukee assembling plant as a hospital. The Ford company will vacate its building by Nov. 1. The temporary headquarters building is located at Market and Johnson Streets, in the downtown district of Milwaukee. It formerly was used as a cooper shop by the Blatz brewery. The annual rental is \$10,000.

**Grand Rapids Brass Enlarging**

GRAND RAPIDS, Oct. 26.—The Grand Rapids Brass Co. will increase its capitalization by \$75,000. The company has at the present time six Government contracts, totaling several hundred thousand dollars, which will take about 70 per cent of the manufacturing capacity of the company. Other orders are expected to be received, and it is believed that for the fiscal year 1918 the company's total business will amount to about \$1,000,000. The company owns plants in Grand Rapids and Lansing and employs about 400 men.

**May Not Take Boston Buildings**

BOSTON, Oct. 26.—There is a hitch in the plans to take over all the motor buildings on Commonwealth Avenue and now it begins to look as if the dealers will not have to go scurrying about for places. Rear Admiral Wood, who has charge of the First Naval District, approved of the plan, and he was anxious to house the sailors there for the next eight months. But when officials of the Navy Department went over the figures submitted by the Boston dealers the cost seemed too high.



**Kirkpatrick in Motor Transport**

NEW YORK, Oct. 28—Andrew Kirkpatrick, vice-president and secretary of L. V. Flechter & Co., has resigned to enter the Motor Transport Corps.

R. C. Greth has been appointed district representative of the Cleveland Tractor Co. in the Oklahoma territory. For the past 2 years he has been engaged in the automobile business in Phoenix, Ariz., prior to which he was associated with the Overland and Hudson companies as special representative.

U. B. McCurdy has been appointed district manager for the Cleveland Tractor Co., with headquarters at 1307 Waldheim Building, Kansas City. The territory which will be under the supervision of the Kansas City office comprises Kansas, Nebraska, Colorado and Wyoming, also portions of Missouri, Iowa and South Dakota.

M. M. Risberg has been appointed controller of the Republic Motor Truck Co., Alma, Mich., and the other concerns controlled by the Republic company—the Republic Motor Truck of California, the M. & S. Corp., Detroit, and the Torbenesen Axle Co., Cleveland. W. G. Ralph will be Mr. Risberg's assistant.

Arthur Birge, who was manager of the Ames Tool & Shovel Co., Anderson, Ind., has succeeded R. F. Dyer as assistant sales manager of the Aluminum Castings Co., Detroit.

Howard Emery, who was manager of the Detroit plant of the Aluminum Castings Co. a few years ago, and later transferred to the managership of the Manitowoc plant, has returned to the Detroit plant to occupy the position of manager recently vacated by Charles B. Bohn.

A. H. Doolittle, formerly sales and advertising manager of the Zenith Carbureter Co., Detroit, has joined the publication division, service department, Bureau of Aircraft, in Detroit.

Major H. O. Bernhardt, formerly production manager of the Pierce-Arrow Motor Car Co., and more recently factory manager of the Harroun Motors Corp., Wayne, Mich., has been promoted to the rank of lieutenant-colonel. He has recently completed an assignment at the plant of the Bethlehem Steel Co., Bethlehem, Pa., for the chief of ordnance, and comes to Detroit representing him as assistant district chief, assigned to the Ford plants at Highland Park and Dearborn.

Elmer H. Hohenthal, formerly associated with the Bosch Magneto Co. and the Simms Magneto Co., has been appointed manager of the Detroit sales and service branch of the Eisemann Magneto Co.

## Men of the Industry

### *Changes in Personnel and Position*

Charles M. Smith, formerly associated with the Detroit Steel Castings Co. and with the Michigan Steel Castings Co., Detroit, has been appointed superintendent of the foundry operation by the Nelson Bronze Co., Saginaw, Mich.

E. M. Benedict has been appointed general manager of the Jackson Munitions Corp., Jackson, Mich. He comes from Toledo, Ohio.

Archibald Black, recently aeronautical engineer of the L-W-F Engineering Co., College Point, N. Y., has become aeronautical engineer with the Bureau of Construction and Repair, Navy Department, Washington, D. C., and began his duties there Oct. 21, 1918.

**75,288,851 Tons Iron Mined in 1917**

WASHINGTON, Oct. 28—Iron ore mined in the United States in 1917 totaled 75,288,851 tons, exceeding the 1916 output by 121,179 tons, according to a report issued here to-day by the Department of the Interior. The ore was mined in 25 States in 1917 and 24 in 1916, the greater part of the output coming from Minnesota, Michigan, Alabama, New York and Wisconsin. The imports of iron ore in 1917 were 971,663 tons as compared with 1,325,736 tons in 1916.

A total of 38,612,546 tons of pig iron, exclusive of ferroalloys, was shipped or used by producers in 1917, as compared with 39,126,324 tons in 1916, a decrease of 1.32 per cent. The production of pig iron, including ferroalloys, in 1917 was 38,647,397 tons in 1917, as compared with 39,434,797 tons in 1916, a decrease of 4.5 per cent.

**1000 Liberty Engines Produced Weekly**

WASHINGTON, Oct. 30—Production of Liberty airplane engines for October has reached an average of 1000 per week. This was the production hoped for by December. There are now 2500 fighting planes, not including single seaters, manufactured in this country and shipped abroad to the American Expeditionary Forces. These include 150 heavy bombers and other planes of all classes, such as observation and day bombing machines. It was stated here to-day that the production of aircraft has reached a point where it is limited only by facilities for transportation to France and that there are more American-made airplanes awaiting shipment at points of embarkation than can immediately be loaded.

**Veteran Boston Dealer Dies**

BOSTON, Oct. 26—Frederick S. Smith, one of the pioneer dealers in Boston, and who has handled the Mercer car, was buried here yesterday. He was another victim of the Spanish influenza pneumonia epidemic.

Charles T. Jeffery, Kenosha, Wis., who was president, general manager and one of the chief owners of the Thomas B. Jeffery Co., until the interest was acquired by the Nash Motors Co., has accepted a position as one of four superintendents of industrial relations for the Emergency Fleet Corporation. He will have charge of the Delaware River district, with headquarters in Philadelphia.

W. L. Romaine, secretary of the Badger-Packard Machinery Co., Milwaukee, has accepted the appointment of director of the division of oil conservation of the Fuel Administration for Wisconsin. This is a new position which has been created for the purpose of administration of rules and regulations affecting the use of fuel, lubricating and other oils, as well as gasoline and other petroleum products.

B. T. McDonald, manager of the Poughkeepsie (N. Y.) works of the Moline Plow Co., Moline, Ill., has temporarily been transferred to Stoughton, Wis., to take charge of the Mandt vehicle branch of the Moline company during the illness of George Ford. Mr. McDonald was general manager of the Stoughton plant before being placed in charge of the Poughkeepsie works.

**Manganese in Utah**

WASHINGTON, Oct. 28—Manganese ore reserves have been found in the Green River district of Utah, according to the Department of Interior, which has just completed an examination of this region. The investigations included a thorough examination of 20 manganese mines and a detailed survey of 4 square miles. The mines in this district are producing from 400 to 600 tons of manganese ore monthly and, according to the reports, there are at least 7300 tons of high grade ore still available for mining under present conditions and without modification of existing methods. In addition 22,500 tons, chiefly in the residual surface deposits, will be available under improved conditions or methods. Most of the ore in this district contains close to 4 per cent of manganese and is consequently a profitable mining venture.

**Motor Transport Corps Insignia**

WASHINGTON, Oct. 28—The Motor Transport Corps will use a purple hat cord to designate its enlisted men. The hat cords will soon make their appearance, although they are not likely to become common in this country, as the Motor Transport Corps is essentially an overseas organization and the men and officers both go to France shortly after completing their training courses.

### Ordnance Department Contracts

WASHINGTON, Oct. 28—The following contracts were placed by the Ordnance Department:

Holt Mfg. Co., Peoria, caterpillar tractors.  
Briscoe Motor Corp., Jackson, machining shells.  
Four Wheel Drive Auto Co., Clintonville, chassis.  
Nash Motors Co., Peoria, chassis.  
Cadillac Motor Car Co., Detroit, motor spare parts.  
The Sterling Motor Car Co., Washington, shells.  
Nash Motors Co., Kenosha, miscellaneous truck equipment.

### Quartermaster Corps Contracts

WASHINGTON, Oct. 28—The following contracts were placed by the Quartermaster Department:

Splitdorf Electric Co., electrical supplies, \$6,155.68.  
B. F. Goodrich Rubber Co., tubes, \$3,050.  
Fisk Rubber Co., casings, \$6,888.  
Pantasote Co., New York, side curtain material, \$22,800.  
B. F. Goodrich Co., casings and tubes, \$7,056.  
H. W. Johns-Manville Co., motor parts, \$8,325.01.  
Willard Storage Battery Co., storage batteries, \$8,778.60.  
Goodyear Tire & Rubber Co., casings and tubes, \$7,090.30.

### More Quartermaster Contracts

WASHINGTON, Oct. 21—Following is a list of contracts placed by the Quartermaster Depot of the Army:

Kelly-Springfield Motor Truck Co., motor parts, \$32,540.45.

Packard Motor Car Co., Detroit, motor parts, \$36,987.21.

Standard Oil Co. of California, cup grease and oil, etc., \$6,779.

Standard Oil Co. of Kentucky, gasoline, \$6,970.

### Aircraft Production Contracts

WASHINGTON, Oct. 25—The following contracts have been recently placed by the Bureau of Aircraft Production:

Wright-Martin Aircraft Corp., New Brunswick, engine spares.  
Hartzell Walnut Propeller Co., Piqua, generator propellers.  
Howell & Lesser, San Francisco, airplanes.  
Curtiss Aeroplane & Motor Corp., Buffalo, spares for planes.  
Splitdorf Electrical Co., Newark, engine spares.  
Splitdorf Electrical Co., Newark, magnetos and parts.  
Firestone Tire & Rubber Co., Akron, balloon.  
Splitdorf Electrical Co., Newark, engine spares.  
Zenith Carburetor Co., Detroit, carburetors.  
The Willys-Overland Co., Toledo, engine spares.  
Wilson Foundry & Machine Co., Pontiac, engine spares.  
Pittsburgh Model Engine Co., Pittsburgh, engine spares.  
Wright-Martin Aircraft Corp., New Brunswick, tools.  
Curtiss Aeroplane & Motor Corp., Buffalo, cylinders.  
Stromberg Motor Devices Co., Chicago, engine spares.  
Champion Ignition Co., Flint, spark plugs.  
Silvex Co., South Bethlehem, spark plugs.  
Gray & Davis, Boston, aero navigation lights.  
B. V. D. Electric Co., San Antonio, magneto trouble finders.  
Oxweld Acetylene Co., Thirty-sixth and Jasper Place, Chicago, blowpipe and extras for welding outfit.  
Buffalo Aeroplane Corp., Buffalo, services and material.  
Harrison Radiator Co., Lockport, radiators.  
Boech Magneto Co., New York, starting magnetos.  
Wright-Martin Aircraft Corp., New Brunswick, N. J., tools for engines.  
Grand Rapids Airplane Co., Grand Rapids, Mich., tools, jigs, dies, etc.

## Contracts

The Connecticut Aircraft Co., New Haven, supply bags.  
W. H. Mullins Co., Salem, Ohio, spares for planes.

### Revise Export Commodity List

WASHINGTON, Oct. 29—A revised export commodity list for European Holland, issued by the War Trade Board, states that the following articles are among those which will be considered for exportation: Automobiles (passenger), bicycles, motorcycles and spare parts but no tires and no accessories. Prospective importers should obtain import certificates from the Netherlands Overseas Trust and should upon receipt of the certificate notify the prospective exporter and advise him of the serial number. The exporter in turn will then apply to the War Trade Board for his export license.

### Highways Congress for Chicago Dec. 4-5

NEW YORK, Oct. 30—The Highways Industries Association and the American Society of State Highway Officials will hold a highway congress at the Congress Hotel, Chicago, Dec. 4 and 5. The congress will be opened on Wednesday morning, Dec. 4, and will be addressed by Logan Waller Page and Fourth Assistant Postmaster James I. Blakeslee. Speakers at the afternoon session are Governor Cox of Ohio, E. J. Mehren, Editor of *Engineering News-Record*, and Roy D. Chapin, chairman of the Highways Transport Committee. S. T. Henry, third vice-president of the Highways Industries Association, will address the evening session. The speakers for Thursday session are A. R. Hirst, Paul D. Sargent, J. W. Bliss, H. Eltinge Breed, A. G. Batchelder, A. B. Fletcher, Duncan Buie, Geo. P. Coleman, George M. Graham and H. J. Shirley. It is planned that the congress shall go into every phase of highway construction, maintenance and use.

### First "Eagle" Placed in Commission

Washington, Oct. 30—The first of the "Eagle" boats built for the Navy at the Ford Motor Co. plant, Detroit, was placed in commission yesterday, according to an announcement by Franklin B. Roosevelt, Acting Secretary of the Navy.

## Calendar

### ENGINEERING

Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

### SHOWS

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration. State Fair.  
Nov. 11-16—Phoenix, Ariz. Tractor demonstration. State Fair.  
Nov. 11-16—Pittsburgh, Pa. Fall Automobile Show. Motor Square Garden. Automobile Association of Pittsburgh.  
Jan. 13-19—Des Moines, Ia. First Tractor Show. Des Moines Thresher & Tractor Club. H. J. Clark, Mgr.

### Dissension in the Aero Club

NEW YORK, Oct. 30—That there is organized opposition to the regular ticket proposed for the election of officers of the Aero Club of America on Nov. 11 was made evident to-day when Roy U. Conger, leading the opposition forces, applied to the Supreme Court for an order to compel the officers of the club to supply a list of all members and their addresses or, alternatively, to permit them to be copied.

The officers proposed by the opposition are Howard E. Coffin for president and Cortlandt Field Bishop, Howard Talbot, C. M. Vought and L. L. Briggs as vice-presidents. There is no fight on the proposed governors.

### Charles G. Roebling Dead

TRENTON, N. J., Oct. 28—Charles G. Roebling, vice-president of the Mercer Automobile Co., died Saturday, Oct. 25.

### Bishop White Passes Away

BRIDGEPORT, Oct. 28—Bishop White, vice-president and general manager of the American Chain Co., and treasurer of Pratt & Cady Co., Hartford, died of pneumonia on Sunday morning at his home, West Hartford. He was 33 years of age. Bishop White was born in West Hartford in 1885. Immediately after finishing college Mr. White became identified with a New York bank, and shortly thereafter started business as a manufacturers' representative in the automobile supply trade, which brought him in contact with the Weed Chain Tire Grip Co., with whom he became associated about 1911. When the American Chain Co. was incorporated in 1912 Mr. White went to Sherrill, N. Y., to organize and manage that company, which later absorbed the Weed Chain Tire Grip Co. after the business had been transferred to Bridgeport. He then became vice-president and general manager of the new corporation, a position which he held at the time of his death. In 1914 Mr. White successfully carried out the reorganization of the Pratt & Cady Co., of which concern he was treasurer. His widow and one child, Bishop White, Jr., survive him.

### Twin Disk Clutch and Clutch Pulley

(Continued from page 760)

this case the central disk is the driven one, and the two outer disks are the drivers. The latter are turned with grooves in their circumference, these grooves taking felt packings designed to exclude dust from the friction surfaces.

At the present time the large clutch is made in one size only, with friction disks 11½ in. in diameter, and this is said to be suitable for tractor engines delivering all the way from 30 to 60 hp. The clutch pulley also is built in only one size so far, but other sizes are in contemplation.

Thomas L. Fawick, designer of the clutch and clutch pulley, has had 8 years' experience in tractor work.



# AUTOMOTIVE INDUSTRIES

*The* AUTOMOBILE

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NEW YORK, NOVEMBER 7, 1918

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Three dollars a year

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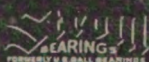
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United  
War Work  
Campaign

NOVEMBER 11th  
TO  
NOVEMBER 18th

**GIVE!**

THIS SPACE CONTRIBUTED TO  
THE WINNING OF THE WAR BY



U. S. BALL BEARING MFG. CO.  
CHICAGO ILL.





Back view showing mirror,  
included at no extra cost.

**\$5.00**  
Complete  
with bracket  
and  
electric cord

# Stewart V-RAY SEARCHLIGHT

*A Real Searchlight—Not a "Spotlight"*

When you have occasion to use a searchlight, you want a *real* searchlight—not a "spotlight" with its small restricted "spot" of light.

You want a strong, powerful, all-revealing searchlight beam.

That is what you have in the Stewart V-Ray Searchlight. Its penetrating shaft of light shoots 'way down the road, revealing even the most distant objects.

The exterior design is particularly noteworthy. See how it stands apart—a thing of beauty. Observe how symmetrical it is. Note the design of the body; also the back.

It is beautifully finished with many coats of jet black enamel, baked on. And there is just a touch of nickel here and there to make the "tailor-made" appearance complete.

The Stewart V-Ray Searchlight harmonizes with the design of the modern automobile. Adds to its appearance. Looks like a built-in part of the car—not like a misplaced, re-vamped headlight.

It is scientifically designed. Made with a perfect parabolic reflector, which is silver-plated—not polished tin. Has a full six inch curved lens, instead of plain window glass.

A 3/4 inch reducing mirror, included at no extra cost, is located in the center of the back. It is not necessary to twist the light at an unsightly angle to use mirror. The switch is located conveniently so the hand finds it instantly in the dark.

The back is so formed that the hand grasps the light naturally, without cramping—and turns the light in any direction—up, down, right, left, front, or back—with ease. The case is absolutely dust and moisture-proof. A focusing device permits the use of any size bulb.

The bracket—an exclusive Stewart feature—not only permits turning the light in any direction, but also fits any windshield.

Both its handsome appearance and complete utility recommends it. It has high quality and finish all the way through. Its low price—\$5.00—is not an indication of quality, but a tribute to the Stewart Organization, which makes quality accessories at popular prices possible through large quantity production.

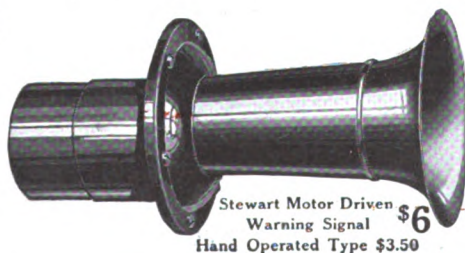
And so it is with all Stewart Automobile Accessories. Each, because of sheer merit and high quality, deserves a place in the equipment of every automobile.

Stewart Accessories are sold by leading accessory dealers, jobbers and garages everywhere.

**Stewart-Warner Speedometer Corporation**  
CHICAGO, U. S. A.

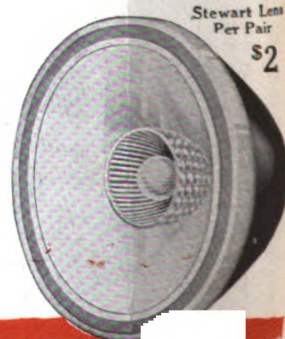


Stewart  
Speedometer  
**\$25**



Stewart Motor Driven  
Warning Signal **\$6**  
Hand Operated Type \$3.50

Stewart  
Vacuum System  
**\$10**



Stewart Lens  
Per Pair  
**\$2**



# AUTOMOTIVE INDUSTRIES

## AUTOMOBILE

VOL. XXXIX

NEW YORK, THURSDAY, NOVEMBER 7, 1918—CHICAGO

No. 19

## Liberty Engine Profits Not Excessive

In Contrast to Original "Bogey," Subsequently Reduced, and Costs of Similar Types to Our Allies, They Are Reasonable—Bare Statements of Hughes Report Create Misunderstandings—Charges Against Deeds and Vincent Considered Minor Compared With Allegations Investigated

**W**ASHINGTON, Nov. 5—That the former aircraft authorities and the automobile makers manufacturing airplane engines have been completely vindicated, and that this exoneration forms the important result of the Hughes airplane report is the opinion here following a week's digest of the statement.

As regards the less important findings, there are many varied views. Failure to recall the serious charges of wholesale graft and waste which instigated the Hughes investigation has led many to regard the disclosures in the report critically and to demand prompt action by the authorities.

They do not contrast the minor violations uncovered with the extravagant accusations which were shown to be untrue. Others are of the opinion that Mr. Hughes "went gunning for an elephant and came home with a squirrel."

This opinion is based upon the fact that Mr. Hughes started out to investigate charges of widespread dishonesty and possible theft of hundreds of millions, and only discovered less important wrongs which form the substance of his statement. However, the report which is an accurate statement and the result of a highly trained legal mind limited by the boundaries of law, would not have been complete had it not dwelt as thoroughly on the less important details also. Both those who believe that the report discloses most serious evils and those who

criticise it because it apparently dwells upon less important wrongs, fail perhaps to consider that the very absence of sensation, without intent magnifies the minor violations.

Perhaps the chief criticism of the report may be directed to its lack of explanations and comparisons without which some of the bare statements tend to create misunderstanding of the situation. This is particularly true in the case of the Liberty engine contracts.

In discussion of the profits made by the Liberty engine manufacturers Mr. Hughes told that the original bogey price was \$6087 and this was reduced in December, 1917, to \$5000 with the fixed profit at 12½ per cent. or \$625 per engine. This contract has again been changed recently and put upon a fixed-price basis of \$4000 per engine.

The engines are being manufactured by a number of companies, including Packard, Lincoln and Ford, says the report, at costs of from \$3200 to \$3583 with the result that under the \$5000 bogey, manufacturers made profits up to \$1100 per engine while on the \$4000 fixed-price, profits will range up to possibly \$1000 per engine on the total contract outputs.

This profit Mr. Hughes calls "very liberal." The tenor of his statement is that an excessive profit has probably been made heretofore, and it is here that his bare statement of facts without explanation

and comparison is likely to lead the public to the impression that automobile makers producing Liberty engines are guilty of profiteering.

That this is not the case is easily understood when, first, consideration is given to the fact, that the European nations are paying \$11,000 per engine for types similar to the Liberty though not as powerful, and secondly that the original bogey price set on Liberty engines, in view of European costs, was exceedingly low and perhaps more of a "gamble" for the manufacturers than for the Government.

The proof that the makers were not profiteering and were as anxious to reduce the figures as is the Government has been shown in their constant efforts to lower the production cost and their prompt collaboration with the authorities in the revision of contracts as warranted.

### First Cost Was Unknown

With the first work on engine production the cost, due to the fact that the industry was new and that the work was entirely experimental, was a completely unknown quantity. The automobile industry invested \$35,000,000. The first engines turned out at \$5000 netted some manufacturers but 5 per cent. on their investments. As production went ahead, however, the cost decreased. The personnel became more skilled. Production routing improved. And consequently the figures on the Liberty engine cost could be and were revised.

Therefore, although the profits made on the first engines, and the profits which would have been made on the \$5000 bogey contract on which possibilities Mr. Hughes dwelt at length, may have appeared excessive, in consideration of the risks undertaken by the manufacturers and the cost of European engines, they were reasonable.

### 60% of Profits to Government

Further, as stated by Attorney General Gregory in his comment on the contractors' profits, while "they appear to be unusually liberal, when it is remembered that 60 per cent. or more of them must be paid to the Government as income and excess profits taxes, and that most of the net profits will be invested in buildings and facilities which may or may not be capable of profitable use for an indefinite period after the termination of the contract, no such profits have been allowed as to justify a charge of bad faith."

The charges against Col. E. A. Deeds and Lt. Col. J. G. Vincent have aroused some resentment in the minds of those who believed that the violations and improper conduct of these men were minor in comparison to the charges Mr. Hughes sifted.

### Recommendations Considered Severe

It is pointed out that the report itself found no evidence of fraud or intent to defraud in the case of Vincent and in consequence it is thought that the recommendation for criminal prosecution against him is severe, particularly in consideration of the valuable services he has given the Government.

The charges against Col. Vincent are insignificant and purely technical. At the outbreak of the war

the Government had no factories of its own for speedy production of Liberty engines and the Packard company, equipped for immediate output, had pushed production regardless of the technicality of the law prohibiting any person interested in a corporation dealing with the Government from acting as an agent of the Government in business transactions with that concern.

Shortly after the Liberty engine was adopted as the standard aircraft engine, Col. Vincent resigned as vice-president of the Packard Motor Car Co., to accept the position of chief engineer in the production of the engine. The Liberty engine having been created there was no Government organization to expedite production. Nevertheless a complete engine was built within a month from the time the Packard company received instructions from the Government to proceed. This work was executed by an organization prepared and trained by Col. Vincent, that is the Packard experimental department which it is probable was the best equipped plant for this work in the whole United States. The accomplishment of results was put ahead of the technical correctness of the method. The sole charge is a technical one.

### Ford Defends Alien Enemies

Henry Ford who was criticised for his failure to remove employees who were German born and who were at work upon Liberty engines replied to the charges in a statement saying:

"The Ford Motor Co. has manufactured 1242 Liberty engines during the past month. That was about 300 more than were manufactured by the next highest factory. I do not know what better answer could be made to all the criticisms. We started later than others and have passed all, the production standing up to the most rigid inspection in every particular.

"Our policy is to make men, not to break men. In times of panic great injury and injustice are often done to innocent persons and we try to keep our heads. We would not allow injustice to be done to an old, trusted and valued employee even though he was born in Germany. The results speak for themselves.

### Claims German Was Efficient

"Mr. Embie referred to as the special example in the report has been with us over 12 years and he is a most able and excellent engineer and has always given perfect satisfaction. Not one word of fault could be found by Mr. Hughes or any one else with regard to Mr. Embie's actual work. We in the plant know he gave valuable systems and many suggestions for the development of the Liberty engine cylinders which are being furnished to all manufacturers at a saving of \$345,000 a month to the Government over former prices."

The criticism against Brig. Gen. George O. Squier that the construction of an adequate organization for aircraft production was beyond his competency, is taken here by many as a direct reflection upon the War Department. It is understood to imply that the War Department did not grasp the magnitude of



the task and that in leaving the huge aircraft programs in the hands of the Signal Corps it failed to realize the special features of this program and technique and skill involved.

Some comment is made that the report does not dwell sufficiently upon Howard E. Coffin but considering that Mr. Hughes failed to find Mr. Coffin guilty of wrong acts and that his position was purely advisory, which findings exonerate Mr. Coffin from all the charges made against him last spring, little more could be expected.

The difficulties under which Mr. Coffin worked and by which he was hampered are clearly reflected in that part of the report which dwells upon the inefficiency of Gen. Squier's office. Recommendations by the Aircraft Production Board, which was headed by Coffin, went for naught. Attempts to have production on the Caproni and other planes started were thwarted time and again. Most of the other recommendations were likewise tabled or delayed.

### Great Credit Due Old Board

Perhaps the best proof of the worth of the original aircraft board was shown recently in a statement by the present authorities to the effect that great credit was due that board and that the present aircraft successes are solely the result of the continuation of the principles and program laid down originally.

The charges that unfair contracts for the Government were entered into are shown by both Mr. Hughes and Attorney General Gregory to be incorrect. No contracts providing for a fixed percentage of profit on production cost were made.

It will be recalled that the earlier charges maintained that contracts had been made by which manufacturers were to receive a certain percentage of the cost for their profits.

Under such contracts, it was said, the higher the cost, the greater the profit, and, consequently, it would be to the interest of the manufacturer to increase the cost rather than lower it. As Attorney General Gregory stated "no such contracts have been made."

The forms of contracts entered into have all been on the cost-plus basis, the only forms of contracts which would be sufficiently flexible to operate satisfactorily and which could be made in view of the unforeseen and uncontrollable changes in the prices of material and labor.

The contracts that were made under the cost-plus arrangement are shown by the Attorney-General to insure a gradual decrease of cost to the Government by the provision that the contractor would share in the saving if the actual cost were less than the estimated cost or bogey, in the contract. Furthermore the contracts that were made contained a clause reserving to the Government the right to terminate them or revise them at any time by repaying the amounts expended plus the fixed profits on finished articles and 10 per cent of the labor and materials costs on unfinished work.

Thus, the sensational charges of last spring, made by a man who used a personal letter from the President, as the credential for investigations taken up by members of Congress, in some instances possibly for political reasons, and later developed to such a degree that they were serious reflections upon the automobile industry, have come to naught.

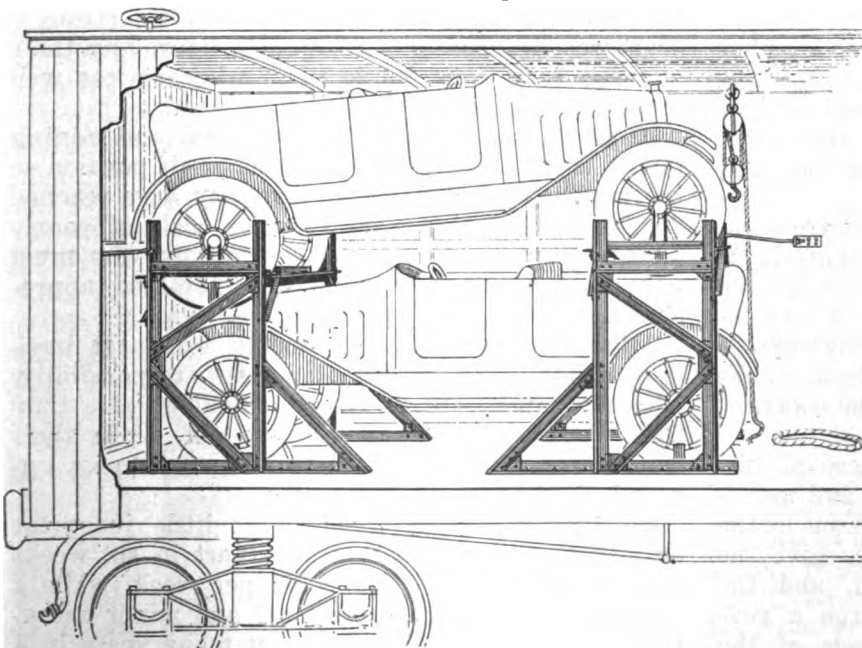
## Carbo Steel Deck for Loading Automobiles

THE Carbo Steel Post Co., Chicago Heights, Ill., has devised a deck for loading freight cars with automobiles, motor trucks and tractors which permits of in-

creasing the capacity of a box car from 60 to 70 per cent over single-deck loading. One car is placed on the floor, and the steel deck is placed over it, another car being placed on the deck, reversed end for end with respect to the first one. The method of loading by means of these decks can be used on flat cars as well as in box cars, and will then increase the capacity 100 per cent. These steel decks are said to be lighter than wood decking, and thus to save freight.

In loading cars with the aid of the Carbo deck the wheels need not be taken off the top cars, and generally the tires are even left on. As the cars straddle each other, the height of the two cars combined will be 18 to 24 in. lower than with other methods of loading. It will be seen from the illustration that the two cars are reversed end for end.

These decks are also used by automobile dealers and warehouses for storage purposes, and they are claimed to be preferable to pits for repair work. The decks are standardized for various loads and purposes, and they are either leased or sold outright.



# Agreement vs. Bargaining

Trust or Confidence Between Employer and Employee Impossible So Long As Both Frankly Base Their Relations Upon Their Ability To Take Advantage of a Bargain

By Harry Tipper

**A**LMOST all the strikes which have taken place in the various countries at war have been distinguished by the decision of a body of workers to strike in the face of instructions to the contrary from their national union, and the fact that they have frequently broken a contract made by the same body at an earlier time.

Not long ago there was a strike of press feeders in Chicago. This strike was repudiated by the National Union. The employing printers had an organization and agreed to allow the men to strike rather than meet the demands.

The men struck, and after a few days some of the employing printers deserted their organization, with whom they had agreed to stand out against the men, and met the demands in order to go ahead with their business.

As this is being written there is a strike of press feeders in New York, despite the fact that it is not countenanced by the National body, and despite the fact that there is an agreement with the employers which should run till next spring.

Whenever a group of manufacturers gets together and talks about the labor question there are two matters which always come in for a good deal of attention—the uncertain character of an agreement with a union and the weakness of some members of the manufacturers' group.

The fact is local interests and necessities are paramount with both sides. Just so long as there is no reason for breaking away from an agreement the general action of the group stands, but so soon as the local situation presents either advantage or apparent necessity for special action that local condition will govern, general agreements to the contrary notwithstanding.

The present conflict has witnessed more of this independent action of local labor unions and manufacturers' groups, because the local conditions of the labor market in a time of such scarcity give the worker much advantage in a bargain, and the local conditions of business with so large a governmental necessity influence the attitude of the

local manufacturers' body upon the same matters.

Since wages ceased to be the subject of legislation and became the private concern of the parties at interest, the amount of such wages has been a matter of trade. When the labor market was overstocked with available labor, the manufacturer has always used that to keep down the price and when the market has been unable to supply the demand the worker has always seized upon his advantage to increase the price of his work.

Both sides have had a good deal to say about their rights and how just and fair they were in their attitude toward the matter, but the history of the continual disputes and the condition of wages shows

clearly that wages have always been based upon the horse-trading principle—each side gets as much as it can from the other, according to the prevailing conditions.

Under such a system of payment there is no relation between the value of a piece of work and the amount which may be paid for it. Because they are in a better position to drive a bargain, the strongly organized branches are constantly improving their working conditions, while those who are less well organized are constantly losing ground.

Thus workers in some of the metal and mining trades have been able to strengthen their position so thoroughly that during this war they have reached \$5,000, \$10,000 and even a larger scale of yearly earning capacity, while the supervisors who must govern these workers have not increased appreciably.

I know many men who must govern large business affairs and accept important responsibility whose earnings are less in commodity value than they were before the war broke out, while their employees are able to indulge in luxury to an unheard-of amount.

Workers whose job requires so little judgment or skill that they can become expert in six weeks are making \$50, \$60 and \$100 per week, while a vast army of clerks, accountants and minor executives in business who have spent many years in a

**“W**HERE the majority vote is necessary to ratify an agreement, the majority vote can, of course, rescind such an agreement and, while between individuals a contract must involve a *quid pro quo*, it has been found impossible as yet to enforce the same principle in contracts between organized masses, so that these contracts are practically nothing more than expressions of opinion between the majorities which it is hoped will last the length of the agreed time.”—*The New Business*.

slow growth in the required training of their specialization are not nearly so well off from an earning standpoint as they were before the war.

In the days of hand labor the craftsman was paid according to the length of apprenticeship required for his training and for his extra skill at his work when the training was over.

The present methods of deciding wages and of readjusting them cannot be justified upon any consideration of equity and can be of value only if industry is to continue to run its business upon the basis of horse-trading, with its concomitant discontent, compromise and readjustment.

There are some manufacturers who have stated to the writer that they expected to continue their business upon those lines and to be able to secure a dominant position again after the war is over. One of them stated the case in these words:

*"We are accepting these conditions now because we are in business to win the war and we will go out of business if necessary to do that; but you wait till the war is over and we get back on commercial business. There will be plenty of labor then and we will get back to our old basis."*

It is not necessary to discuss the absurdity of this viewpoint, but it is necessary to point out that the worker is much more powerful than he has ever been before; not merely because of scarcity of labor, but because of the growing solidarity of his organizations and class consciousness, because of his numerical power as a voter in the political government of the country and his influence upon governmental outlook and action.

### Politics Based Upon Industrial Demands

The political demands of the Labor Party of Great Britain are mostly industrial demands turned into the political arena. The action of government upon industrial matters in this country has been visibly influenced by the importance of labor as a voting power. These things make it certain that a continuance of the old system of bargaining in the spirit of a horse-trade *will have the result of placing the manufacturer in a poorer position to trade at each necessity for decision.*

It will make it impossible to depend upon agreements between unions and manufacturers' groups and it will hasten the entry of industrial questions into the arena of political action.

For these reasons it is necessary for the manufacturer to study the wage system with a care that he has not given it heretofore. It will be necessary for him to approach the matter with some idea of finding out if there is a just way of computing the value of different classes of work and if it is possible to come to agreements with his employees instead of continually bargaining with them. It is this system which is at the bottom of the want of confidence between the employer and the employee.

*There can be no trust or confidence between parties who are frankly basing their relations upon the ability to take advantage of a bargain and to put into the bargain every advantage which conditions may open up.*

No agreement will ever make the workers of a locality or a factory lose a bargain when the advantage of bargaining is on their side, and it is evident from the record of strikes during the past four years that the attitude of the national body of workers will not be permitted to prevent the workers of that locality or establishment from getting theirs if there seems to be a good opportunity to do it.

No agreement with other manufacturers will keep the individual manufacturer so thoroughly tied up that he will not kick over the traces when there is an opportunity to get the best of the bargain with his local labor by breaking it, or get the advantage of his competitor by the same method.

There is little or no chance for the co-operative spirit in a manufacturing establishment, no matter what bonus, profit-sharing, welfare and other advantages may be offered, so long as all the workers in that establishment know that the wages and salaries are arranged as a matter of trade, and they are therefore only to be rearranged when the employee has some bargaining advantage.

### Unjust Wage System Causes Distrust

It is the lack of justice in the method of operating the wage system which is responsible for the unbelief in the employer on the part of the employee. It is not that the wages are necessarily small, but the continual bargaining individually and collectively results in such rank injustices that there are always many employees who feel that they have not been treated fairly because they were not good at bargaining, and there are just sufficient evidences at all times that this or that body of workers has been able to put it over to induce the other unions to try.

The most intelligent, alert workers are frequently the poorest bargainers and the radicals among labor leaders number quite a few of these.

It has been well said in advertising that the firm that wants to advertise and stay in business must tell the truth about itself and give just service. It is sure that if the good will of the buyer of goods can be permanently maintained only by telling the truth and giving just service, the good-will of the employee is not to be more easily secured.

This is a problem so important in its difficulties and so necessary in its solution that it could well be the topic of discussion between employer and employee sitting around the council table of the industrial organization.

### Industrials and the Reconstruction Period

IN England, as in other countries, the thought of industrials at this time is turning toward the period of reconstruction, and serious efforts are evidently to be made by British automobile manufacturers to secure tariff protection when the sale of automobiles will again be permitted. *The Autocar* quotes the Prime Minister to the effect that "the key industries must be allowed to reconstruct themselves while they have still behind them the spirit of patriotism and sacrifice which has been aroused by the war and of the spirit of fraternity which makes rich and poor one great people."



## Types of Tractors Recently Exhibited in France

*Plowing with De Dion-Bouton cable-winding machine**Doisy machine with winding drum**Paris General Omnibus Co. tractor**Tractor exhibited by the French Schneider company, showing front and rear views*



# Tractor Development in France

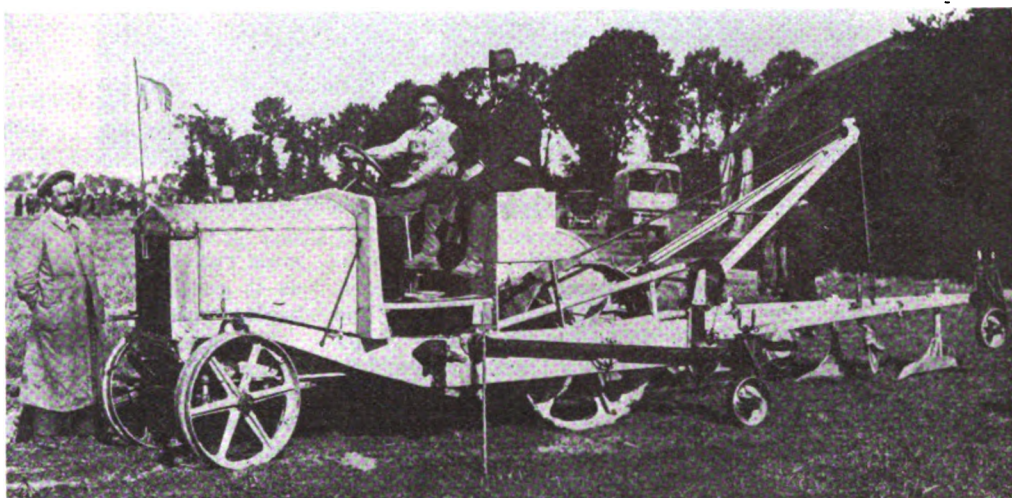
Scarcity of Horses and Agricultural Labor Compels Use of Tractors—Various French, Italian and American Types Shown at Demonstration Conducted by National Tractor Association

By W. F. Bradley

**P**ROOF of the importance which is attached in France to the farm tractor is to be found in the formation of a syndicate of tractor manufacturers and dealers in the decision to hold public demonstrations twice a year, in the spring and fall.

The first of the syndicate's demonstrations took place recently in the neighborhood of Paris, under the direct patronage of all the Government departments, and proved to be the biggest and most important event of its kind held in France. The situation at the present time is full of difficulties. Owing to the fact that the agricultural classes have furnished the greatest proportion of fighting men—for the mechanical classes have mostly been mobilized in the factories—land is going out of cultivation and each succeeding year shows a lower output of wheat. This condition will not be completely remedied with the end of the war, for the losses among agricultural workers have been so heavy that there will be a shortage of labor on the land for years to come. This fact is fully recognized by the various authorities, who are doing everything possible to increase the number of tractors in use.

The education of farmers to the use of tractors is the



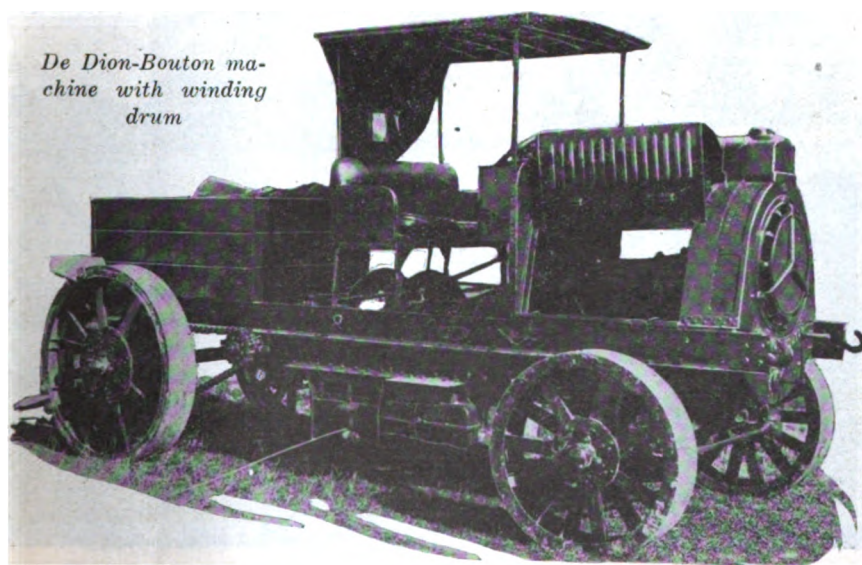
*Tourand-Latil tractor recently exhibited in France under Government auspices*

lesser of the two problems. Eight years of demonstrations in various parts of the country have convinced the farmers that the land can be worked better by tractors than by horses. If they did not make the change it was more by reason of inertia than because of lack of conviction. Now that 2,000,000 farmers are in the army and horses are reduced in number so much that they have to be loaned from farm to farm, the only problem is how to get delivery of tractors.

Importers and French manufacturers are on an equal footing. The former cannot get shipping space and the latter are limited in their output by reason of the shortage of material. One firm alone, with an output of 5 four-wheel drive heavy artillery tractors a day, states that it is 200 agricultural tractors behind on deliveries. Other factories are in the same position. Although they possess manufacturing facilities they are held back on agricultural tractors by reason of the more urgent call for war material.

Such importers as Case, International Harvester, Cleveland, and Gaston, Williams & Wigmore have plenty of tractors, but they are all on the docks at New York. The French Ministry of Agriculture has taken the matter in hand and has purchased from the Case company, and shipped to France, more than 500 tractors, which are being either sold or rented to groups of French farmers. This is doing much to relieve the shortage, but the quantity is insufficient.

At the French demonstrations 13 French machines and 6 of American



*De Dion-Bouton machine with winding drum*



*The Auror light tractor going through its paces at the recent French exhibition*

origin were presented and demonstrated. The big automobile firms are interesting themselves in tractors. Among these are the De Dion-Bouton Co., the oldest automobile firm in France; the Latil Tractor Co., which is the largest artillery tractor concern in France; the Schneider Co., which has built most of the Paris omnibuses and is the largest maker of artillery in France; the Paris General Omnibus Co., which has taken up an English design. It is reported that the Panhard-Levassor Co. is interesting itself in an agricultural tractor. In Italy the Fiat Company, which claims to be the biggest of its kind in Europe, has already produced and marketed an agricultural tractor.

### Three Groups of Tractors

The French tractors are divisible into three main groups, which in numerical order of importance are: cable towing machines; direct haulage tractors; self-contained tractors with rotary and other type plows.

De Dion-Bouton has settled in the cable towing class after having experimented with various kinds of machines during the last half dozen years. The machines it presented are a simple type of chassis with four cylinder motor under a hood and winding drum placed amidships. The chassis is not spring-suspended at the rear, and has only coil springs at the front. Two types were shown, one of these having side chain drive to the rear wheels, and the other the De Dion-Bouton system of internal gear. Naturally, with this system two tractors are required for one plow, a tractor being placed at each end of the field being plowed.

There is a modification of this system in the Doisy tractor, which has the motor forward under a hood, three-speed transmission, a jack-shaft with drive by side chains to the rear wheels, and from the jack-shaft another chain drive to a winding drum placed within the chassis and hav-

ing its shaft parallel with the rear axle. The jackshaft is fitted with dog clutches so that either pair of chains may receive the power; that is to say, the rear wheels or the winding drum may be driven independently off the same shaft. The distinctive feature of this tractor is its locking arrangement. The cable is not taken direct from the winding drum to the plow, but is carried round an idler pulley mounted on a shaft pivoted transversely under the center of the chassis. Attached under the shaft is a heavy steel plate fitted with a suitable system of spikes. The pull on the cable passing round the idler pulley draws the locking mechanism into the ground, and the greater the pull on the cable the greater the locking effort obtained. Only one tractor is used, and when the plow has been drawn across the field it

must run across to the opposite end, paying out its cable as it goes, and, after dropping its locking mechanism, begins winding operations again.

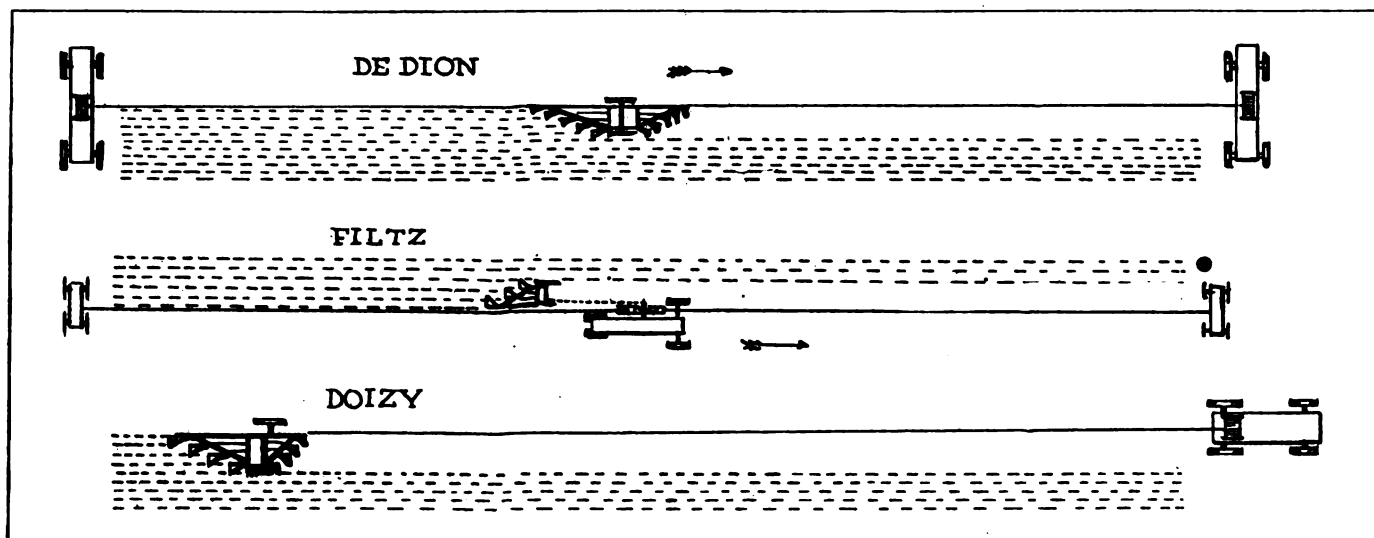
The next of the cable machines is the Filtz, which is again different from the other two. The Filtz, which was one of the first to be put on the French market, and was really well known before the war, is a light tractor with a plow connected up to it by a chain, and which hauls itself across the field by a cable which is anchored solidly at each end and passed around two winding drums mounted on the extremity of shafts just outside the frame members. There are two seats with a central steering column and wheel between them. On reaching the headlands the driver moves from one seat to the other and reverses the drive.

In the direct haulage class the most successful and best known machine is undoubtedly the Tourand-Latil. This tractor was designed some eight or nine years ago by Tourand, who demonstrated it and experimented with it on limited means until the beginning of the war, when it was adopted by the Latil Tractor Co. This firm has become the biggest four-wheel drive artillery tractor concern in France, with a huge modern factory and a yearly output of more than 2,000. The agricultural machine has profited by this association, for although



*Operating Filtz agricultural tractor*





Three systems of cable plowing demonstrated at French trials: De Dion-Bouton system with two tractors operating winding drums; Filtz system with a plow attached to it and hauling itself along the field by means of a fixed cable; Doizy system using a single tractor which moved from one side of the field to the other and hauled the plow by means of its winding drum

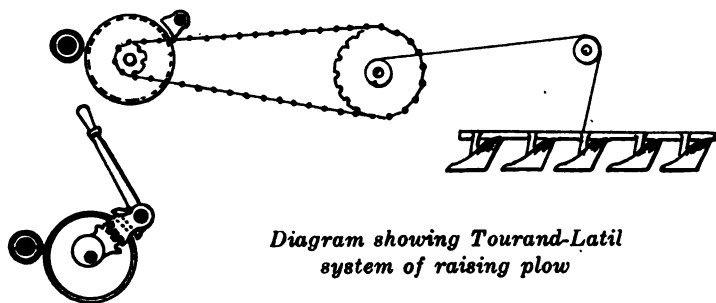


Diagram showing Tourand-Latil system of raising plow

the same in principle it has undergone many improvements in detail and in manufacturing methods.

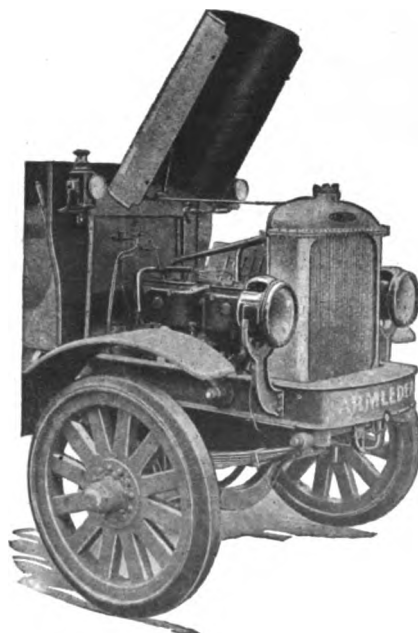
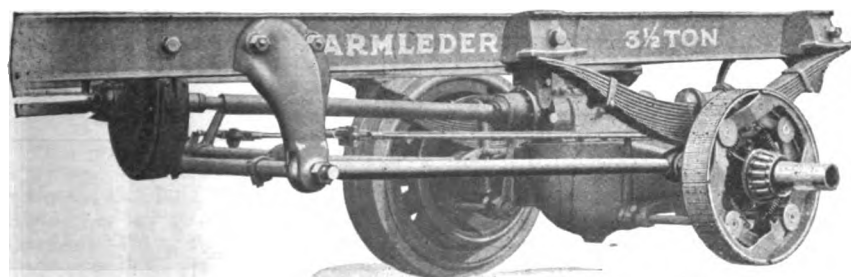
The motor is entirely new, being one of those used by the Latil company in the artillery tractors. The frame members have been redesigned so as to give a lower center of gravity and permit a better attachment of the plow to the tractor. This system of direct attachment of the plow to the tractor is one of the distinctive features of the Tourand-Latil. As will be seen from the illustrations, the plow is direct connected to the center of the frame, but pivoted at the rear, so that the entire plow can be raised or lowered by power in the shortest time, and is also adjusted for depth.

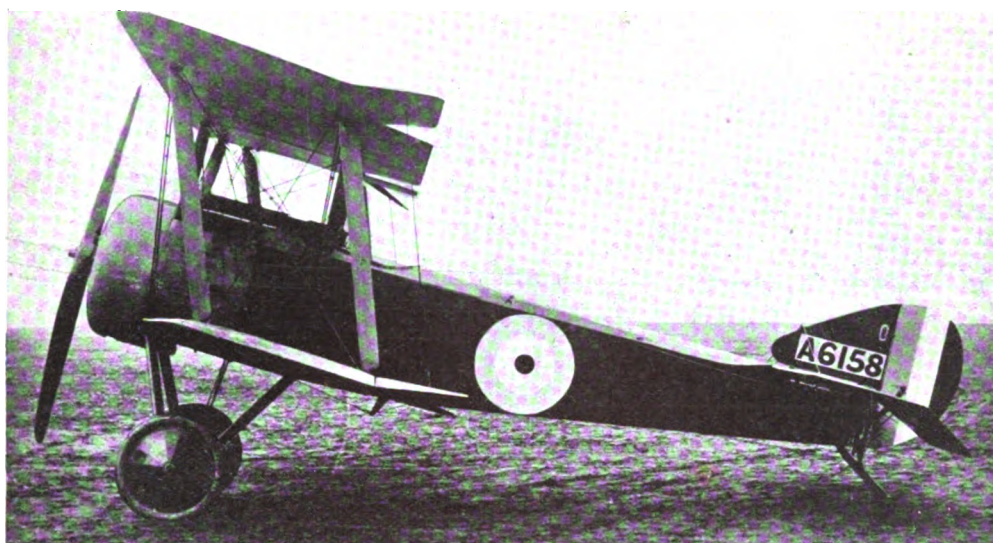
The only rotary plow in the trials was one presented by the S. O. M. U. A., this company being an auxiliary of the Schneider company. The machine, which is not new to the French public, is in the same general class as the Ford, so far as the absence of frame members is concerned. Here, however, the similarity ceases.

### Novel Features in Armleder Truck

A NUMBER of novel features are found in the new truck models of the Armleder Co., Cincinnati, O. One of these consists in the arrangement of the radius rods. These extend between the spring saddles on the rear axle housing and drop brackets secured to the frame channels. These radius rods are fitted with ball and socket connections at both ends so that they are not subjected to stresses due to road inequalities. The rods are secured to the rear axle by means of the spring saddles, which are accurately machined to fit over the axle housing. The saddles are lipped and so clamped over the housing that the transmission of the driving thrust will not tend to displace the spring clips. All moving parts are bushed. The radius rods are parallel with the propeller shaft and of the same length. They are so placed in relation to the frame that when the truck is under load they are almost parallel to the ground.

The second new feature is the engine hood. Each side member of this hood is removable, the idea being to afford easy access to both sides of the engine. The upper part of the hood is hinged against the dash so that it can be raised from the front end and secured in the raised position to permit of such operations as valve grinding.





*The Sopwith "Pup," on which the design of the "Camel" is based*

## The Sopwith "Camel"

Description of a Late Model British Scout Plane, Translated from  
a German Aircraft Publication

**A** NEW machine put out by the Sopwith Aviation Co., Ltd. of Kingston-on-Thames, "the Camel," is a development of the same firm's Pup. It differs from the latter, however, in having a more powerful engine and in numerous details of construction.

As in the older type the wings and tail plane with elevator are of trapezoidal plan form, but the greatest span occurs at the trailing edge. The top plane center-section has a span of 2.17 m., while the strut attachments are only 1.48 m. apart. As the fuel pressure tank and gravity tank are placed rather far aft, the pilot's seat is placed immediately behind the engine or underneath the top plane center-section. In order to provide a better view, a rectangular opening is cut in the center section. The longitudinal edges of this opening are provided with three-ply plates projecting beyond the wing profile so as to reduce the amount of air flowing over the edges. To facilitate getting into and out of the machine the trailing edge of the center-section has been cut away. Upper and lower planes have an equal span of 8.57 m., and an equal chord of 1.37 m. The aspect ratio is therefore 6.25 against the aspect ratio of 5.15 of the older type.

The wing spars, which are made of spruce, are spindled out to an I-section, with the exception of the bottom rear spar, which is left solid. The gap between the planes is 1.31 m. at the tips and 1.52 m. near the body. (In the older single-seater the gaps were 1 m. and 0.86 m. respectively.) The upper plane is staggered forward 0.45 m. There is no sweepback. The dihedral angle of the top plane is 178 deg. and of the bottom plane 170 deg. The angle of incidence of the top plane is 2 deg. at the center-section, 3 deg. at the tip. The bottom plane has a uniform angle of incidence of 3 deg.

The inter-plane struts, which are of solid spruce of streamline section, are, as in all Sopwith machines, placed with their ends in steel sockets welded to the fittings on the wing spars, and are provided with no further attachment. The lift wires and landing wires, of which the

former are in duplicate, are in the form of streamline wires.

Non-balanced ailerons are fitted to the rear spars of both planes. The wing fabric, which is sewn on to the ribs, is cream colored underneath, and the top surface, as well as the body fabric, is painted a reddish brown. The body, which is of the usual girder type with four longerons, has a rounded top. The undercarriage is of the usual Sopwith type. A divided aluminum axle rests in a streamline covering of wood. The axle hinges are braced from the fuselage.

The tail plane, which is deeply cambered on both sides, is rigidly attached to the upper body longerons with an angle of incidence of 1.5 deg. The tail plane trimming gear hitherto fitted to all Sopwith machines has been abandoned, in spite of the fact that the fuel tanks are placed behind the pilot's seat. The fin and rudder are of the usual characteristic Sopwith form.

The 130-hp. Clerget engine, which is built by Gwynnes, Ltd., develops about 134 hp. at 1200 r.p.m. According to a

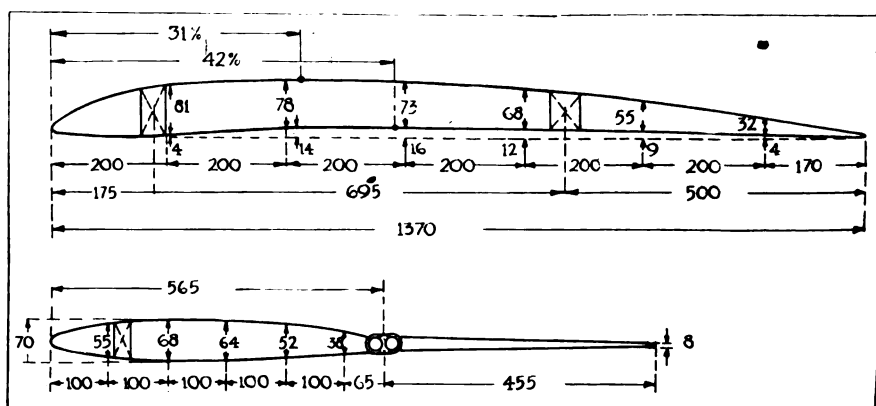
plate in the pilot's cockpit the revolutions of the engine are not to exceed 1250 r.p.m.

The fuel pressure tank has a capacity of 138 liters and the gravity tank holds 32 liters. This gives sufficient fuel for a flight of about 3½ hr. duration. An oil tank with a capacity of 30 liters is placed behind the engine. In some machines the tanks are of welded sheet aluminum, in others they are made of lead-coated, riveted sheet iron. The weight of the tanks is 12.5 kg. and 20 kg. respectively, giving a percentage weight of

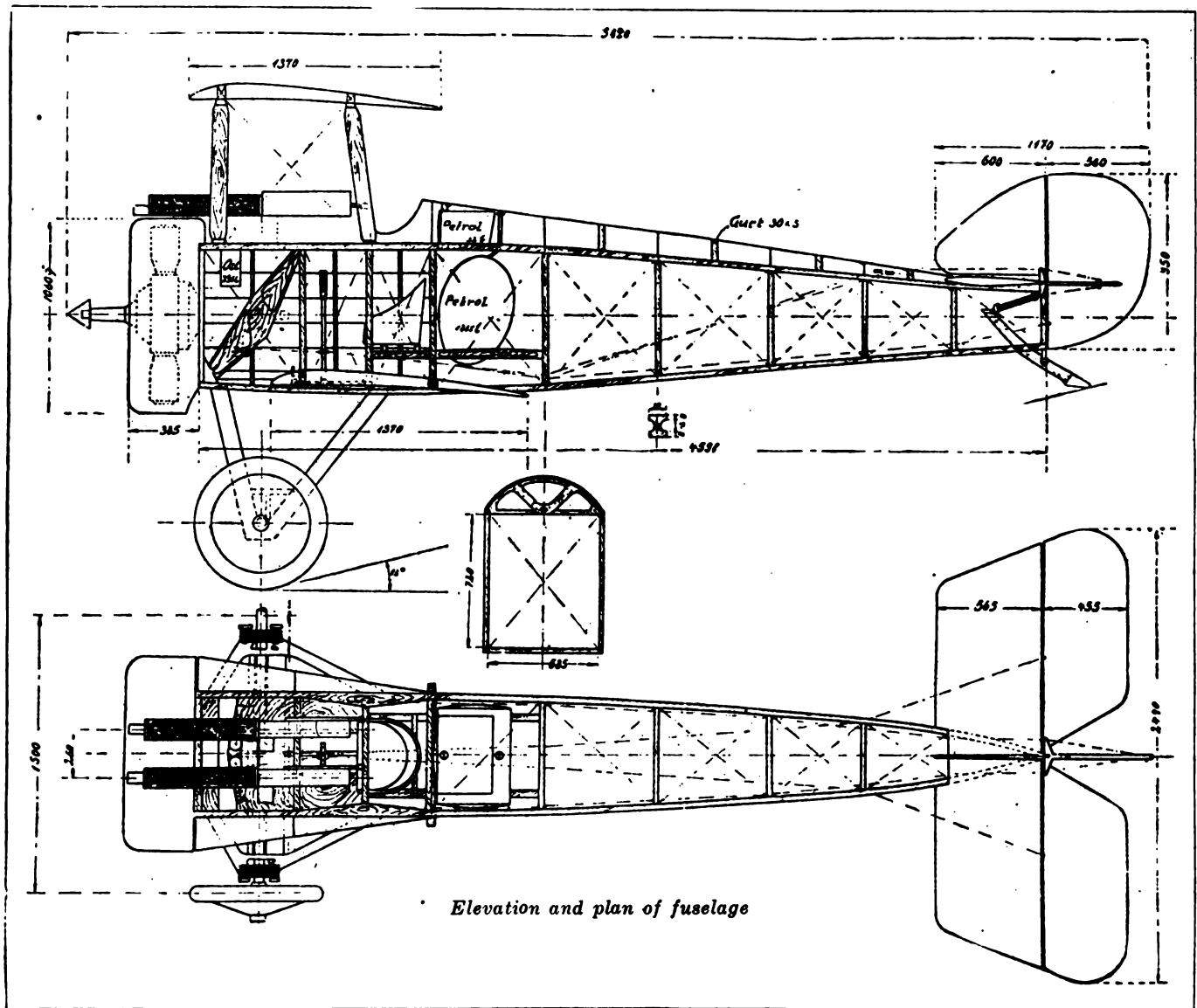
$$\frac{12.5}{146} = 0.0832 \text{ and } \frac{20}{146} = 0.133 \text{ respectively.}$$

In the pilot's cockpit are the following instruments:

In the center on the instrument board: Manometer, with safety valve, clock, pressure gage, altimeter, compass, two switches, revolutions indicator, and pulsometer. On the right: The hand-pump (air). On the left: Control levers for pressure and gravity fuel tanks, fuel tap, throttle lever, fuel level indicator for pressure tank, Bowden cable for bomb release. A propeller air pump for the pressure tank is mounted on the starboard chassis strut. Two fixed Vickers guns are mounted on top of the fuselage. Their locks and feed block



*Dimensioned drawings of wing spar, stabilizer and elevator*



Elevation and plan of fuselage

levers are inside the body covering. Between them is a telescope sight. In a bomb rack under the body can be carried four bombs, the Bowden controls for which are placed to the left of the pilot. There is no bomb sight fitted to the body of the machine.

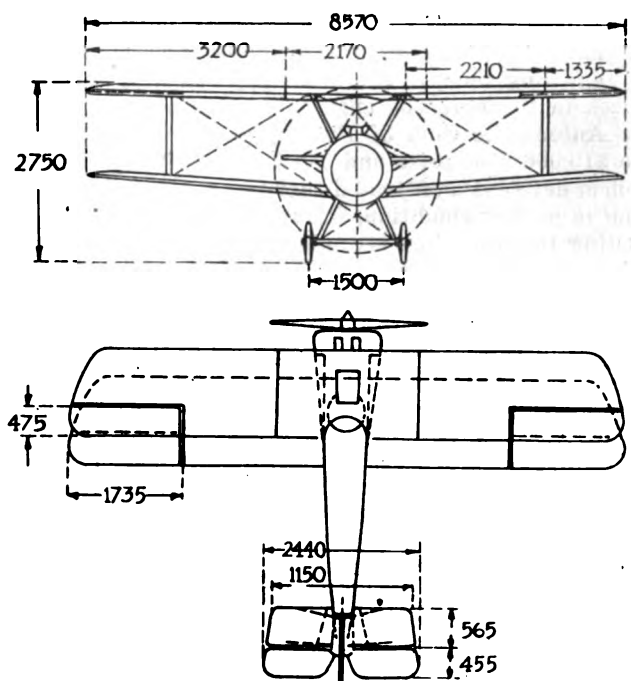
The weight of the machine empty was ascertained to be 430 kg. With tanks full the weight of the fuel is 150 kg. With pilot and armament the useful load would then amount to 290 kg. It is therefore to be assumed that the weight of about 50 kg. of bombs is only carried when the tanks are not full. Assuming a useful load of 290 kg. the total weight "all up" amounts to 720 kg. As the wing area is 19.76 m<sup>2</sup>, the loading is 36.5 kg. per sq. m., and the loading per hp. is 720; 134 = 5.37 lb.-hp. The corresponding loadings for the Sopwith "Pup" were 23.4 and 6.6 respectively. The "Camel" has therefore a higher wing loading, but a considerably smaller loading per horsepower.

**Detail weight**—Motor, 159.0 kg.; propeller, 18.0 kg.; tanks, 12.5 kg.; motor accessories, 12.5 kg.; body with aluminum covering, etc., 48.5 kg.; seat, etc., 9.0 kg.; undercarriage, 39.0 kg.; tail skid, 2.5 kg.; controls, 4.5 kg.; wings, 100.0 kg.; tail plane, fin, rudder and elevator, 13.0 kg.; fittings for armament, 11.5 kg.; total, 430 kg.

**Weight of wings**—5.5 kg.-sq. m.

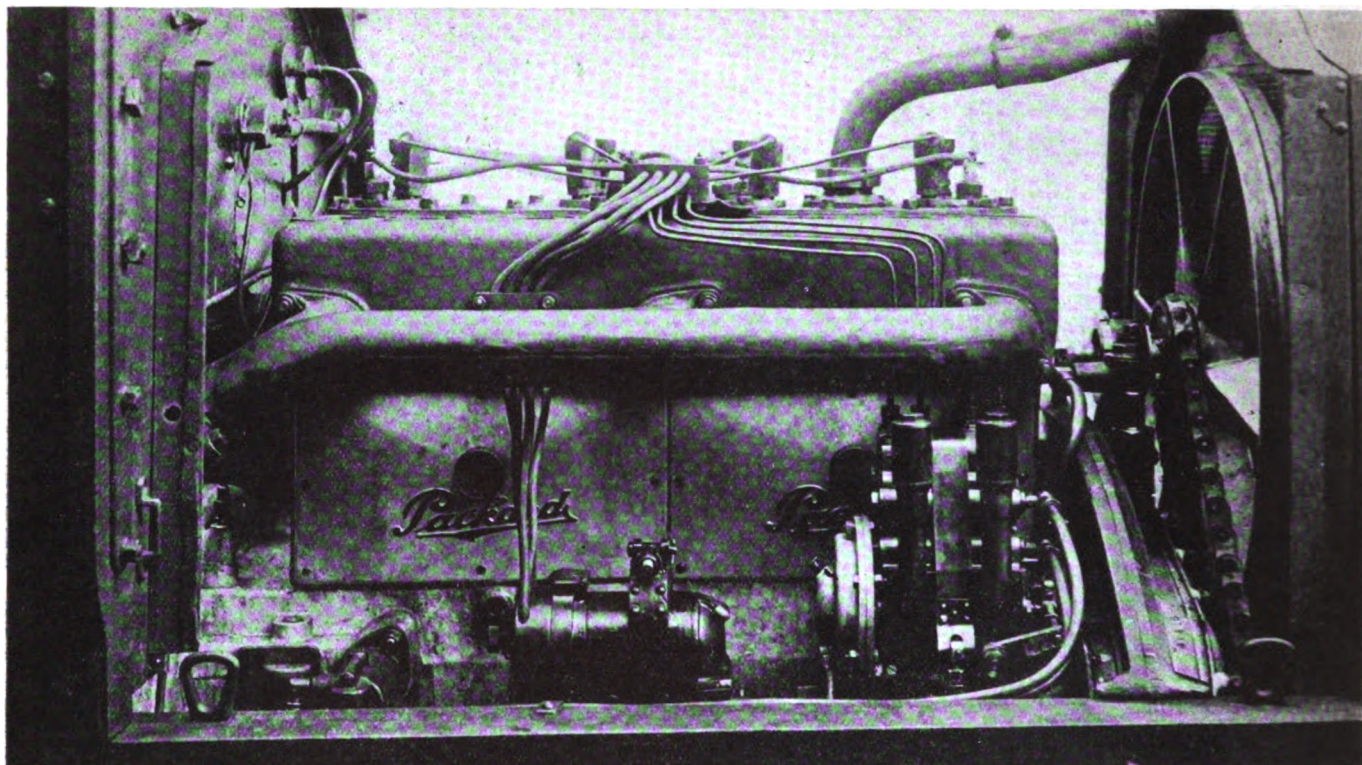
**Loading**—Pilot, 80 kg.; armament, 60 kg.; 4 bombs, 50 kg.; instruments, 5 kg.; fuel, 150 kg.; total, 290 kg.

The above article is reproduced from *Flight* of London, which had the text translated from the German. All dimensions in the various line drawings are in millimeters.



Front view and plan of the "Camel"





*The Bellem equipment applied to a Packard truck engine. The pulverizers may be seen on top of the cylinders and the distributor in the foreground on the right*

## Bellem Wins French Kerosene Tests

Starts Cold Engine on Kerosene—Engine Running Well in 4 Seconds—Is a Pulverizing Device—Can Be Fitted to Gasoline Engines

By W. F. Bradley

PARIS, FRANCE, Sept. 15.—The Bellem kerosene pulverizer for use on automobile and other engines, enabling them to use kerosene, won first and second prizes in the kerosene engine competition conducted by the Automobile Club of France, and so has carried off the \$10,000 first prize and the \$2,000 second prize. The Bellem device demonstrated that the engine could be running in perfect condition, according to the engineers conducting the tests, in 4 seconds from the time of starting, this being the best record of the test. The time required to get the engine running properly varied from 4 seconds to 45 seconds on the winning engine fitted with the Bellem. The engine started on kerosene, and did not use gasoline at all, although the rules permitted starting with gasoline if necessary.

There was a second engine fitted with the Bellem attachment which used gasoline for starting in some of the tests, and which required sometimes as long as 3 minutes to get into perfect operation.

The six different devices which started in the competition were given four distinct bench tests, as follows:

- 1—A 3-hour test with full load at full speed.
- 2—A 2-hour test with full load at half speed.
- 3—A 3-hour test with half load at full speed.
- 4—A 2-hour test without load at full speed.

After the engines had taken these four tests they were

fitted into a chassis and given a road test of 634 miles in 4 days, at an average speed of not less than 19 m.p.h. Because of their performance on the bench test only the two engines fitted with the Bellem device were eligible for the road test.

The Bellem devices for using kerosene were fitted to two four-cylinder Unic engines with 4 by 5.9 in. cylinders.

During the bench tests it was permissible to make use of gasoline for starting, on condition that a special tank was not employed. No. 1 Bellem was started on kerosene every time. No. 2 Bellem used a small amount of gasoline for starting. The time necessary to get the engines running properly was noted by Lieutenant Lumet, the club laboratory engineer. The best time was that of one of the Bellems, which was running perfectly in 4 seconds. The slowest time of the Bellems was 90 seconds. The slowest time for any competitor was 25 minutes. All the bench tests were made with commercial kerosene of 809 gravity and flash point at 58 deg.

Although applicable to any four-cycle engine, the successful Bellem system entails some changes in construction. The Unic engines used in the competition had originally been standard L-head type, block casting, with carburetor on the valve side. The modification consisted in changing the time of the intake valve, fitting a kero-



sene pulverizer in each cylinder head and placing a kerosene measuring instrument or distributor on the pump and magneto shaft.

The intake valve was timed to open 45 deg. before lower dead center. During this portion of the stroke a partial vacuum is formed in the cylinder, for only a very small quantity of air is drawn in through the kerosene pulverizer mounted in the cylinder head. This initial quantity of air carries with it a quantity of kerosene which has been fed to the pulverizer by the measuring instrument driven off the magneto shaft. This method of injecting the kerosene into a partial vacuum causes very fine pulverization. About 45 deg. before lower dead center the intake valve opens, and closes again 45 deg. after lower dead center. As there is a considerable vacuum in the cylinder when the intake valve opens, the short period during which it remains open is sufficient to get a complete charge even at high revolutions per minute. The charge is compressed to 4 to 5 kilograms per square centimeter and is fired in the usual manner by a high-tension magneto.

### Conditions of the Contest

The competition was organized to encourage the use of kerosene for automobile engines, and particularly for truck engines. For this reason the horsepower was limited between 20 and 40, the weight per horsepower had not to exceed 33 lb.—this included flywheel, carbureter, ignition appliances, cooling apparatus, but no water—and the fuel consumption had not to exceed 350 grams per horsepower-hour. Only appliances constructed entirely in France were eligible.

There were six competitors originally, but these dwindled down to four, two of the motors being presented by the Bellem company, one by the Aldo company, and one by the Genault company. Among the two who had en-

tered but did not go through the tests was Ballot, the biggest motor specialist in France.

The competition was originally slated for the early portion of the year, but owing to the military situation was postponed until last month. Incidentally, it was held in Paris, during the great German offensive, within sound of the guns, and while the city was receiving an occasional shell from Big Bertha.

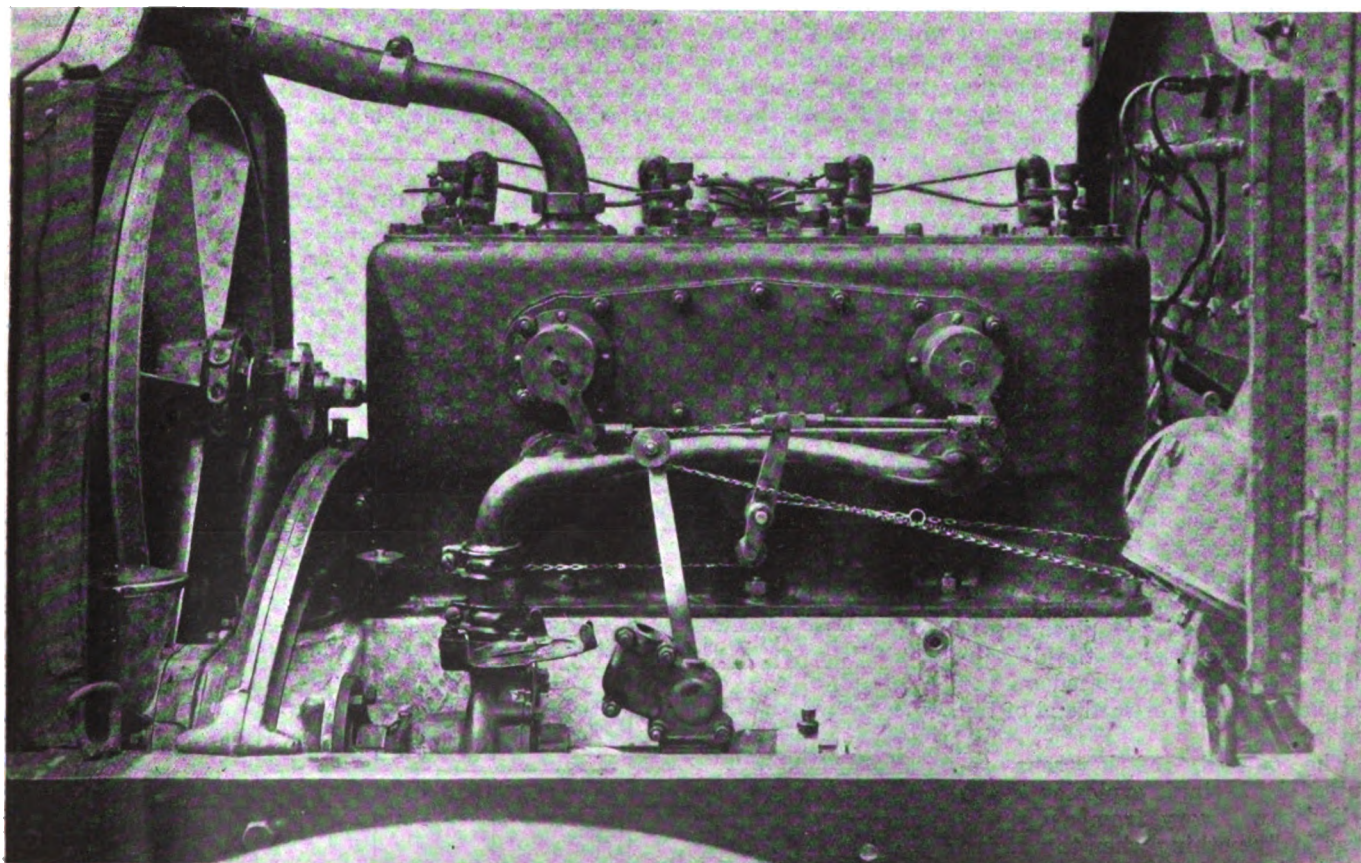
The tabulation on the bench tests gives the horsepower of the different engines, their r.p.m., as well as the consumption in kerosene per hour, which is given in grams. In the full-load test the two Bellem devices showed practically the same power, approximately 32 hp. at 1160 r.p.m. The fuel consumption of one was 334 grams per hour and of the other two 97. The consumption of the two other devices, namely, Aldo and Genault, was so much higher, and their horsepower approximately 50 per cent lower, that they could not be considered factors in the test.

In the 2-hour test with full load at half speed the Bellem devices showed approximately 50 per cent horsepower, and the fuel consumption was 10 per cent greater than when operating at full speed.

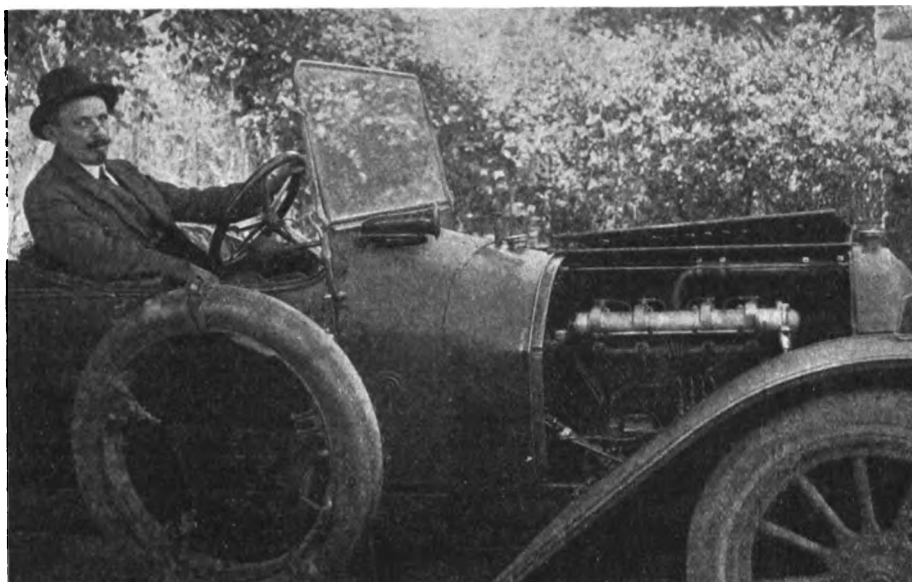
With the Bellem devices operating at half load and full speed the fuel consumption was higher than when running with full load at half speed.

When the Bellem devices were operating at full speed without load the fuel consumption was 1.56 gal. per hour.

In the road tests with the Unic engines, fitted with the Bellem devices placed in automobiles, good results were obtained. The total weight of No. 1 car was 3783 lb. in full running order, and its average kerosene consumption was 13.1 miles to the American gallon. The average speed maintained was 25.4 m.p.h. No parts of the engine had to be touched during the road test, and



*Left side view of Packard truck engine fitted with Bellem kerosene feeding device*



*M. Bellem, winner of the \$10,000 prize for kerosene-burning appliances, at the wheel of a Unic car converted to a kerosene-burning machine*

the only incidents recorded by the official military observer were a seize brake and a broken feed pipe. The latter was repaired with a piece of gasoline-proof rubber hose.

The second Bellem engine was placed in a new type Unic chassis with a two-seater test body and bags of sand as ballast. The total weight was 3977 lb. Average speed was 24.9 m.p.h., and average fuel consumption 13.2 miles to the American gallon. This car had no engine trouble on the road, the incidents noted being a loose steering connection, a fractured feed pipe and a lost oil plug.

The Bellem kerosene device is manufactured by Bellem & Bregeras, a French company, in which the Unic company is interested. Several gasoline-type engines have been converted by the Bellem system, including a number of Packard 3-ton trucks belonging to the French Army, and also a number of standard engines used in French submarine chasers.

The Bellem device consists of two parts—one, what might be designated a distributing mechanism by which the necessary quantity of kerosene is given to each cylinder for each explosion, and another a pulverizing system by which this quantity of kerosene is completely pulverized, making it possible to start a cold engine without the use of gasoline. No liquid kerosene enters the cylinder, but the pulverization is so complete that a very fine mist is formed within the cylinder. The pulverizing apparatus is fitted in the cylinder head in place of the priming cups, whereas the distributing mechanism is placed on the crankcase at the forward end of the engine.

The quantity of kerosene required for a single explosion in the cylinder will vary from a drop to practically nothing when the engine is running light, and at an engine speed of 1800 r.p.m. this quantity

of kerosene has to be delivered in the short time of one one-hundredth of a second.

The distributing mechanism consists of a cam-operated plunger pump with a cork packing. A variable column of mercury is used to control the pressure of fuel feed. The pump plunger is spring returned, and the amount of fuel fed per stroke can be controlled by means of a stop which is interlinked with the throttle valve.

The kerosene from the distributor goes to the pulverizers, which are placed in the cylinder heads in place of the priming cups. In some cases this pulverizer is an automatic valve, but on the Unic competition engines it was mechanically operated by means of an overhead camshaft. This comprises a hollow-stem poppet valve. On the beveled edge of the valve head, and within the valve seat, are a number of equally spaced holes. When the valve is forced from its seat, either mechanically or by suction, air is drawn through the hollow stem and through the fine holes in the valve head, and these horizontal streams of air impinge upon the vertical currents of air and fuel coming through the fine holes in the valve seat, thus thoroughly pulverizing the fuel.

IN view of the increased demand for tungsten ores, it is interesting to record a substantial increase in the exports from the Federated Malay States in 1917. The Federated Malay States Government has suspended the export duty on tungsten ores, and is granting free prospecting licences, and one result of this policy is the trebling of the output since the outbreak of war. The chief cause of the increase in the State of Perak was the discovery of two very rich non-extensive deposits of scheelite on a tin-mining property.

### French Bench Tests on Kerosene

Name of Competitor	Starting on Kerosene or Gasoline	Running in on Kerosene	Average Speed, R.p.m.	Average Horse-power	Consumption per Hour	Average Temperature Water Outlet, Centigrade
<b>3-HOUR TEST WITH FULL LOAD, AT FULL SPEED</b>						
Bellem No. 1	Kerosene	45 sec.	1152	32.4	334 gr.	44 deg.
Bellem No. 2	13 cu. cm. of gas.	1 min.	1163	33	297 gr.	39 deg.
Aldo	470 cu. cm. of gas.	9 min. 30 sec.	1051	24	304 gr.	26 deg.
Genault	300 cu. cm. of gas.	2 min.	1749	22.6	365 gr.	38 deg.
<b>2-HOUR TEST WITH FULL LOAD, AT HALF SPEED</b>						
Bellem No. 1	Kerosene	4 sec.	655	16.2	372 gr.	45 deg.
Bellem No. 2	Kerosene	50 sec.	645	15.2	353 gr.	43 deg.
Aldo	520 cu. cm. of gas.	15 min.	607	14.6	546 gr.	23 deg.
Genault	350 cu. cm. of gas.	10 min.	864	3	714 gr.	66 deg.
<b>3-HOUR TEST, WITH HALF LOAD, AT FULL SPEED</b>						
Bellem No. 1	Kerosene	45 sec.	1177	13.9	423 gr.	50 deg.
Bellem No. 2	30 cu. cm. of gas.	1 min. 50 sec.	1242	16.24	374 gr.	53 deg.
Aldo	400 cu. cm. of gas.	2 min. 30 sec.	1034	12.95	387 gr.	27 deg.
Genault	300 cu. cm. of gas.	25 min.	1743	11.73	521 gr.	65 deg.
<b>2-HOUR TEST, WITHOUT LOAD, AT FULL SPEED</b>						
Bellem No. 1	Kerosene	12 sec.	1252	....	1.56 gal.	47 deg.
Bellem No. 2	Kerosene	1 min.	1270	....	1.45 gal.	50 deg.
Aldo	180 cu. cm. of gas.	20 min.	1082	....	1.03 gal.	26 deg.
Genault	100 cu. cm. of gas.	3 min.	1675	....	0.76 gal.	75 deg.



# Foote-Strite Tractor Transmissions

Made in Models Suited to Tractors with Longitudinally and Transversely Mounted Engines — Given Either Two or Three Forward Speeds — Belt Pulley Drive Is Incorporated with Transmission

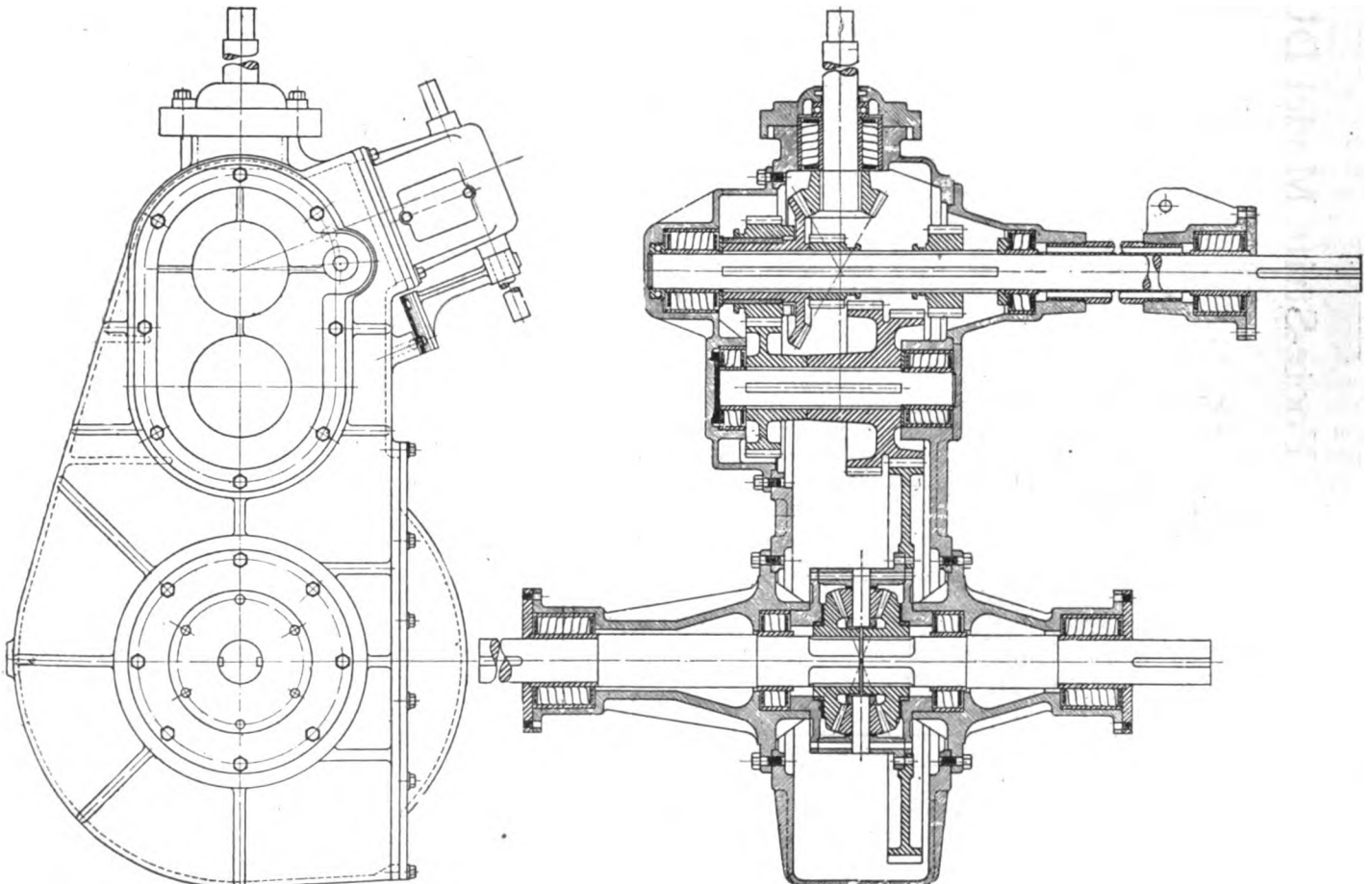
**F**OOTE BROS. GEAR & MACHINE CO., Chicago, Ill., are producing a line of tractor transmissions from designs by George T. Strite, the well known tractor engineer. These transmissions are so designed that they are readily adaptable to almost any design of tractor, and a wide range of gear reductions can be obtained. One style of the transmission is designed for tractors on which the engine is arranged longitudinally and the other for tractors in which the engine sets crosswise. In the former the first reduction is by a pair of bevel gears. The shaft on which the driven member of the bevel gear set is mounted is of the splined type and also carries two sliding pinions and the belt pulley. The shaft is made of a length to bring the pulley the desired distance from the transmission housing and is surrounded by a tube to which a bearing housing can be fitted at the outer end. The inner end of the tube screws into the cast iron transmission case. The design of the outer end is left open, as it has to be varied according to frame design, general layout of power plant, etc.

The two sliding pinions are arranged to be slid into mesh with the two gear crowns of a double intermediate gear respectively, by means of a selective control mechanism mounted on top of the transmission housing. One of the gears of the intermediate set meshes with the gear on the differential, and a

variation in gear reduction can be made by using either the smaller or the larger gear of the intermediate set for the purposes. Other variations are made possible by changing the sizes of the sliding pinions and of the differential crown gear. In fact, the latter may be made with from 48 to 72 teeth. The differential, which is of the self-contained bevel pinion type, is mounted on the jackshaft, from which the drive is to the rear wheels by bull pinion and gear, the latter either of the spur or internally toothed type.

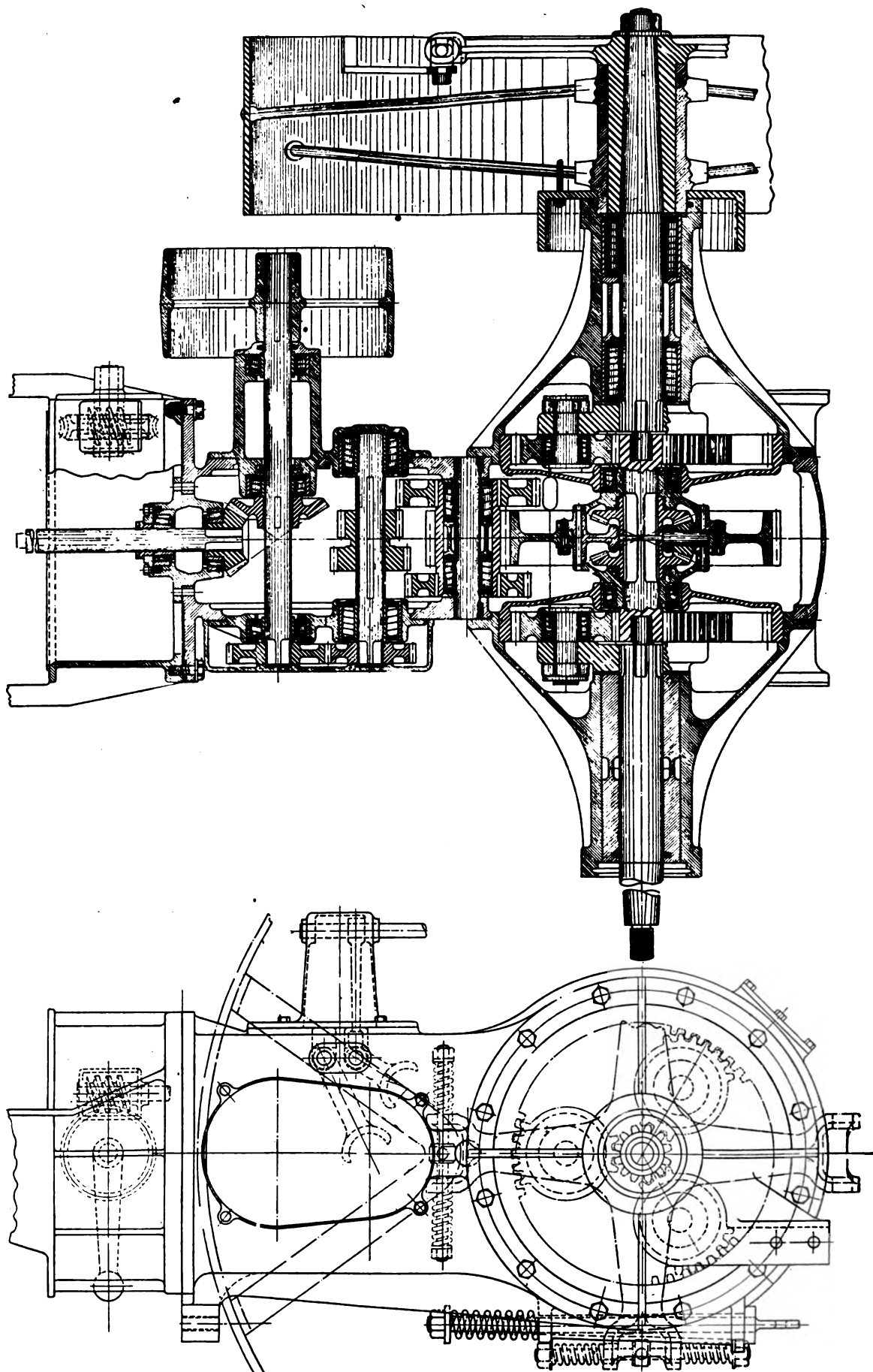
With a transversely mounted engine the bevel gear reduction is dispensed with and the splined shaft carrying the sliding pinions is direct connected to the clutch shaft. The transmission is then an all-spur design. In this case the forward part of the transmission is located alongside of the engine and the narrow width of the transmission case makes this possible. A flange is cast on the transmission housing which joins directly to the engine bell housing.

It was stated above that the housing was of cast iron, and while this is the material mostly used, the Foote company is also prepared to furnish housings of semi steel or cast steel. It will be noticed that the main part of the housing is in a single casting, which, together with the well-planned ribbing, makes for great rigidity. There is a large opening on top, covered by a hand hole plate, through which the differ-



Side elevation of and horizontal section through Foote-Strite transmission, with first reduction by bevel gears

## Foote-Strite Model DU Tractor Transmission.



*With this transmission is combined the rear axle which has a drive through planetary pinions. All shafts run on roller bearings and a spring drive to the wheels is provided for*

ential and other parts may be introduced. There are two tapering jackshaft housings which bolt to the sides of the transmission and carry the bearings for the differential and the jackshaft. The jackshafts are supported in Hyatt roller bearings near the bull pinions, while the differential is carried in parallel bearings. There are also Hyatt roller bearings on the splined shaft, and where the bevel gear set is used ball thrust bearings are mounted back of both the driving and driven gears to take the thrust. The intermediate gears turn on a stationary shaft keyed in the housing.

Three-point support is used, each of the jackshaft housings having a smooth-turned belt at which the transmission can be clamped to the frame, and the third point of support is at the forward end.

Efficient lubrication is provided for, as all gears operate in a bath of oil. This also takes care of the bearings. Transverse partition walls to both sides of the intermediate gears insure that the latter always dips in oil. Gear reductions are such that a plowing speed of 2 to 2½ m.p.h. is obtained, depending on the engine speed. As the plowing speed can be made either the high or the low speed, the extra speed will be either lower (about 1½ m.p.h.) or higher (3½ m.p.h.). The reverse, which is obtained by means of a pair of intermediate gears, is always equal to the low speed.

The Foote-Strite transmission is recommended for engines up to 30 hp. and weighs approximately 550 lb. ready for shipment. The sliding pinions are made from low-carbon steel forgings, case hardened and ground, while the large gears are made either of high-carbon steel or of drop forgings and case hardened. Either carbon or nickel steel shafts are used, and are cut with integral splines. Provisions can be made for braking on either side of the differential or on both sides.

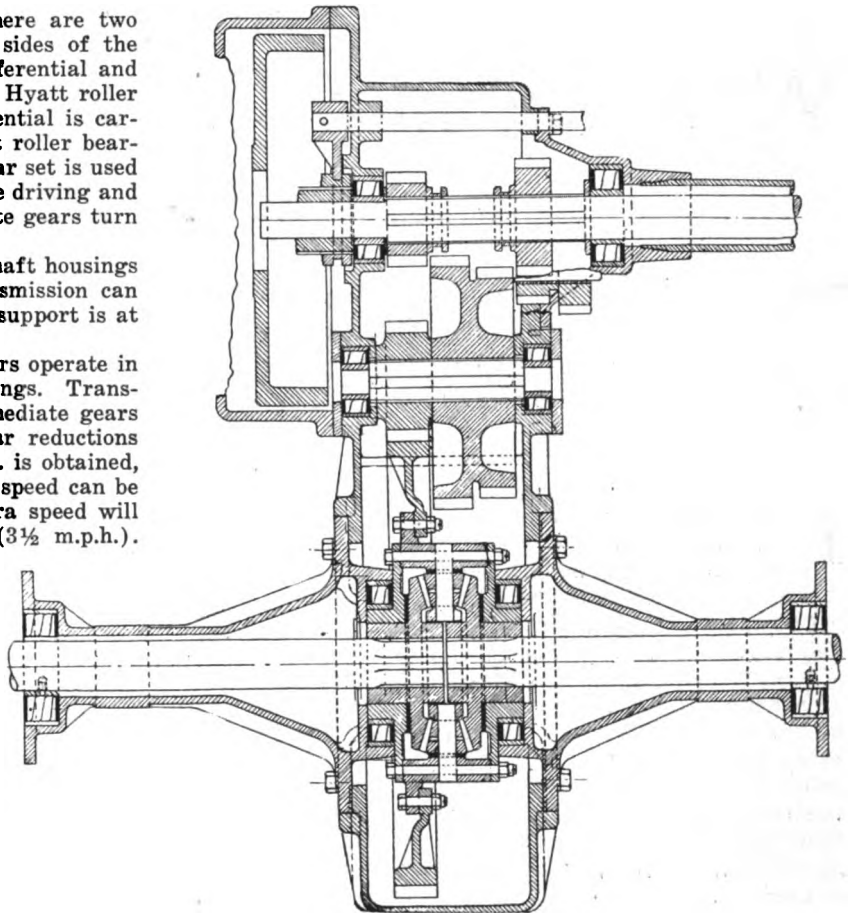
An additional transmission for 30-40 hp. tractors has recently been added to the line and is known as No. 2 A. Hyatt roller bearings are used throughout in this transmission, even in the reversing gears. This transmission can be furnished to give either two or three forward speeds, and the three-speed design is herewith illustrated. In this design the range of speed obtainable is further increased by the possibility of interchanging or reversing the two gears of the high speed set.

The new gear shifting and locking mechanism is now used on all models of the Foote-Strite transmission. There are three shifting forks, one for each sliding pinion. The gear lever operates in a slotted plate and is provided with a locking quadrant which holds it in the neutral position or in the position of full mesh.

In conformity with the latest tendencies in tractor design the Foote company has brought out a combined transmission and rear axle, the housing of which will also serve the function of the frame. This is the new Model DU intended for tractors pulling three or four plows. It is for a live axle type of design and gives a ratio of 70 to 1 on low gear and 50 to 1 on high. There is an arrangement on the outside of the gearbox by which changing a set of gears gives a ratio of 82 to 1 on low and 58 to 1 on high. This change can be made, it is said, in five minutes. This new gearset weighs 1750 lb. and uses Hyatt bearings all through, except that there are two Timkens on the clutch shaft which carries the bevel gear.

Splined shafts are used throughout and all gears are of vanadium steel, except the two large diameter internal gears. The rear axle drive shafts of the set are 3 in. in diameter and are carried either on graphite bushings or Hyatt rollers. The set is designed for using tractor road wheels of 48 to 54 in. diameter. The complete set is suitable for tractors with a wheel base ranging from 84 to 96 in. according to the desires of the tractor maker.

Using this model of gearset a rear frame on the tractor is not needed, as the housing for the gearset forms the rear axle and the frame, so that the frame structure is limited to two side uppers which extend forward from the gearbox and support the engine.



*Foote-Strite transmission with spur gears only*

On the front of this gearset is used an S. A. E. No. 2 bell housing. There are but two bevel gears in the set. In connection with this gearset the spring drive in the rear wheel as shown on the Trojan tractor is used.

## British Exhibit of Enemy Aircraft

IN the Agricultural Hall at Islington, near London, where automobile shows were held in former years, there is now being staged a most interesting exhibition of captured enemy aircraft and engines. The exhibit is under the direction of the Controller of the Technical Department, Aircraft Production, Ministry of Munitions. It comprises examples of nearly all the types of German aeroplanes which have been captured during the war, and thus represents very completely the development of enemy aircraft design. The object served by the museum is twofold, firstly to enable designers and constructors to keep in close touch with what their German rivals are doing, and secondly to provide pilots and cadets with first-hand information which will not only help them to recognize hostile machines, but will also indicate their most vulnerable points. For these purposes all the aeroplanes are treated in the same manner, one-half being entirely stripped so as to expose any structural detail, the other half left intact. Among the numerous exhibits may be mentioned the Friedrichshafen and Gotha bombing planes, the Fokker biplane and triplane scouts, and the Hannoveraner and Halberstadt fighters.

WE are in receipt of a copy of the Cleveland Worm & Gear Co.'s catalog of Cleveland worm gear drives. This catalog, in addition to an exposition of the company's product, contains much tabular matter of use to the designer. There are charts and formulæ for determining worm and worm wheel bearing loads, a table of English and metric equivalents, a collection of rules for the solution of problems connected with right angled and oblique triangles, and numerous mathematical tables.



# What Langley Did for the Science of Aviation

Seven Years After Langley's Death His Theories Were Fully Vindicated by a Successful Flight Made by the Langley Man-Carrying Aerodrome Piloted by Glenn H. Curtiss

## PART IV

**I**T WAS seven years after Langley's death, or in the spring of 1914, that the world first knew that he had accomplished what he had set out to do.

For ten and one-half years he had struggled with the development of the basic science of mechanical flight, had made exhaustive experiments and countless tests, only in the end to meet with what was regarded by all except himself and those close to him as very little short of ignominious failure. Judged by an unenlightened press whose influence with those who could have provided the means for continuing Langley's experiments was sufficient to shut off further funds, his work in aviation terminated with the failure in December, 1903, to fly his man-carrying machine, which was later demonstrated to have been scientifically correct and capable of performing what it was built to do.

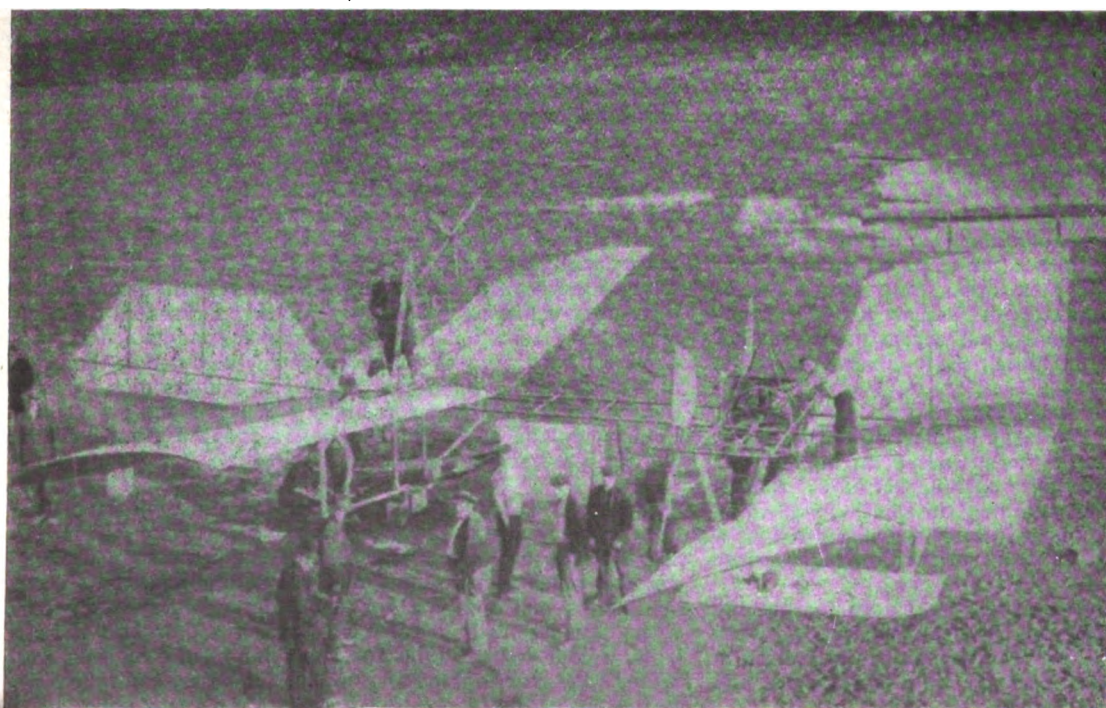
In March of 1914, eleven years later, Glenn H. Curtiss was invited to send one of his flying boats to Washington to take part in the celebration of "Langley Day." In response to this invitation, Curtiss replied that he would like to have the opportunity to fly the Langley aerodrome itself on that occasion, and he was finally permitted to have the original machine shipped to his plant in Hammondsport, N. Y., there to be put into condition for further tests and for flight, if possible, either with

its original power plant or with a more modern one of Curtiss' design.

The machine was shipped the following month, and a month later, with re-covered wings, was ready for its first trial since the accident which terminated Langley's experiments.

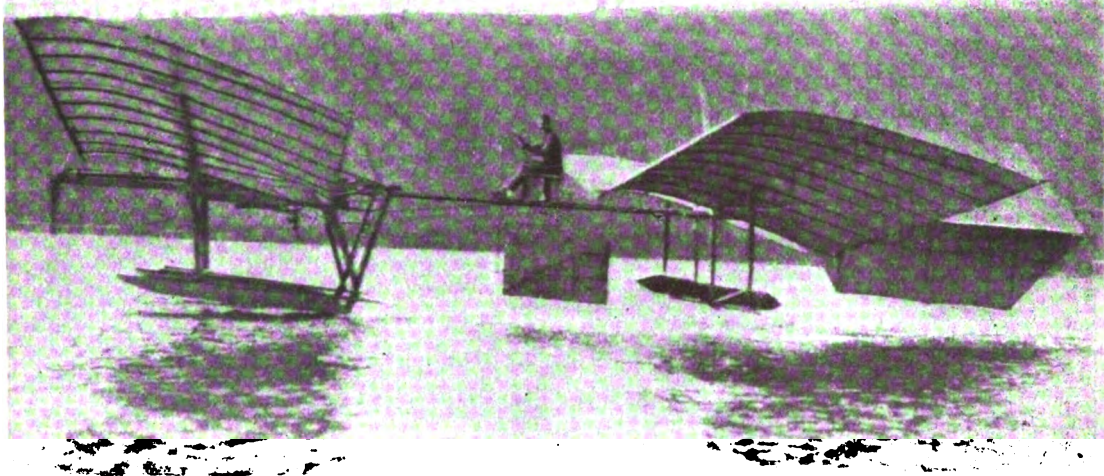
It was the purpose of these new trials, first, to show whether the machine, as Langley had designed and built it, was actually capable of sustained free flight, carrying a pilot, and also to learn more fully whatever advantages there might be in the tandem type construction. Both of these objects were accomplished, and it was found that Langley had indeed produced a successful flying machine.

In his attempts to fly the aerodrome, Langley, as has been recorded in previous articles in this series, made use of a launching device, built on the roof of a houseboat which was anchored in the middle of the Patomac River. The aeroplane was supported on a car which was drawn swiftly along the launching track by means of long spiral springs and, through the medium of an automatic releasing device, was suddenly dropped from the end of the track, free in the air. Careful consideration was given by Mr. Curtiss to this method of launching, and, while he considered it a practical plan, he did not consider it



Langley man-carrying airplane (built 1898-1903) ready for launching at the Curtiss Aviation Field, Hammondsport, N. Y., May 28, 1914

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to adopt it. He also considered starting the aeroplane from the ground, by means of wheels, from the ice, runners similar to those of an ice-boat, and from the water by means of floats. The last method was adopted.

Description of the machine when it was ready for its tests at the Curtiss plant at Lake Keuka is given

A. F. Zahm: "The steel main frame, the wings, rudders, the engine and propellers all were substantially as they had been in 1903. The pilot had the same under the main frame, and the same general system of control as in 1903. He could raise or lower the craft by turning the big rear rudder up and down; he could turn right and left by turning the vertical rudder.

It had no ailerons nor wing-warping mechanism, but lateral balance depended upon the dihedral angle of the wings and upon suitable movements of his weight or the vertical rudder, and herein it may be noted that they had placed the vertical steering rudder under the rear of the center of gravity. So placed, it acted as a fairly good aileron by exerting a turning moment about the longitudinal axis of the machine."

May 28, 1914, after adjustments had been completed and with a light breeze blowing, the aeroplane was placed upon the water by a number of men who waded it from the bank and waded in to a sufficient depth so that it would clear the land, the engine, which was the original Langley power plant, was set going, and with Curtiss at the wheel, the large tandem-winged craft sailed off over the water, across the wind for a short distance and then, acting automatically, headed into the wind and rose into the air, soaring for about 150 ft. and then gliding lightly again upon the water. In this short flight Curtiss decided that the large rear rudder should be able to turn on a vertical as well as on a horizontal axis as the pressure of the wind against it made the machine act as a weather-vane and it was difficult to be impossible to steer in any direction except head into the wind.

Following this initial trial, several other short flights were made with the machine equipped with the original Curtiss engine and twin propellers, but, as the engine never developed the power which had been obtained from it in tests made by Langley in Washington, it was taken to Lake Keuka and a Curtiss 80-hp. engine with direct-connected propeller was substituted.

Equipped by Langley, the total weight of the ma-

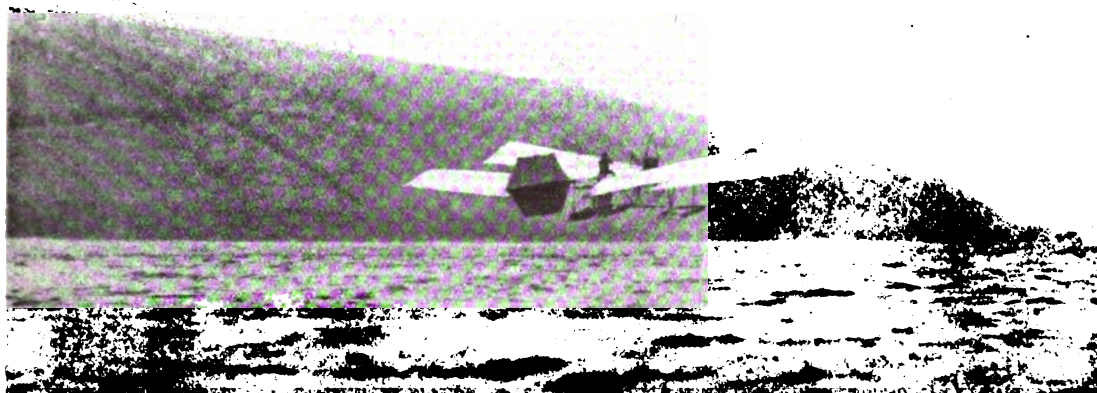
chine and pilot was 830 lb. The floats added for the experiments at Lake Keuka brought the total weight to 1170 lb., and with the Curtiss engine substituted for the original power plant, the total weight became 1520 lb. This gave a total added weight above the original weight of approximately 85 per cent, but during the experiments the wing spars and ribs, although designed for a much lighter load, stood the added strain without any evidence of giving way under it.

For several reasons which it is not necessary to recount here, as they had to do with matters entirely independent of the machine itself, work was suspended on the Langley plane at the Curtiss plant until the following September. At that time, in the absence of Mr. Curtiss, Elwood Doherty, a pupil in the Curtiss Aviation School, volunteered to act as pilot in further tests, and on the afternoon of Sept. 17 he succeeded in flying for about 450 ft. at an elevation of two or three yards.

A few days later, using a 9-ft. screw, Mr. Doherty made a number of longer flights in a breeze which was sufficient to ripple the surface of the water without causing whitecaps. A description of this flight is given by Dr. Zahm in his account of these experiments: "A dozen workmen, lifting the great tandem monoplane from the shore with the pilot in his seat, waded into the lake and set it gently on the water. A crowd of witnesses near at hand, and many scattered about the shores and on the lofty, vine-clad hills, stood watching expectantly. When some of the official observers and photographers, in a motor boat, were well out in the lake, a man in high-top boots, standing in the water, started the propeller and stepped quickly out of the way. Then with its great yellow wings beautifully arched and distended, the imposing craft ran swiftly out from the shore, gleaming brilliantly in the afternoon sun. At first the floats and lower edges of the rudders broke the water to a white surge, then as the speed increased they rose more and more from the surface. Presently the rear floats and the rudders cleared the water, the front floats still skipping on their heels, white with foam. The whole craft was now in soaring poise. It quickly approached the photographers, bearing on its back the alert pilot, who seemed to be scrutinizing every part of it and well satisfied to let it take its race. Then it rose majestically and sailed on even wing 1000 ft.; grazed the water again, rose and sailed 3000 ft.; turned on the water and came back in the same manner; and, as it passed the photographers, soared again



Flight of Langley airplane above Lake Keuka, September 17, 1914, piloted by E. Doherty and driven by a Curtiss engine and tractor propeller



nearly half a mile. The flights were repeated a few minutes later, then, owing to squally weather, were discontinued for 11 days."

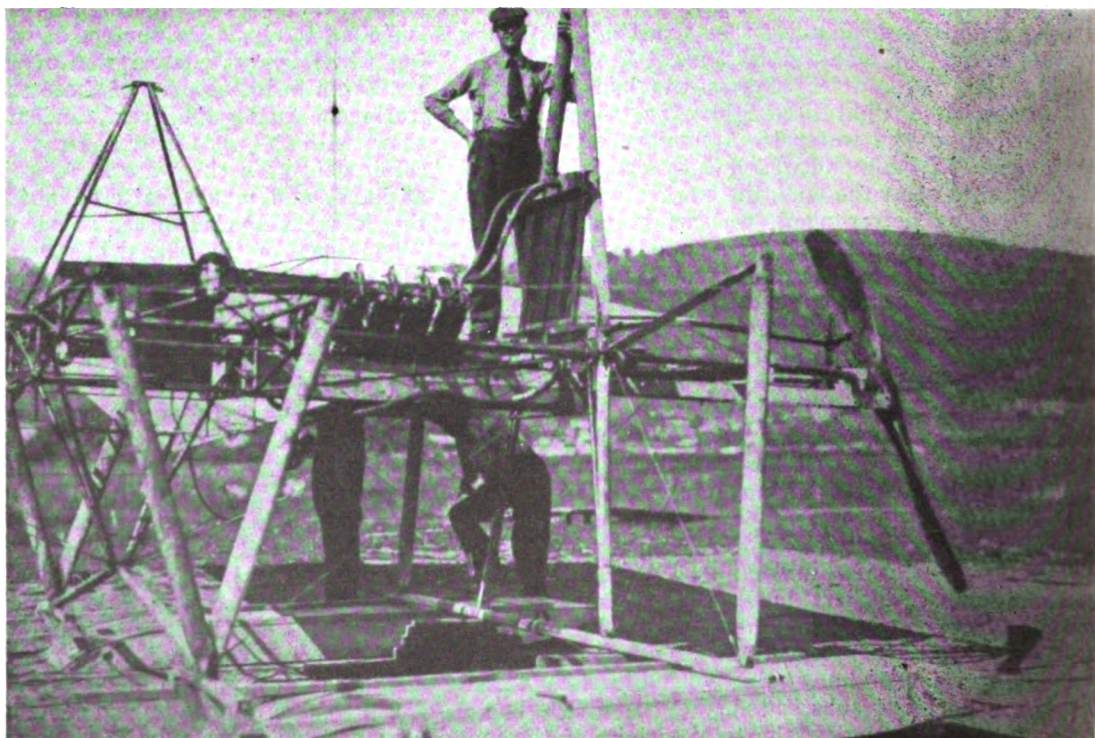
Following these flights came others, on other days, of 1000, 2000, 2250 and 3250 ft. at altitudes averaging better than 30 ft. No longer flights were attempted, as it was not deemed wise to run the risk of injury to the machine, especially as this risk was increased through carrying an excessive overload. The fact that the machine would fly was clearly demonstrated and it was also proved beyond the semblance of a doubt that Langley had actually produced a machine which would have flown but for a minor accident, which, had it occurred to-day, would be regarded as insignificant.

Records of engine tests made by Langley and Mr. Manly, who was associated with him, showed that a static thrust of 450 lb. had been obtained. At Hammondsport, however, the output of the engine fell nearly 100 lb. short of this amount. If, therefore, the engine and propellers could have been restored to their original

working condition, they would undoubtedly have been able to drive the machine in flight even with its aggregate weight at that time of nearly 1600 lb., or about double that which it was designed to carry. With the extra weight removed and with the engine developing a thrust of 450 lb. as it had in its early tests, the Langley aeroplane would have been able, the experiments at Lake Keuka clearly demonstrated, to have carried a man and sufficient supplies required for a flight lasting nearly a whole day.

Dr. Langley's work may be briefly summarized as follows: His experiments were sufficiently complete to form a basis for practical pioneer aviation; he built and launched in 1896 the first steam model airplane capable of prolonged free flight; he built the first internal combustion engine suitable for a man-carrying machine; he developed and launched successfully the first gasoline model airplane capable of sustained free flight, and he developed and built the first man-carrying airplane capable of sustained free flight.

Showing the Curtiss 80-hp. engine and tractor propeller installed on the Langley airplane at the Curtiss plant. Prior to this the airplane had flown successfully with its original power plant





# British Airplane Activity

Operations Undertaken in Four Main Theaters of War, Extending from the Belgian Seacoast to the Mountain Fastnesses of Samaria and the Rim of the Syrian Desert

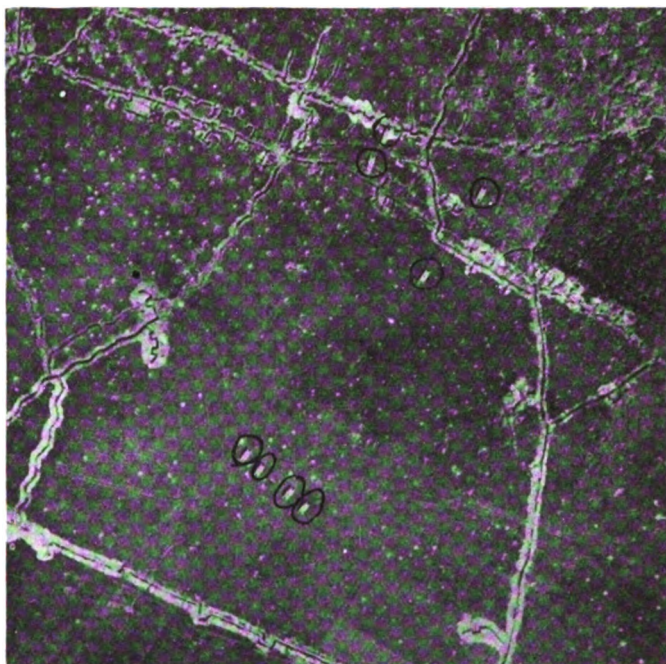
WASHINGTON, Nov. 1.—During a recent week British airmen have been heavily engaged in the four main theaters of war, from the Belgian coastal sector of the north to the rocky defiles of Samaria and the fringes of the Syrian desert. The heaviest air fighting has taken place north of the Arras-Cambrai road, where large enemy air forces have been thrown into the battle. On this front, in addition to dropping nearly 140 tons of bombs and firing an immense number of rounds of small-arms ammunition, British airmen have destroyed 69 enemy machines and driven down 24 out of control. Five hostile machines have also been brought down by anti-aircraft fire, making a total of 98 enemy aircraft accounted for on the British western front during the week. In the same period 46 British machines were reported missing.

On the Rhine front the R. A. F. Independent Force has discharged a heavy weight of bombs upon enemy railway and industrial centers in the course of 22 successful raids into German territory. In all, 511 tons of bombs were dropped during the week upon the railways at Frankfort, Treves and Metz-sablon, blast furnaces at Hagendingen and Rombach, the Lanz Works at Mannheim, factories at Burbach and Karlsruhe, and the hostile aerodromes at Boulay, Frescaty, Morhange, etc. Many direct hits were observed both at Treves and Mannheim, while extensive fires were started at Metz-sablon, Karlsruhe and among the hangars at Frescaty and Morhange, although necessarily upon a smaller scale than in the West.

In Palestine, during the past week, contingents of the Royal Air Force and the Australian Flying Corps have been carrying out reconnaissance upon a wide scale over the maritime plane, stretching from Mount Carmel to

the Shechemjopha road, as well as over Samaria and the Valley of the Jordan, from the edge of the Judæan plateau to the Sea of Gallilee.

On the Italian front, in addition to much valuable reconnaissance and photographic work done, successful air fighting has taken place. During the week 6 enemy machines have been destroyed and 3 driven down out of control. All British machines returned safely.



*The photographs reproduced herewith were taken by the crews of British reconnaissance machines. The upper one is a scene along the battle front and shows eight allied tanks proceeding toward the German lines, four of them running abreast while the others are scattered. The lower photograph shows a fleet of motor trucks lined up along the curb in the center of a village*

# Maybach 300-Hp. Aircraft Engine

## PART II

### Details of the Valves and Valve Gear and Design of the Crankshaft and Crankcase

**T**HE twin inlet and exhaust valves work vertically in cast-iron valve stem guides in the cylinder heads, and are operated by rocker levers mounted on roller bearings, each pair of valves being operated by a single tappet rod from one of the camshafts in the crankcase.

**Valves**—The heads of all the valves, both inlet and exhaust, are of the same diameter, i. e., 54 mm., and the angle of the valve seats is 30 deg. in each case.

The inlet valves are machined concave under the head, and are formed with a 20 mm. radius between the valve stem and the head. The exhaust valves are convex in the head, and are made with a compound radius between the valve stem and the head of 9 and 25 mm. The diameter of all the valve stems is 11 mm., the clearance in the guide bushes being 0.12 mm. (inlet) and 0.15 mm. (exhaust) (cold). The ends of the valve stems are fitted with hardened steel disks, which are bedded in the recessed ends of the stems.

The inlet valves are 136.5 mm. long overall, while the exhaust valves are 152.5 mm. in length. The exhaust valves are made longer to allow for the extra water cooling space in the cylinder head above the exhaust valve pocket already referred to.

All the valve springs, however, are of exactly the same length, i. e., 52.5 mm. free, and measure 39.5 mm. when in their position in the cylinder, initially compressed with no valve lift. The diameter of all the valve springs is the same, 51 mm. (central diameter of coils), and the gage of wire is 5.22 mm. in all cases.

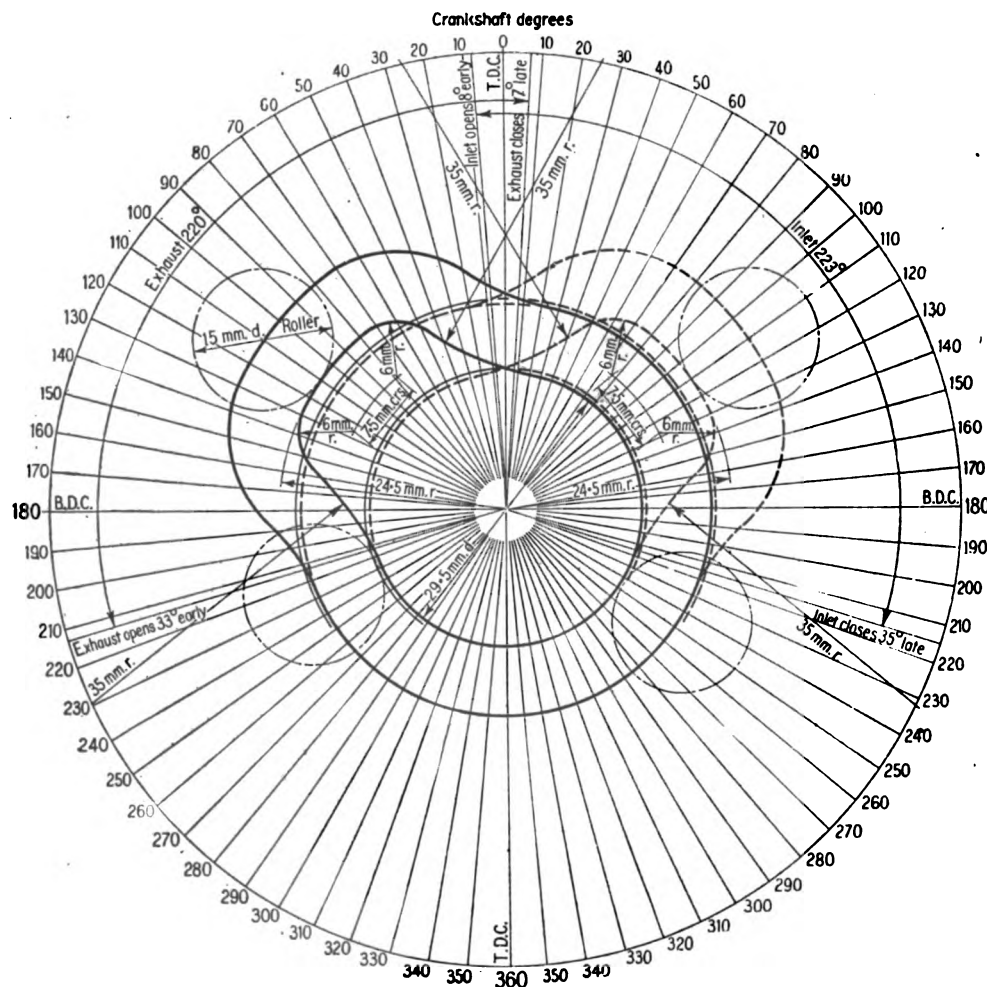
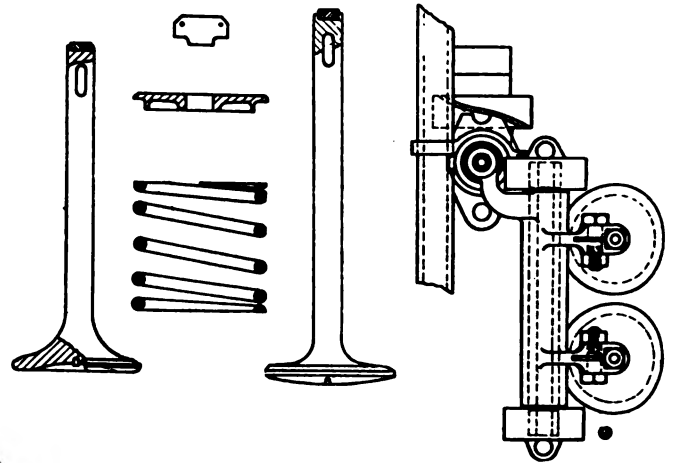


Fig. 9—Cam layout diagram

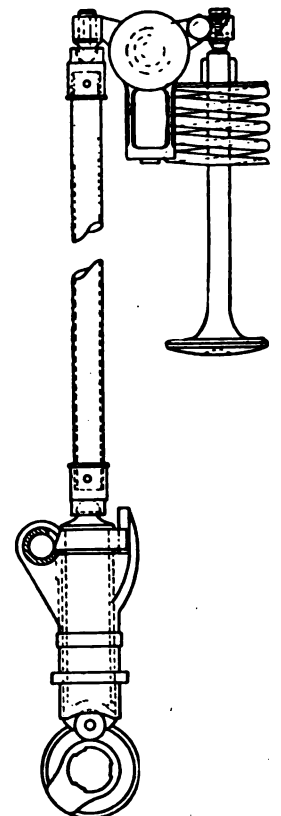
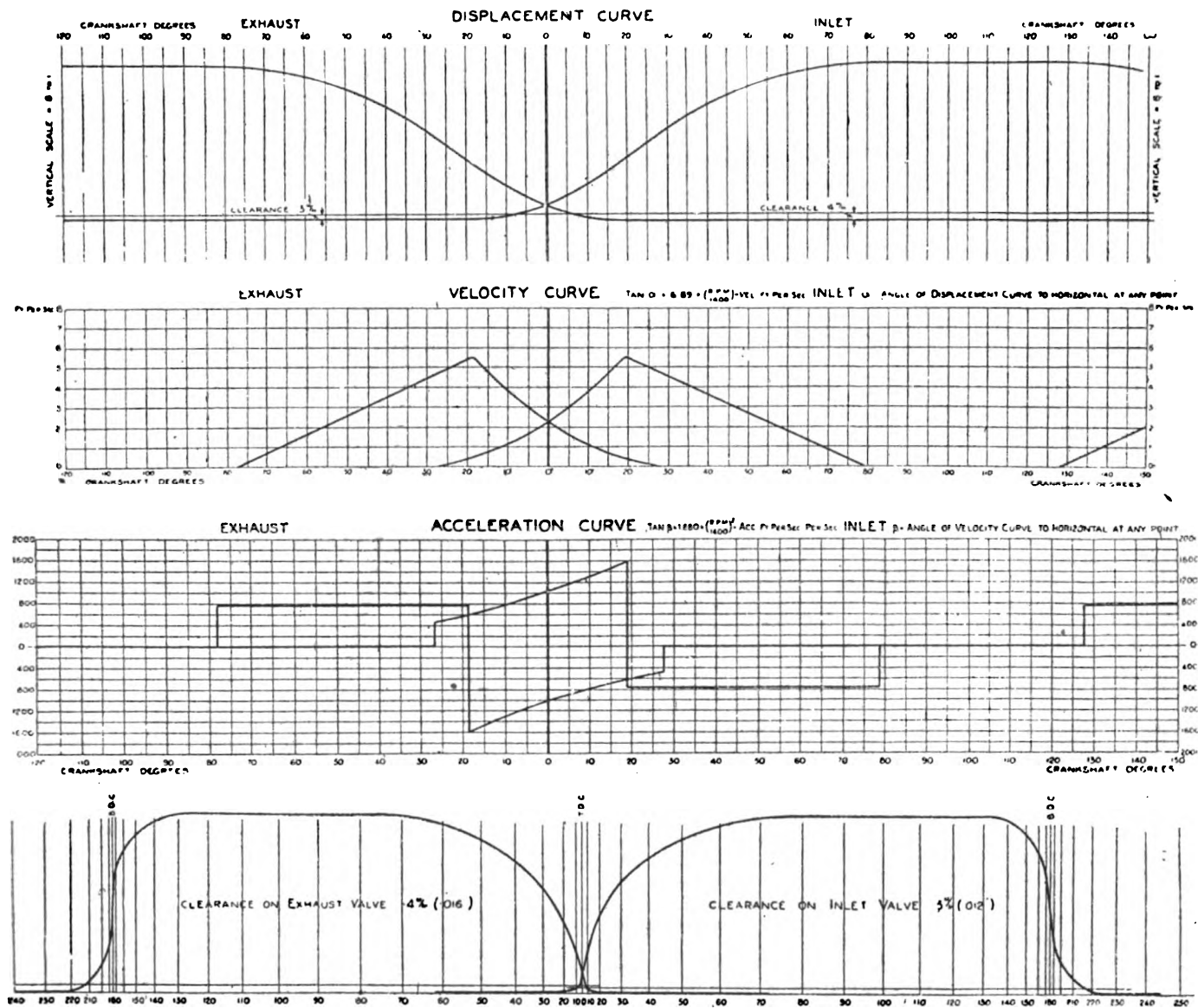


Fig. 10—Valves and valve gear





Figs. 10, 11, 12 and 13—Diagrams of valve lift, velocity and acceleration

The valve springs are fitted with plain collars at the top. These are secured by T-shaped cotters through the valve stems in the usual way. These are also locked in position with small wire clips, which are fitted to the spring cotters through two small holes. The surface of all the valve spring collars is galvanized or plated with a tin or zinc deposit of some nature, apparently to prevent corrosion. This form of galvanized exterior finish is carried out on several other parts of the engine.

Details of the valves and valve springs are given in Fig. 10.

**Valve Rockers**—The roller bearings carrying the spindles of the valve rockers are mounted in short brackets, each of which is attached to the cylinder heads by two 8 mm. studs and castellated nuts. The bearing brackets are steel drop forgings, and the roller races are, to a certain extent, permanently fixed inside the recessed heads of the brackets, and are covered by thin steel disks fitted over the front faces of the bearings, these being held in position by a form of mechanical knurling largely used in German aero engine manufacture. This mechanical process takes the form of spinning or riveting over the housing metal of the part by a series of accurately spaced indentations.

The hardened steel set screws for the adjustment of the tappet clearances are drilled with a 5 mm. hole in the center portion through the squared end only, and the usual form of transverse locking bolt is provided. The method of splitting the lever to provide for the locking of the tappet adjusting screw, however, is carried out in a somewhat unusual way. This is shown in the view of the rocker lever in Fig. 10, from

which it can be seen that the saw-cut is made from the tappet hole, which takes the tappet adjusting screw backward through the center of the rocker lever toward the rocker spindle.

A steel stud having a hardened hemispherical end, which makes the top joint of the valve push rod, is fitted on the outer lever of the valve rocker. These steel studs are driven tightly into the levers and are secured by small steel wire rings snapped over semicircular grooves cut in the top end of the spherically-ended studs.

The tappet push rods are made of steel tube 16 mm. outside diameter, and are fitted with hemispherical hardened steel cups at each end. These are fixed to the push rods by taper pins and weigh 0.48 lb. each.

Hardly any alteration has been made in the familiar tappet design. The tappets consist of hollow steel tappet barrels, which are plugged at the top ends by hardened steel caps. The tops of these caps are formed with hemispherical heads, which engage with the lower ends of the cupped push rods.

The hardened cam rollers are held in position by the grooves machined in the bottom ends of the tappet barrels. These grooves are made slightly more than a semicircle to prevent the roller from falling out. Side movement of the rollers is prevented by the tappet guides. The cam rollers are 15 mm. in diameter, and are bored with a 4.5 mm. hole.

Four small holes are bored radially in the sides of the hollow tappet barrels, which always carry a certain amount of oil, thus providing a very simple, efficient method of lubricating the tappet guides. These are made of gunmetal, and



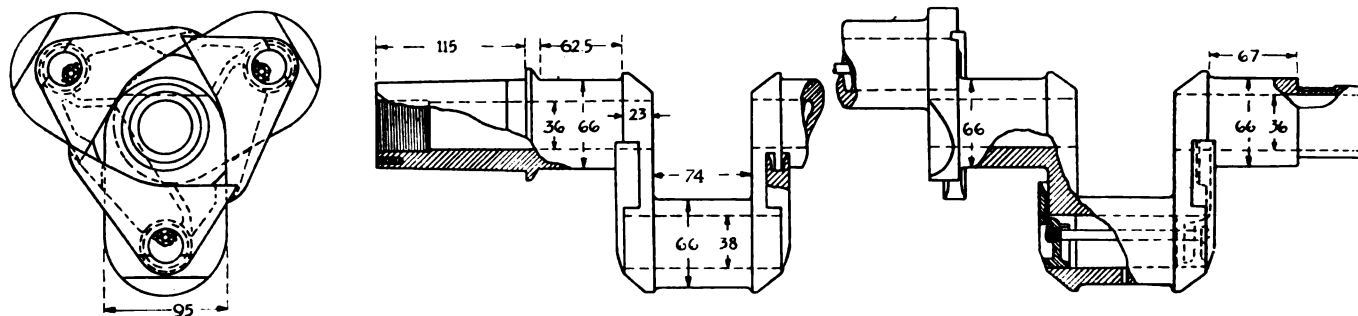


Fig. 14—Crankshaft details

the general design is clearly shown in the cross-sectional drawings.

A vertical lug is provided on the top of each tappet guide, which forms the guide for the tappet barrel, and prevents it from rotating. Three oil grooves are machined inside the tappet guides.

**Cams and Camshafts**—Both the inlet and exhaust cams are of the same profile, although the valve lift is slightly greater for the exhaust valves, according to the valve lift diagram reproduced in Fig. 11, which has been calculated from the actual valve setting of the engine under test. This difference is due to the unequal tappet clearances. Details of the cam design are given in Fig. 9. The cams are made in pairs, machined from solid forgings. Each pair of inlet or exhaust cams is fitted to the camshaft separately. Each camshaft is provided with three key-ways, which are machined along the whole length of the shaft. The cam blocks are made with three keys cut inside the hole which is bored in the cam blocks, the keys being solid with the cams. The cam blocks are also fixed to the camshaft by taper pins to prevent lateral movement. The central portion of each cam block between each pair of cams is machined to a diameter of 49 mm.  $\times$  16 mm. in width. These portions of the cam blocks form the journals of the camshaft bearings. They run in plain phosphor-bronze bushes let into the top half of the crank chamber, and helical oil grooves are cut in the face of the bearing journals on the camshaft. Each cam block is also fixed in position in the camshaft by one 5 mm. setscrew, which prevents the cams from moving laterally in the keyways.

The five bronze bushes forming the camshaft bearings are pressed into the crankshaft bearing webs of the crank chamber. The front and rear camshaft bearings are fitted with a flange, and are detachable; they are twice the width of the other three on account of the camshaft driving gears which are fitted on the front end of the camshafts, and the magneto driving gears, etc., which are fitted to the rear ends of the camshafts.

The setting of the valves is shown in the accompanying diagram (Fig. 11), which shows the following valve positions, viz.: Inlet valve opens 8 deg. e.; inlet valve closes 35 deg. l.; period of induction, 223 deg.; exhaust valve opens 33 deg. e.; exhaust valve closes 7 deg. l.; period of exhaust, 220 deg.

Further details of the valve gear and cam design are given in the list of data at the end of this report, and in the following diagrams (Figs. 11-14.)

Details of the design of the crankshaft are given in the dimensioned drawing in Fig. 14. The crankshaft runs in seven plain bearings lined with anti-friction metal of the usual formation. All the journals are 66 mm. in diameter. The diameter of the crankpins is also 66 mm. The crankwebs are all of the same section, being 23 mm. in thickness and 95 mm. in width across the face. All the journals are bored 36 mm. diameter. The crankpins are bored 39 mm. diameter, the ends of the holes being plugged with the centrifugal oil scoops characteristic to the Maybach engines. (Details of these are dealt with later in the notes on lubrication.) The rear end of the crankshaft carries the extension shaft, on which is

mounted the wireless dynamo driving pulley, which embodies a friction clutch. This design of wireless pulley is a standard German engine fitting. Full details of its design and construction have already been issued in previous reports.

The extension shaft referred to above is a driving fit in the rear end of the crankshaft, which is bored 42 mm.; the extension shaft is locked by a 7 mm. taper pin. Two centrifugal oil-thrower rings are machined on the extension shaft. These details were shown in the general arrangement of the engine in last week's instalment.

The main driving bevel gear is fixed to the rear end of the crankshaft by a key 8 mm. wide by 5.5 mm. deep, half sunk in the shaft.

#### Detail of Crankshaft Design

An interesting point in the design of the crankshaft is found in the method of fixing the flange to which the propeller hub is bolted. The construction is clearly shown in the sectional arrangement of the propeller hub, from which it will be seen that a slight taper, 1 in 33.3, is machined on the front end of the crankshaft, onto which the propeller hub flange is very tightly driven. No key is fitted to the taper, but a grub screw 10 mm. diameter is screwed into the front end of the flange, the hole being drilled half in the flange and half in the crankshaft.

The grub screw is locked by the flanged head of a large plug of 40 mm. diameter, which is screwed into the hollow front end of the crankshaft. This flange, to which the propeller hub is secured by eight 14 mm. bolts with countersunk heads, is mounted on a large single race ball-bearing, 132 mm. outside diameter, behind which is fitted the double thrust ball race, 108 mm. diameter on the ball center diameter.

On the front portion of this propeller hub carrying flange is mounted a double oil-thrower ring, which is driven on to the outer diameter of a split collar or bush, as shown in Fig. 15. The driving gear for the camshafts is machined on this propeller hub flange; the teeth of the gears are integral with the flange, hence the splitting of the bush which carries the double oil-thrower rings.

The general details of the construction of the propeller hub are given in Fig. 15. Eight 15 mm. bolts are used to bolt the front flange to the two rear propeller hub flanges,

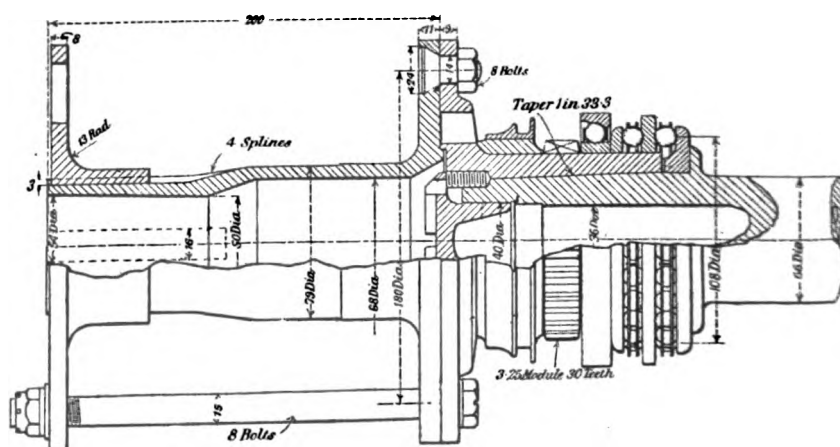


Fig. 15—Propeller hub and mounting

and the propeller is secured by castellated nuts in the usual manner. The surface of the propeller hub and flanges is galvanized with deposited tin to prevent corrosion. The front flange floats on the propeller hub in four castellations, 17 mm. wide by 3 mm. deep. The total weight of the complete propeller hub, with all bolts, less extension flange on end of crankshaft = 21 lb.

Unlike most of the enemy aero engines, the bottom halves of the crankshaft main bearings are bolted to the top half of the crank chamber. These are very deep in section, and are secured to the crank chamber by 19 mm. diameter bolts, which pass through the crank chamber, and are also used to bolt down the cylinders by means of triangular clamps, now almost standard practice. Flanges are machined at the top end of the holding-down bolts, which are let into recesses cut in the top face of the crankcase. The front main bearing cap also carries below the intermediate gear pinion for driving the oil pumps as shown in the general arrangement of the engine. Cast aluminum covers are bolted to the front and rear ends of the crankcase for enclosing the camshaft driving gears at the front ends, and for the magneto and interrupter gears at the rear end of the engine. Further details of the crankcase construction are shown in the illustrations.

The lower half of the crank chamber presents several points of interesting design, and is of simple construction, weighing 41.32 lb. bare. At the rear end of the flange, which is bolted to the top half of the crank chamber in the usual way, extended brackets are cast for taking the two magnetos, and the three gear type oil pumps are situated on brackets cast on the bottom of the inside of the base chamber.

The small detachable oil sumps are fixed to flanges cast on the under side of the base, one at each end.

Details of the construction of the oil pumps and detachable oil sumps are given in the notes on lubrication.

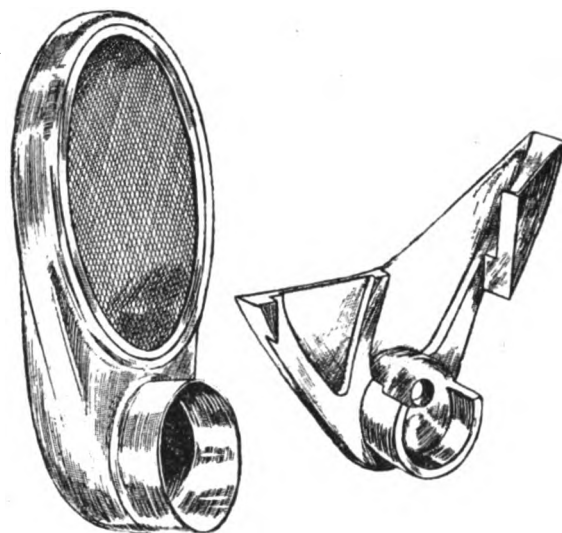


Fig. 17 (left)—Crankcase breather. Fig. 18 (right)—Oil scoop which fits to crank arm

As in the Zeppelin-Maybach engines, the efficient ventilation of the crankcase has received careful consideration. The design is, in fact, very similar in both types of engine. On the induction side of the engine six breathers are fitted; these are constructed of fairly coarse brass wire gauze baffles mounted in sheet aluminum breathers which are attached to short steel tubular connecting lugs screwed into the crankcase, and are fixed in position by steel wire clips. Details of the construction of these breathers are shown in the sketch, Fig. 17.

(To be continued)

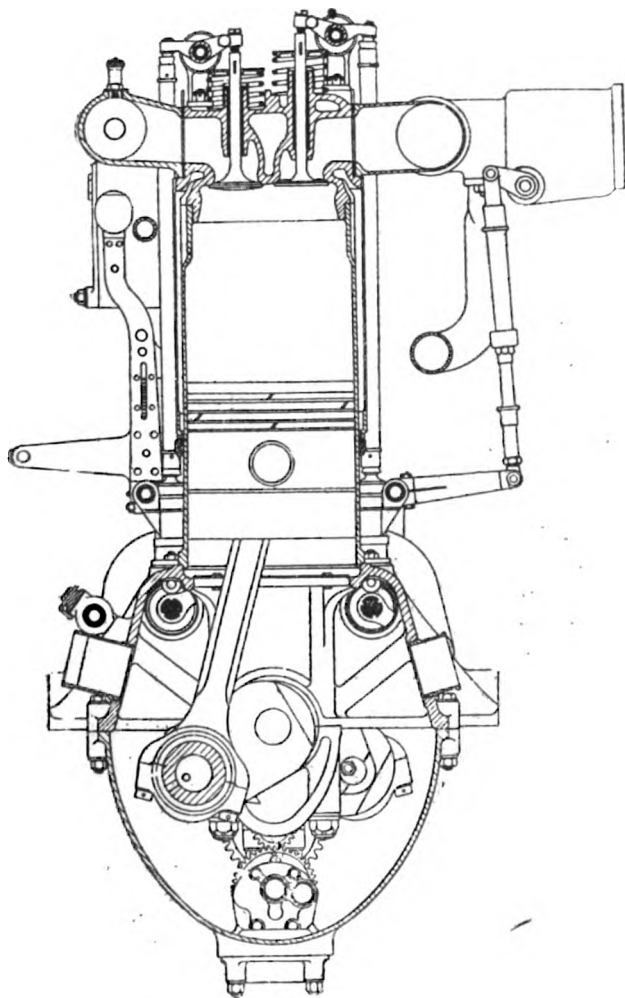


Fig. 16—Section through cylinder and crankcase

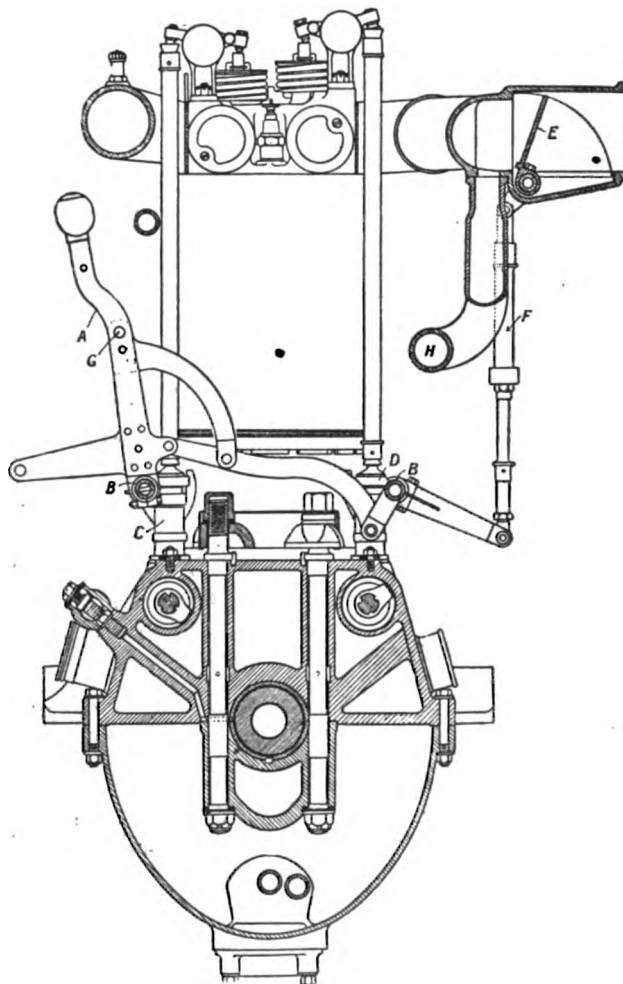


Fig. 18—Showing method of main bearing support

# The Owen Automatic Lighting and Power Unit.

Engine Started Automatically When Battery Charge Runs Low and Stopped When Charge Is Complete—Also Started When Load on Battery Exceeds Normal Discharge Rate—Load Circuit Opened When Load Is Excessive

By P. M. Heldt

**A** SELF-CONTAINED electric generating unit suitable for farms and country places is manufactured by R. M. Owen & Co., New York. It comprises a single cylinder, vertical gasoline engine, direct-connected to a four-pole electric generator; a 32-volt, 80-ampere-hour storage battery and a switchboard containing apparatus for the control of the system.

The feature of the system is its automatic control. When the battery charge, or discharge, reaches a certain predetermined value, the engine is started up automatically. When the battery is fully charged the engine is stopped automatically. If the engine stops for any reason, as, for instance, the fuel supply becoming exhausted, the battery current is shut off from the generator automatically. If an overload is thrown on the battery, the engine is automatically started up and takes care of the load up to the capacity of the generator, after which the battery also supplies power if the load requires it, but if there is not sufficient load to absorb the capacity of the generator, the surplus current is stored in the battery. In other words, the engine runs at its full load all the time it is running, and all the current used on the line goes direct to the line and not into the battery, but the surplus goes into the battery. If too much load is thrown on for the generator and battery combined, the load circuit will open automatically.

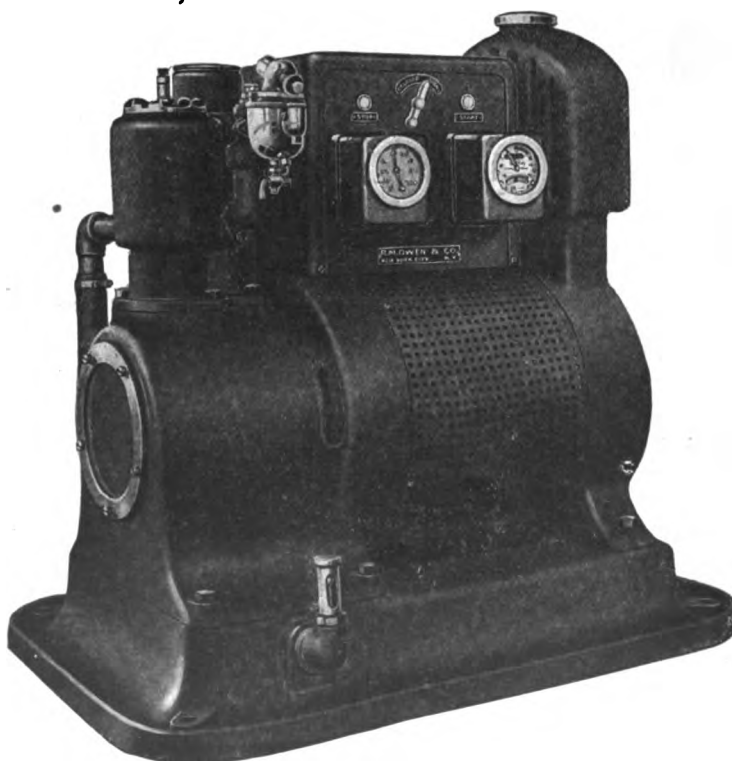
The gasoline engine is of interest because of the silent rotary valve which it employs. The engine is of 3-in. bore and 4-in. stroke and is governed to run at 1300 r.p.m. Its crank is formed on the end of the armature shaft, the crank pin being secured to the crank arm by a tapered fit and nut. The connecting-rod head is

solid and contains a cylindrical roller bearing. An aluminum alloy piston is employed, together with leak-proof piston rings.

Although the crank case is of very large volume, the up-and-down motion of the piston causes a variation in the pressure within the crank chamber, and as the latter is partly filled with oil, there is a tendency for the oil to be forced out with the outflow of air as the piston comes down, reducing the volume of the crank case and increasing the pressure therein. To prevent this a breathing device is provided on the circular plate closing the end of the crank case.

The silent valve is of the tapered type and is self-adjusting for wear and for differences in heat expansion. It is driven through a vertical shaft at one-quarter crankshaft speed. The shaft extends through the valve and near the upper end carries a quick-pitch screw engaging a corresponding female screw thread in a ring nut

screwed into the valve. A coiled torsion spring anchored to the timer disk on top of the valve shaft tends to screw the valve down on the shaft and onto the valve seat. On the other hand, the friction between the valve and the seat tends to screw the valve up on the shaft and out of the seat. By this arrangement two important advantages are secured. In the first place, if the valve expands more than its seat, as it naturally will when the engine heats up, the increased friction of the valve in the seat will cause the valve to unscrew or rise slightly in its seat, and thus relieve the friction. The general effect is to maintain a constant pressure between the valve and its seat, fixed by the setting of the spring. Secondly, as the valve and its seat wear,



*Owen lighting and power unit for farms and country places. It comprises a single-cylinder upright engine with a rotary valve, an electric generator of 1250 watts output, and a switchboard which insures automatic control*



the resulting looseness is automatically taken up by the spring. Of course, the spring force would become slightly less as the valve sank deeper into the seat, but the reduction would be negligible for ordinary wear, and, besides, if it should become necessary, the point of anchorage of the spring could be changed. The wear is said to be practically nil.

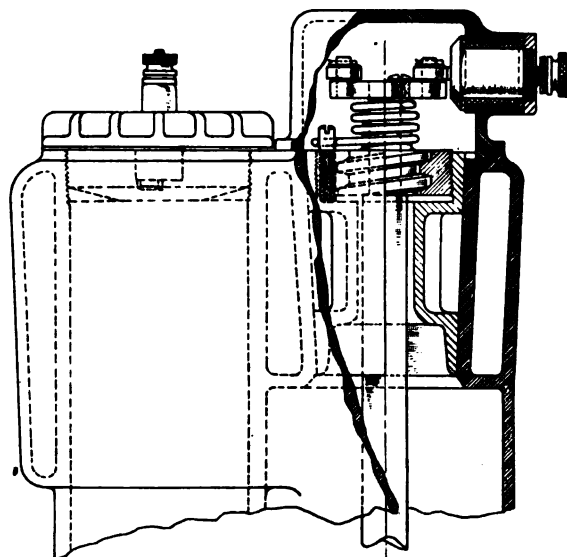
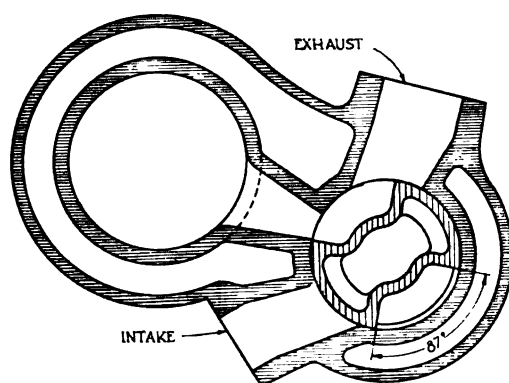
There are two wide, oppositely located ports in the valve. These do not extend through the valve, but are in the form of pockets which at the proper moment place in communication a passage from the cylinder, with the inlet port and then with the exhaust port in the valve seat. Thus, each port or pocket in the rotary valve serves alternately for the inlet and the exhaust. The result is that these ports are cooled by the incoming cool charge and the charge is raised in temperature, whereby the fuel is maintained in the gasified condition.

The oiling system of the whole outfit is automatic. A supply of oil is maintained in the engine crank chamber and is circulated by means of an eccentric pump located at the bottom of the vertical valve shaft. There is direct feed of oil to the long main bearing between the armature and the engine crank. This shaft is chambered out and a drilled passage leads from its oil pocket diagonally through the crank arm to the roller bearing on the crank pin. An oil delivery pipe runs up the side of the engine and divides into two branches, one branch leading to the valve pocket and the other to the outboard generator bearing. The rotating valve has an oil hole drilled at one point of its circumference near the top, and every time this oil hole registers with the oil hole in the valve seat, a small amount of oil is forced through it into the space above the valve. The valve, therefore, is always well oiled, and it is a noteworthy fact that in spite of this copious supply of lubricant to the valve, there is absolutely no smoky exhaust, except for an instant when first starting. Each bearing is provided with an oil return passage to the oil well. An oil gage at the side of the well indicates the amount of oil in the machine.

It will be noticed that the helical gear for operating the vertical valve shaft is located in a pocket formed at the middle of the main bearing and is therefore well taken care of as far as lubrication is concerned.

The carbureter is a Schebler, mounted adjacent to the valve pocket, with which it communicates through an inlet pipe containing a barrel type throttle valve. This throttle valve is acted on solely by a fly-ball governor mounted on the vertical valve shaft. The governor spring is located on top of the throttle valve and the governing speed can be quickly adjusted by means of a screw with check nut on top of the inlet pipe.

Ignition is by jump spark with current from the stor-



*Horizontal section through cylinder and valve*

age battery. The spark plug is screwed into the center of the air-cooled cylinder head, which latter in turn is screwed into the cylinder. A special form of timer has been evolved for this engine. On top of the valve shaft is mounted a steel disk which carries two oppositely located hardened steel rollers. These make contact with an insulated member secured into the side wall of the valve cover. There is a large glass window in the cover plate of the valve cover, so that the action of the timer and the feed of lubricant to the valve can be observed. Incidentally, the timer disk, which may be seen through this window, is the only moving part of the outfit that can be observed when the engine is running. Spark timing, of course, is fixed, but adjustments can be made by revolving the valve housing cover.

Cooling is by thermo-siphon circulation, and the cylinder jackets and connecting pipes are of large cross-section. The cellular radiator is a single iron casting, but as regards form, it comprises two parts, the lower circular in outline, behind which the cooling fan is mounted, and the upper of the general shape of a conventional automobile radiator.

The lower circular part conforms in diameter to the engine fly-wheel housing and a generator shield of perforated metal extends between the fly-wheel housing and a flange on the lower part of the radiator forming the fan housing. In order to permit of continued operation of the outfit without serious loss of water, a condenser designed for attachment to the wall at some distance above the radiator is connected to the top of the latter. This returns any loss by evaporation to the cooling system.

The engine fly-wheel is designed with fan-shaped spokes, and both the fly-wheel and the radiator fan draw air through the perforations of the generator shield, forcing it through ventilating holes in the engine housing and through the radiator respectively. The fly-wheel fan draws its air through the generator, thus helping to keep the latter cool.

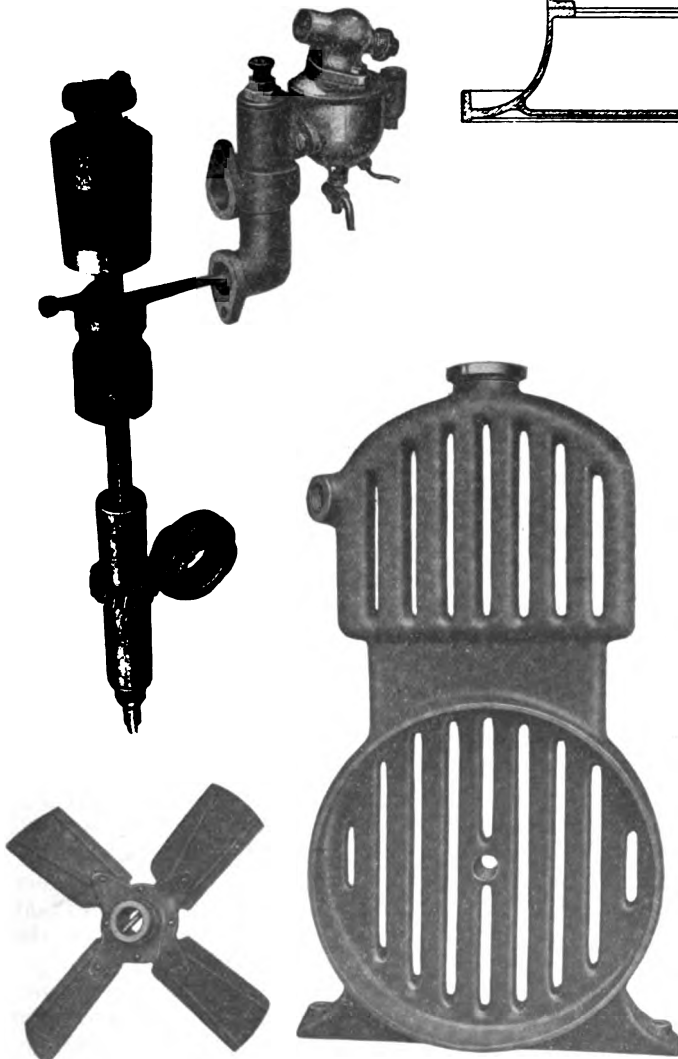
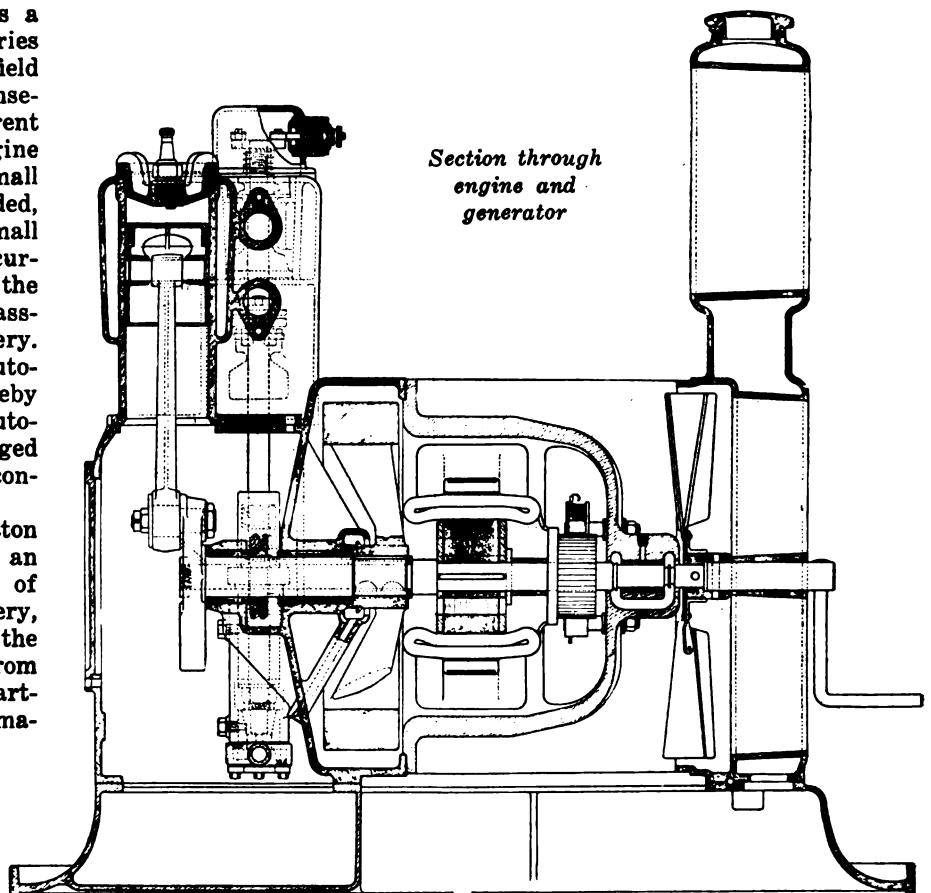
The generator is of the four-pole type, and carries four brushes. Its field frame is of cast iron, flanged outward at the engine end to join the fly-wheel bell-housing, and having the bearing bracket for the commutator end cast integral with it. This bearing, by the way, is supplied with oil through a special lead from the pressure oil pump. There is a knife-edge type of oil guard at each end of the bearing and a common return from the two oil guard grooves to the oil well.

There are three independent windings on the field poles of the generator, which, however, are formed and taped up into a single coil. One is the main shunt winding, another a small series winding serving to maintain the voltage constant, irrespective of the load on the generator, and the third is an additional series winding serving

only while the generator is used as a motor in starting up the engine. A series field winding gives a much stronger field in starting than a shunt winding, consequently the motor draws less current from the battery in starting the engine than it would if only the shunt and small compounding series coil were provided, thus protecting the battery. The small series coil, moreover, carries only current delivered by the generator to the lamp or other load and not current passing between the generator and battery.

What is known as the Strong automatic system of control is used, whereby the engine is started and stopped automatically to keep the battery charged and to take account of various other conditions.

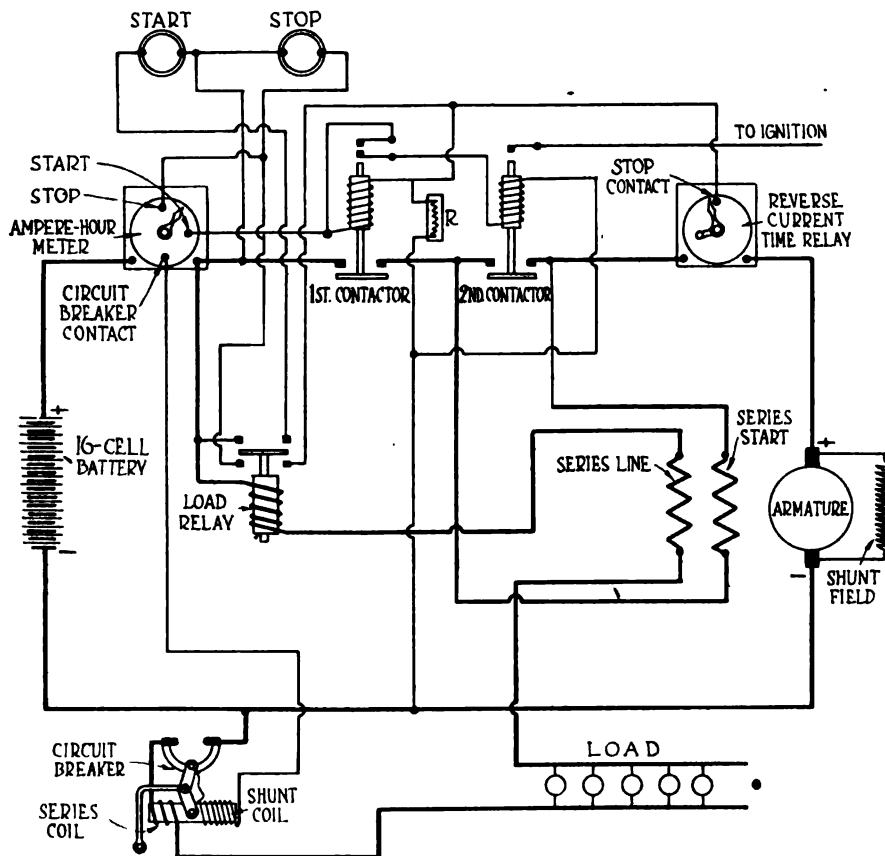
To first start the engine the button switch marked "Start" is pressed for an instant. This connects the solenoid of the "first contactor" across the battery, and this contactor, which is really the main switch, is closed. Current from the battery then flows through the starting series field winding and the arma-



Above—Valve and valve gear, carburetor, inlet pipe and governor. Below—Radiator and fan

ture of the generator, and the latter starts-up as a motor. The first contactor also controls the circuit of the second contactor, which latter cuts out the starting series field winding and closes the ignition circuit. Thus when the spark is turned on, the engine already has attained a considerable speed and the shock of the explosion on the bearings is reduced. As the generator increases in speed, its voltage surpasses that of the battery, and charging begins. It will be noticed from the wiring diagram that the compounding series field coil is so connected that only current flowing through the load (i. e., lamps, motors, etc., connected to the outfit) passes through this coil. Included in this circuit is a so-called load relay which when the load on the battery exceeds the normal discharge rate of same, closes a switch connected in parallel with the starter button switch and thus starts the engine.

Two ampere-hour meters are included in the control system, one serving to start and stop the engine as the battery becomes nearly discharged and charged respectively, and the other to prevent running down the battery in cranking the engine, if the latter for any reason cannot pick up its cycle, as when there is no gasoline in the tank. Both charge and discharge currents pass through these meters and the meter hands revolve in opposite directions, according to the direction of current. But as the number of ampere-hours which it is possible to obtain from a battery during discharge is smaller than that which is sent into it during charge, a compensating device is incorporated in the meters which causes them to run faster for a certain discharge current than for the same charging current. The dial of the meters is not graduated in terms of ampere-hours, but in decimal fractions of the battery capacity. The meter hand of the charge and discharge meter serves as a switch lever making contact with contacts on the dial, the hand and



Circuit diagram of Strong automatic control

start contact forming a switch connected in parallel with the starting button switch. The start contact on the ampere-hour meter dial is adjustable and may be set to cause the starting circuit to be closed when the battery charge is down to 20 per cent, 30 per cent or any percentage desired. Thus when the battery charge is depleted to this extent, the engine is automatically started and charging begun.

As the charging proceeds the ampere-hour meter moves around in a left-hand direction, and when the battery is fully charged, it establishes contact with the stop contact on the meter dial. This action de-energizes the coil of the first contactor, causing it to open and thereby stop the engine and generator. The same effect can be produced by pushing on the stop button switch, this latter being connected in parallel with the stop contact on the ampere-hour meter hand and the stop contact on the reverse current meter.

The other ampere-hour meter or reverse current meter shown on the right in the diagram serves to prevent exhaustion of the battery in cranking when the engine won't start. The meter arm is held in place on the stem by means of a friction clutch which allows it to slip. All current flowing from the generator to the battery, and vice versa, passes through it. Ordinarily, while the battery is being charged, the hand is restrained by a stop and the stem slips inside its hub. When the generator draws current from the battery in cranking the engine, the meter hand revolves the opposite way, and if this continues for any length of time the hand comes to a stop contact on the dial, when it makes the same electrical connection as the stop button switch, disconnecting the generator from the battery.

Reference was made above to the load relay which starts up the engine as soon as more current is drawn from the battery than its normal discharge rate, and

as soon as the engine begins to fire, most, if not all, of the load, is shifted from the battery to the generator. One reason for starting up the engine as soon as considerable current is required is that it is more economical to supply this from the generator direct than through the intermediary of the storage battery. At light loads, on the other hand, say only four or five lamps, it is more economical to draw the current required from the battery, unless additional current can be used to advantage for charging.

It is conceivable that so much load be thrown on the circuit that the battery and generator connected in parallel cannot supply the necessary current without being overloaded. This contingency is provided against by means of an overload cut-out in the load circuit. All of the control mechanism is mounted on a switchboard located on top of the generator.

Compensation for variation in load is very effective. There is hardly a quiver in the voltmeter hand under variable lamp load. When the battery is fully charged, the outfit has a capacity sufficient to supply current to 100 20-watt lamps for 8 hours. When only a few lamps are being used, motors up to 1¼ hp. can be run by current from the set. The generating unit occupies 22½ x 32½ in. floor space.

On Nov. 1 one of the sets was given a 1-hr. full-load test in the presence of the writer. The set delivered an output of substantially 1250 watts throughout the period of the test and ran smoothly from start to finish without signs of undue stress in any part.

## South American Trade Mark Laws

Editor, AUTOMOTIVE INDUSTRIES:

We have read with very considerable interest the article appearing in the issue of your paper, AUTOMOTIVE INDUSTRIES, of Aug. 1, 1918, regarding the Patent and Trade Mark Laws of the Argentine.

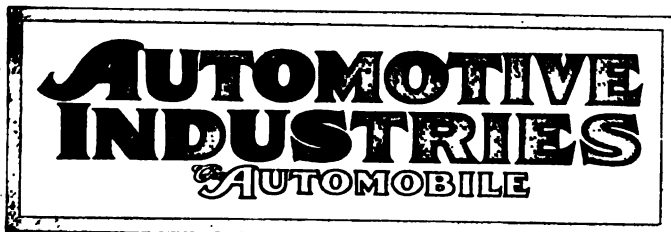
We may say we have already experienced the hardship of finding we are unable to sell our manufactures in the Argentine under our own trade name, which is well known throughout the world, due to the fact that the same name was registered by a firm of merchants in Buenos Aires prior to our entering that market, and although they have never utilized the name in connection with any articles of the class we manufacture, their action prevents us using our own name.

This same difficulty and extreme hardship has been experienced by many other firms in this country trading with the Argentine, and the matter has been before our Board of Trade and Chambers of Commerce in Glasgow and London on many occasions, but so far we regret with little effect, as there appears to be some difficulty in getting the Argentine authorities to move in the matter.

It appears to us, however, that if a joint representation was being put forward by the authorities in America and Great Britain and possibly including also our other allies at this time, very considerable pressure could be brought to bear on the Argentine Government to amend their trade mark law so that it would work out more equitably.

The great changes, both economical and political, which are bound to result as the outcome of the present war should offer a suitable opportunity for this matter being made a subject at least for negotiation.—"A British Motor Manufacturer."





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Automotive Industries-The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repair man (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

## Effect of Aircraft Experience on Post-War Automobile Design

RECENTLY there has been considerable speculation as to the effect of aircraft engine experience on automobile engine design after the war. It is apparent that the aero engine marks a great advance over the automobile engine in point of weight efficiency, and it also greatly excels it as regards fuel efficiency. However, while both of these improvements would be very desirable in automobile engines, their realization in that type of engine would be a matter of great difficulty if not impossibility. There is one inherent difference between the conditions governing aircraft engine practice as we have known it during the past several years and those governing automobile practice. No commercial considerations have entered into the former and a slight improvement in performance was worth almost any increase in cost. In automobile work, however, commercial considerations are paramount. A certain gain in weight efficiency

or fuel efficiency is worth while only if it does not increase the manufacturing cost too much, and if we compare the price per horsepower paid for aviation engines with that paid for automobile engines before the war and bear in mind that this cost figure is naturally higher the smaller the engine, it becomes apparent that it will be next to impossible to apply the principles of design and manufacture of aero engines to the ordinary automobile engine.

What is more likely to take place is that a few companies catering to a select clientele who want something out of the ordinary and are willing to pay for it will adopt the aero type engine for automobile purposes. Lightness combined with high ability has always been a desideratum in automobiles, and the successful introduction of the aluminum engine before the war was based on this fact. The lightness of the aero engine is largely due to the use of steel for cylinders and the complete machining of all parts. It is quite possible that steel cylinders will be adopted for automobile work to a limited extent. In former years there would have been some prejudice against steel, owing to uncertainty of its wearing qualities, but the perfect satisfaction it has given in thousands of aero engines under all conditions has set all questions regarding its serviceability at rest.

Crankshaft and connecting rods were completely machined on some high priced automobiles even before the war and the lowest possible piston weight was aimed at by a great many designers. Methods of cutting down weight in machined parts have been further developed in airplane engine work and we may expect to see advantage of this being taken in automobile engine design during the coming years.

## The Maybach Engine Article

WE wish to call attention to the description of the Maybach 300-hp. aircraft engine which was begun in AUTOMOTIVE INDUSTRIES of Oct. 31 and is continued this week. This was issued by the Technical Department of the British Ministry of Munitions and is probably the most detailed description of an aircraft engine ever published. The instalments of the article will continue through at least two more issues, the descriptive text being followed by a series of tables containing test results of different parts, analyses of materials employed in the construction of the engine and the weights of all individual parts.

Information of this sort cannot fail to be of great help in the further development of aircraft engines, and the British Aircraft Production Department is to be congratulated on the excellent character of the material it has issued from time to time.

Presumably the German papers have also had technical descriptions of the newer allied engines, and we have heard it said that a many-page description of the Liberty engine appeared in one of them. However, no German papers are available in this country at present and the English papers, which continually carry abstracts or translations from German aircraft papers, have not mentioned it.

# Necessary Aircraft Waste

**W**HILE so very much has been written and so very much more said, regarding the delays and failures in the U. S. aviation program, little has been heard of the actual working out of aviation problems in France and England.

As yet it is not possible to give any detailed information of failures on the part of our allies, but it may be said and should be made clear that all has not run smoothly on the other side of the water.

A moment's thought shows that with so new a thing as aviation, programs could not be written down and followed up like a program for motor vehicles or typewriters. It is stated, and stated truly, that much time has been wasted in deciding what types of planes to make. It has, but these decisions are not reached much more quickly in Europe. The record of experiments which have never come to anything in England, in France and even in Germany, would fill a large volume.

How could it be otherwise? The airplane at the outbreak of war was but a toy compared to what it is to-day. It has been improved out of all recognition by experimentation of the most daring kind, by the trying out of things which in more sober times have been regarded as barely sane.

It has been worth while to make twenty costly experiments if only one of them produces results. America's fault has been on the other side; America could have permitted *more* experiment.

At the very beginning of the program there was a widespread misconception—this being an almost universal idea—that France and England knew all about airplanes; that all the facts of the case could be found by consultation with French and British engineers.

There *were* no facts and there are no *facts* to-day. Not facts in the usual sense of the word.

A fact about the design of a plane is hardly ever more than a probability. Something accepted as basic to-day is reconsidered to-morrow and abandoned the day after.

Germany experimented less than France and England, especially in engine design. The result was that for a time German output of medium good machines was large, and though the Allies had some better planes they lacked the necessary quantity, but to-day, and for the past six months the very great superiority of Allied machines has told its tale.

England and France have not hesitated to put to use small numbers of experimental planes that looked good, have been content to order small numbers at a time.

This has delayed output, has led to the employment of a multiplicity of types but has had the highly desirable result of constantly putting over a surprise on the enemy.

If there had been a little more faith placed in American brains we would have had a fair number of fighting machines available last April; they would have been a mixed lot but they would have accounted for at least an equal number of Germans.

It is easy to be wise after the event of course, but the moral is that the British and French supremacy of the air has been won by permitting failures and, in a sense, "waste."

The time is very close at hand when the problem will be before us of turning to peaceful usage the vast amount of knowledge of aircraft we now possess. Let it be remembered that the airplane even now is no more ready for quantity production commercially than was the automobile of fifteen years ago. All is before us.

The Hughes report touches only upon production and gives no attention to the fact that the great, the enormous difficulty, has not been *production* but *decision*. The responsibility for choosing this or that design has been a burden, the weight of which will probably never be appreciated except by those who had to bear it.

# □ Latest News of the

## Maxwell Earnings \$2,158,836

Net Surplus Reduced Considerably But No Estimate of War Work Profits Is Made

### MAXWELL REPORT

Assets		1918	1917
Real estate, machinery and equipment .....	\$9,183,843	\$5,846,738	
Good-will, patents, etc. ....	25,224,108	25,457,363	
Inventories .....	16,283,389	10,813,430	
Advance to Chalmers. ....	2,398,115		
London office, net assets .....	65,837		
Interest receipts, government contracts ..	115,485		
Accounts receivable .....	2,611,567	1,395,742	
Notes receivable .....	879,715	706,952	
Liberty bonds .....	773,750	175,180	
Cash .....	2,869,937	1,852,305	
Sight drafts .....	1,783,190	2,946,384	
Insurance and taxes .....	119,405		
Sinking fund .....	10,723	350,185	
Total .....	\$62,419,064	\$50,804,146	
Liabilities		1918	1917
First preferred .....	\$13,336,642	\$13,915,142	
Second preferred .....	10,127,468	10,127,468	
Common .....	12,805,157	12,778,058	
Mortgages and land contracts .....	168,381		
U. S. Government advances .....	5,614,944		
Dividend warrants .....	466,782		
Plant construction .....		172,018	
Notes payable .....	4,160,000		
Accounts payable .....	2,334,124	2,878,430	
Wages, taxes, interest .....	500,149	399,827	
Customers' deposits ..	419,069	418,526	
Due on contracts .....		643,913	
Liberty bond subscriptions .....	209,543	197,000	
Notes receivable, discounted .....	206,844		
Drafts discounted .....	951,935	1,071,320	
Reserve for depreciation .....	2,333,377		
Reserve for doubtful accounts .....	157,524		
Reserve for contingencies .....	60,000	185,000	
Deferred liabilities .....	8,567,125	8,017,444	
Surplus .....			
Total .....	\$62,419,064	\$50,804,146	

DETROIT, Nov. 2—An analysis of the annual report of the Maxwell Motor Car Co. for the year ending July 31, 1918, in comparison with that for 1917, shows that the total assets for the present year amount to \$62,419,064, as against a total of \$50,804,146 for last year. The net surplus after deduction of charges is \$2,158,836, a sum which is equivalent to \$4.82 per share of common stock after 7 per cent on the first and 6 per cent on the second preferred stock have been deducted. In 1917 the company earned \$29.63 a share on the common stock.

Real estate, machinery and equipment are valued considerably higher than was the case in 1917, and inventories have increased by \$5,468,959. An advance to the Chalmers company is represented by an amount of \$2,398,115 and the accounts receivable are nearly double last year's

figure. Good will and patents are at a slightly lower figure and the cash item is over \$1,000,000 greater than last year's item.

On the liabilities side there is an item of \$2,333,377 reserved for depreciation, whereas last year no provision was made under this head. Government advances of \$5,614,944 constitute another item which had no counterpart in 1917 and a substantial reserve is now made for doubtful debts. The surplus brought from last year's report is \$8,017,444, and this year's total income is \$3,163,334.

The company is co-operating to the fullest possible extent with the Government in carrying out its war program, and this has caused a substantial curtailment in the production of passenger cars. As the fiscal year closed approximately 80 per cent of the total Maxwell capacity was engaged on war work and the remaining 20 per cent was available for passenger cars.

According to President W. L. Mitchell, it is impossible to estimate the probable profits from war contracts until the work is more nearly completed.

### Smith Motor Truck Sold

CHICAGO, Nov. 6—The business of the Smith Motor Truck Corp. was sold yesterday under the sheriff's hammer to a man named John Campbell. The sale wipes out the old indebtedness under which the company has been staggering and carries with it control of the name, good will, factory and material equipment of the corporation. It is generally surmised that Campbell represents one of the factions, or a coalition of factions, from among those which have been struggling for control of the company for the last two years or so. Whether the sale will result in a reorganization of the company and a resumption of business no one seems to know. A man who always has been close to the inside affairs of the company ventures the surmise that Campbell represents interests closely allied personally with the Central Bond & Mortgage Co. of this city. He concludes, furthermore, should this prove to be the case, that there is a probability of the men who first put the Smith Form-A-Truck on the map regaining control and attempting a rehabilitation of the business.

### Gordon Heads Selden Sales

ROCHESTER, Nov. 7—George R. Gordon was elected president of the Selden Truck Sales Co. at the annual meeting of the company, other officers elected being: Vice-presidents, Wm. C. Barry, R. H. Salmons, H. T. Boulden and W. F. Reynolds; secretary, E. B. Osborn; treasurer, F. J. Kolb. H. G. Strong and C. H. Stearns were elected directors.

## Conference Modifies Tractor Position

Restrictions on Production Have  
Been Partially Removed by  
Priorities Division

CHICAGO, Nov. 6—As a result of conferences between the War Service Committee of the newly organized American Tractor Association made up of the newer companies and the Priorities Division of the War Industries Board the following modifications have been made in the restriction on tractor production:

First—Tractor makers who, in the period from Oct. 1, 1917, to Oct. 1, 1918, had not received or placed bona fide orders for parts and materials, will be allowed to make a maximum of twenty tractors in the year ending Oct. 1, 1919.

Second—Tractor makers who, in the period Oct. 1, 1917, to Oct. 1, 1918, made less than ten tractors, and prior to Nov. 1, 1918, had in hand or had placed bona fide orders for materials and parts, will be allowed to use up such materials in the manufacture of tractors up to a total not exceeding one hundred machines by Oct. 1, 1919.

The War Service Committee has been recognized officially by the Priorities Division and has been promised further reconsideration with a view to letting down the bars on tractor production to the extent that conditions may make advisable. The association believes that, in view of the present war situation, the modifications mean tractor makers will be able to go ahead with their production plans in almost absolute certainty that before they have exhausted their allotment of materials they will receive permission to go ahead with their production programs without limitation.

### 3878 Libertys in October

WASHINGTON, Nov. 4—Three thousand eight hundred seventy-eight Liberty engines were produced in October as compared with 2378 in September, an increase of 1500. This increased production was made despite influenza, which threatened to hamper the output of the various factories. The quota set for September was 2500 engines and the actual number shipped was 2378. The quota set for October was 3000. The competition among the various factories has now become a race with each concern showing keen interest. The Nordyke & Marmion Co. of Indianapolis won the October pennant, which was sent to the factory in a DeHaviland Liberty plane from Detroit to-day. The quota of Liberty engines set for November is 4350.



# Automotive Industries

## Liberty Pennant for Marmon

**Presented With Production Championship—Bettered October Quota by 246%**

INDIANAPOLIS, Nov. 2—The Nordyke & Marmon factory won the Liberty engine production championship pennant for the month of October by turning out 308 airplane engines during the month. This was 246 per cent of its quota of 125. Five large concerns building Liberty engines entered into a competition Oct. 1 for an honor flag to be competed for each month, the flag to be awarded at the end of the month to the factory which produced the greatest percentage over its quota for the month. The factories in competition, aside from the Indianapolis concern, are the Lincoln Motors Co., General Motors Co., including Buick and Cadillac, Ford Motor Co. and Packard Motor Co.

By producing over twice its quota for the month, Nordyke & Marmon is awarded the championship pennant for the first month. This is to be held until some of the other factories show a greater percentage increase than Marmon for some month. This does not mean that the Indianapolis concern produced more engines than any others during the month, for some of the other builders had much larger production but a much larger quota.

Liberty engine builders altogether shipped 3878 engines during October, 878 more than the quota and 1500 more than the September shipment. November's quota calls for shipment of 4350 engines. Detailed production quotas of the five concerns are shown in the table herewith.

Award of the first championship pennant by the Bureau of Aircraft Production to the Marmon factory was made the occasion for a parade of Marmon workers, and a general celebration in Indianapolis this afternoon. The parade was over a mile and a half in length, comprising more than 4500 employees of the plant, through the streets of the city and to a park, where the raising of the championship pennant unveiled a Liberty engine. The active heads of Liberty engine production made inspirational talks to the employees. Among the speakers were Archer A. Landon, chief of production, Bureau of Aircraft Production, assistant to John D. Ryan, head of the aircraft activity; Lieut. Harold H. Emmons, of the Navy, chief of the engine production department, Bureau of Aircraft Production, and Major James G. Heaslet, Detroit district manager of the bureau.

Other notables in the aircraft production were present. Lieut.-Col. Jesse G. Vincent and Ralph De Palma flew over from Detroit. Major Marmon, of McCook Field; Mr. Kettering and Mr. Talbot, of Delco; Major Johnson, Bureau of Aircraft Production, and others, were present.

Liberty Engine Quotas

Company	September		October		November Quota
	Quota	Shipped	Quota	Shipped	
Nordyke Marmon Co.	100	59	125	308	375
Lincoln Motors Co.	850	687	825	1,050	1,125
General Motors Co.					
Buick & Cadillac Co.	450	193	325	558	600
Ford Motor Co.	800	811	900	1,059	1,375
Packard Motor Co.	800	628	825	903	875
Totals	3,000	2,378	3,000	3,878	4,350

### Mail Motor Trucks Prove a Success

WASHINGTON, Nov. 4—Cross country operation of mail motor trucks is proving very successful, according to James I. Blakeslee, Fourth Assistant Postmaster General. One truck route between Washington and Philadelphia without direct rail connections and costing \$800 monthly for operation has in 8 months paid a monthly revenue of \$16,000. Another route into Washington where 28 parcels daily were moved in the first month now shows a ton of traffic each way in every 24 hr. Seventy lines now operate over the country, all but one being east of the Mississippi River, and plans are being made for a complete system that brings up visions of \$360,000,000 yearly revenue, this amount being estimated provided the entire country is once properly established with a network of roads and truck routes.

Mr. Blakeslee plans to rebuild the thousands of Army trucks now in France after the war and to utilize these also for this work.

Nine million dollars has been asked of Congress for next year's appropriations for the development of the mail truck routes. Three hundred thousand dollars was allowed this year. Even this small amount, if it could be combined with the revenue that would accrue from the establishment of the routes, would be sufficient. However, it is expected that the revenue will continue to be diverted to the general Post Office funds and that instead Congress will pass the \$9,000,000 appropriation.

### Dorris Truck Price Advanced

ST. LOUIS, Nov. 4—The Dorris Motor Car Co. announces a new price on two-ton trucks, effective Nov. 1, of \$3,425. This is an advance of \$440.

## Would Cut Out Taxes On Exports

**Amendment Eliminates Impost Now Collected on Vehicles Sent Abroad**

NEW YORK, Nov. 7—It seems likely that the War Revenue tax imposed on cars for export will be eliminated. Under the terms of an amendment which has been proposed as an addition to the War Revenue measure now in the hands of the Senate and the House of Representatives, it is stated that vehicles sold or leased for export shall not be taxed.

Despite the fact that the Constitution specifically states that there shall be no tax on exports, the Treasury Department has ruled that cars and trucks sold for export are taxable under the provisions of the present War Revenue measure, which provides an impost of 3 per cent. The Treasury Department has ruled that such a tax must be paid when cars or trucks are exported in any one of four ways which have been previously outlined in AUTOMOTIVE INDUSTRIES.

The National Automobile Chamber of Commerce has repeatedly pointed out the unconstitutionality of such a ruling and has urged that the tax on vehicles exported be eliminated. It seems likely now that this will be done. Under the terms of the new War Revenue Bill in the House, vehicles are taxed 10 per cent and in the bill in the hands of the Senate, the tax is 5 per cent. Following is the text of the proposed amendment:

"Under such rules and regulations as the Commissioner, with the approval of the Secretary, may prescribe, a tax imposed under this title shall not apply in any respect to articles sold or leased for export, and in due course so exported."

### Consider Deeds Court-Martial

WASHINGTON, Nov. 6—The suggestions by Charles E. Hughes recommending court-martial for Col. E. A. Deeds and other officers mentioned were referred by Secretary of War Newton D. Baker to the Judge Advocate General of the Army yesterday for consideration and report. Mr. Baker stated also that he is reading the report carefully so as to be able to have the entire question in mind when any action is taken.

Col. Deeds and Gen. Squier and some of the other officers whose names have been mentioned have already asked for a court of inquiry. Ordinarily such requests are granted to determine if there is ground for a court-martial.

## Working Conditions Standardized

### Department of Labor Creates Three Service Divisions to Establish Uniformity

WASHINGTON, Nov. 4—The Working Conditions Service has been established in the Department of Labor to construct uniform standards for working conditions in all industries. For administrative purposes there are three divisions in the Service—(1) Division of Industrial Hygiene and Medicine; (2) Division of Labor Administration; and (3) Division of Safety Engineering. Since there are in operation other agencies with the specialized function of dealing with wages and hours as controversial questions between employers and employed, they will not be dealt with as such by this Service.

The Secretary of Labor at the request of the Working Conditions Service requested the Secretary of the Treasury to authorize the United States Public Health Service to detail personnel to the Division of Industrial Hygiene and Medicine of the Service. As a result of the agreement reached, Dr. A. J. Lanza, Past Assistant Surgeon of the Public Health Service, was detailed to act as Chief, Division of Industrial Hygiene and Medicine, Working Conditions Service. Dr. G. D. Selby, of Toledo, Ohio, will be at the head of the section of Industrial Medicine.

The Division of Industrial Hygiene and Medicine will direct the formulation of sanitary and health codes for industries. Co-operation with the United States Public Health Service will make possible extensive research work necessary to establish fundamental scientific principles as the basis for proper working conditions.

In addition to the work which the United States Public Health Service will perform for the Working Conditions Service, it is also authorized to do all inspections and investigations into matters pertaining to the sanitation of plants engaged on war work and into the health of workers in such industries, and into the sanitation and housing conditions surrounding the homes of war workers. In addition, the Ordnance Department of the War Department has delegated it the responsibility for mechanical safety in ordnance plants.

A field force of specialists in industrial hygiene, sanitation, safety and production engineering, technically trained and of broad practical experience, has been organized which will be under the supervision of Bernard J. Newman.

The Division of Labor Administration will deal with the attitude and policies of the management toward the employed and the personal relations between employers and employed. The chief of this section will be Dr. William M. Leiserson of Toledo, Ohio.

The Division of Safety Engineering completes the Working Conditions Service. Standards for mechanical safety

have been more adequately worked out than standards for sanitation and industrial hygiene. There are now in nearly all of the states of the Union safety codes and agencies charged with the establishment and maintenance of industrial safety. Supplementing Government agencies, the great energizing forces in this field have been the National Safety Council and various technical societies.

The policy of the Working Conditions Service is to avoid duplication of work and activity and, by acting as a co-ordinating agency, co-operate with the forces already in the field to bring federal directing impetus in the national campaign for uniformity of safety standards, practices and equipment standardization of safety organizations, and for the collection of data necessary for the continuous modification of standards to meet new conditions.

The Bureau of Standards has offered its co-operation in the formulation of codes. The assistance of the National Safety Council has agreed to co-operate with the Working Conditions Service and appointed a committee of five for consultation and advice. The codes which are to be worked out under the Division of Safety Engineering will be the result of experience and experimentation, consultation with technical organizations and conferences with employers and employees in order to ascertain the necessary practical modifications.

The Director of the Working Conditions Service is Grant Hamilton and the Assistant Director is Florence C. Thorne.

#### Priority for Gasoline and Kerosene

WASHINGTON, Nov. 2—Priority has been ordered by the Fuel Administration for gasoline and kerosene for shipments to the armies abroad. All producers of kerosene and gasoline have been notified that whenever they have orders both for civilian and war purposes they must give preference to the war business and will not be allowed to supply civilian requirements until all the military demands are first met. Following is the order issued by the Fuel Administration:

"No licensee engaged in the business of manufacturing kerosene or gasoline shall, without the consent of the United States Fuel Administration, make any deliveries of kerosene or gasoline to any customer or consumer, whether the licensee is under any contract to make delivery to such consumer or customer or not, if such licensee shall be in default in delivering kerosene or gasoline which such licensee may be from time to time directed by the United States Fuel Administrator to deliver for export for the United States Army or Navy or for the Allies."

#### No Tractor Show at Phoenix

PHOENIX, ARIZ., Nov. 4—Owing to the prevalence of Spanish influenza, the State fair, which was scheduled to open Nov. 11, has been called off. It was planned to have a tractor exhibition and demonstration in connection with the fair and a number of entries were already secured from tractor concerns.

## 200,000 Men Needed for Motor Corps

### Highways Transport Committee to Assist in Recruiting—Women May Be Enlisted

WASHINGTON, Nov. 2—The task of assisting in recruiting men for the Motor Transport Corps of the Army, which is now being organized along such comprehensive lines as to call for a force approximating 200,000 men and for motor transportation of the value of \$130,000,000 in addition to the value of such transport already in the service, has been assigned to the Highways Transport Committee, Council of National Defense, by General C. B. Drake, Chief of the Motor Transport Corps.

The carrying out of this assignment for one of the great branches of the war machinery means that the whole organization of the Highways Transport Committee, including the regional directors, the committees organized on its behalf by the State Councils of Defense throughout the country, and their local committees, will be given an increased share in the vital task of winning the war.

In order to prevent the disruption which would follow if tens of thousands of skilled men were taken away from the great organization engaged in operating and maintaining the industrial transport service of the country, and at the same time to provide an adequate force, it is necessary to work out for the Motor Transport Corps some plan to secure substitutes for those thus taken away.

#### May Recruit Women

One way of meeting this situation is by substituting women therefore for men, which involves recruiting these women and placing them in training for service while the men in the industry are being withdrawn for army purposes.

The problem which would inevitably develop in carrying out this plan of substituting women for men in the handling of industrial vehicles over the highways would include a determination of how many men in a given locality are employed on types of vehicle which might be adapted to handling by women, and, again, the adaption of the service of such vehicles so as to provide a satisfactory environment for female operatives.

The possible selection and training of women to take the place of men in the handling of various kinds of highways transportation, and simultaneously the selection and training of men whose age makes them unavailable for army service, will be conducted on the basis that these people are volunteers in much the same sense as are those who are entering the Army. In satisfactorily handling domestic transportation problems, which are necessary to the health and comfort of the civilian army in this country as well as an essential link in the trans-

portation system which supplies our war industries and the Army overseas, these volunteers will be doing their bit in a big way.

### Pedestrian, Too, Has Rights

BOSTON, Nov. 2—The full bench of the Massachusetts Supreme Court has just decided that pedestrians have a right in the street, according to a decision just handed down in an automobile case. George G. Miller was driving his car through Reading one night about 10 o'clock. The sidewalk was muddy and so two girls stepped out into the street and were walking there. While getting out of the way of an approaching electric car they were hit by Miller's motor car, which was on the way to Boston from Haverhill. At the time he was engaged in war work. At the trial the testimony showed that he was driving a 56 hp. touring car at a speed of from 35 to 40 miles an hour, although he claimed that his speed was only 20 miles. The two girls were badly injured, one getting a fractured skull and the other a broken leg after being carried 80 ft. by the car.

Judge John F. Brown, of the Superior Court, ruled that the young women were not exercising due care and he directed a verdict for Miller. The attorney for the young women filed exceptions and took the case to the Supreme Court. Chief Justice Rugg, in writing the opinion, said:

There can be no question that there was sufficient evidence of negligence on the part of the defendant Miller. He was violating statute 1909, chapter 534, sections 14 and 16. The speed at which he was driving might have been found to have been excessive and dangerous to other travelers. If the defendant had been traveling at a lawful rate of speed the young women would have reached a place of safety. Even if they did not pursue the wisest course in the light of what happened, that is not decisive against them.

The chief justice further added that the rights of an automobile driven in a public way are not superior to those of a pedestrian. This point will have an important bearing in many suits for damages in the future, for many motorists have contended that motor cars had the right of way on the thoroughfares except at cross-walks, etc.

### Boston Show Out of Question

BOSTON, Nov. 2—If the Boston Automobile Dealers' Association decided to hold a motor show next spring its plans would have to be altered now, for the officials of Tufts College have taken over Mechanics' Building as a barracks for the students who are training in its officers unit. And this unit will be held at the college during the regular college season, so that the barracks being part of the Government scheme of training any lease of the building for motor show purposes would have little consideration. As there is no other building in Boston suitable for a show it would not be possible now to have one.

## Non-War Industries Power Curtailed

### Factories Using More Than 100-Hp. Electrical Energy to Be Affected

WASHINGTON, Nov. 2—Non-war industries using more than 100 hp. connected load of electric energy from light or power companies will be curtailed in their use of this power by new regulations from the War Industries Board.

Preference will be given to consumers of more than 100 hp. connected load who are engaged in war manufactures and who will be placed in class 1. Consumers using 100 hp. connected load or less will also be placed in class 1, as it has been found that the inconvenience and damage they would suffer by curtailment would not be justified. Other industries not engaged in war work will be placed in class 2, 3 and 4, depending upon the importance of their products, and they will be rationed by the use of the following formula:

#### Formula for Rationing

(a) The aggregate kilowatt demands of each of the four classes of all industries and plants shall be approximately ascertained.

(b) The available supply of electric energy shall be ascertained.

(c) Should the available supply equal the requirements or demands, then the requirements of all industries and plants on the preference list shall be fully satisfied.

(d) But should the requirements or demands exceed the available supply of electric energy, then there shall be deducted from such supply the requirements of Class 1, 100 per cent of which must be delivered, and the remainder shall be prorated between Classes 2, 3 and 4, giving to each a per cent of its requirements in the ratio of 5, 3 and 2.

It will, however, sometimes happen, when class 2 or 3, or both, have extremely small requirements in proportion to the total requirements of the district that the formula will allot to one or both of these classes (2 and 3) an amount in excess of their respective requirements. In such a case the over-allotted class or classes should be given 100 per cent of their requirements and the balance of their allotment under the formula should be distributed either:

(a) Between the classes given incomplete service by the formula, in the ratio of their respective priority ratio (5, 3 or 2). This procedure is to apply where two classes are left incompletely served, or

(b) If only one class is left incompletely served by the formula, the over-allotments of the other two classes are to be assigned to the incompletely served class.

The allotment of more than 100 per cent under the formula to a small class of high importance shows that the shortage in the district was primarily caused by the large amount of less important work in the district, and that the small class or classes of higher importance should not be penalized, since they are not responsible for the shortage.

It is not practicable, and it is not intended, that an attempt should be made to apply this formula with literal and mathematical accuracy, but it will afford a workable basis for rationing industries and plants embraced within classes 2, 3 and 4, where the available supply, after satisfying class 1, is less than their aggregate requirements or demands.

### Consider Massachusetts Taxes

BOSTON, Nov. 4—The commission comprising the three members of the Highway Board, Col. William D. Schier, Frank D. Kemp and James W. Synan, and Secretary of State Albert P. Langtry, with Thomas W. White, supervisor of administration, appointed to delve into motor laws and report to the next legislature, have picked out Thursday, Nov. 7, for the first hearing. Letters have been sent to all the prominent motor dealers in Boston and a general invitation is extended to motorists, accessory men and others interested in the industry to attend and air their views. The committee hopes to get enough material together to frame such laws that will do away with the necessity of fighting before legislative committees year after year, as has been done in the past. While motor fees will be considered they will not be so important because of the fees and taxes of the National Government. But headlights, the weight of trucks and other topics will get consideration.

President John H. MacAlman, of the Boston Automobile Dealers' Association, will represent the motor car dealers; John H. Johnson will represent the N. A. A. D.; Josiah S. Hathaway will represent the Boston Commercial Vehicle Dealers' Association; George H. Hudson will speak for the electric vehicle men; James T. Sullivan will appear for the Bay State A. A.; Secretary James Fortesque will voice the sentiment of the Massachusetts State A. A., and it is expected that representatives of other organizations throughout the State will attend.

It is the intention of the committee to have several hearings if necessary so that everyone will have a chance to be heard. Later on the committee may sit at Springfield and Pittsfield to give men in the other part of the State a chance to be heard who cannot come to Boston.

### One Death at Aviation Fields

WASHINGTON, Nov. 2—There was but one death due to training flyers reported from American flying fields during the week ending Oct. 26. This fatality occurred at Park Field, Millington, Tenn. There were no deaths due to aviation accidents reported from any of the other 26 flying fields in the United States. The total flying time at aviation fields in this country during the week ending Oct. 26 was 14,779 hours in the air. The distance covered by all flyers at the 27 fields was 1,182,320 miles, a distance over 47 times around the earth.



## September Exports Satisfactory

Over 11% Better Than Those of August and Slightly in Excess of September, 1917

	1918		1917	
	Cars	Value	Trucks	Value
Sept.	3,305	\$2,593,236	1,280	\$3,215,206
Aug.	2,710	2,818,259	909	2,337,904

	1918		1917	
	Cars	Value	Trucks	Value
Sept.	4,038	\$3,432,290	1,314	\$3,903,067
Aug.	3,432	2,907,051	1,802	2,051,051

WASHINGTON, Nov. 6—Although during the month of September, 1918, we exported a greater number of passenger cars than during the previous month, the value was appreciably less, but this falling off in value was more than compensated for by the considerable increase in both the number and value of trucks exported. Automotive parts also showed a gain during September, with the result that the month's totals representing the value of trucks, cars and parts showed an increase of 11.2 per cent over the corresponding items for August. In comparison with September, 1917, a slight increase in value is shown, the gain in parts alone being more than sufficient to compensate for the drop in cars and trucks.

Taking the nine months ending September the present year shows a falling off in values of cars, trucks and parts of \$10,961,715 when compared with a similar period of 1917, the sole item showing an increase being that of parts.

During this period the various types of engines exported show a very substantial gain, this being especially evident in the case of tractor engines which are used in military service.

The United Kingdom and France continue to absorb the great majority of the trucks exported, but there are indications of increasing demand for commercial vehicles from the Latin American republics, many of which are included under the head of "other countries."

### Bituminous Production Drops

WASHINGTON, Nov. 5—Bituminous coal production for the week ended October 26 was 11,215,000 tons, a decrease of 309,000 tons over the preceding week, due, according to the Fuel Administration, to the influenza epidemic. This production, however, is an increase of 411,000 tons over the corresponding week of 1917. Anthracite production for the week ended October 25 was 1,714,000 tons, a decrease of 339,000 as compared with the corresponding week of 1917. In the week ended October 19 the total loss by all causes from 100 per cent production was 20.6 per cent, of which car shortage comprised 7.6 per cent, labor shortage 8.5 per cent, mine disability 3 per cent and all other causes 1.5 per cent.

### Inland Piston Ring in Larger Premises

ST. LOUIS, Nov. 4—The Inland Machine Co., makers of the Inland one-piece piston ring, has made its third move in two years to larger and better quarters. It is now in the Advertising Building at 17th and Locust Streets, having the first floor and basement.

## Implement Dealers to Convene

Expect 1200 at Combined Three-Day Meeting and Exhibition in Omaha, Nov. 13-15

OMAHA, Nov. 6—All display space is already sold out for the tenth annual convention of the Midwest Retail Implement Dealers' Association, which meets here Nov. 13, 14 and 15. Twelve hundred dealers are expected to attend the three-days session. Headquarters of the convention are at the Hotel Rome, with displays occupying the entire space at the Auditorium. The main floor of the Auditorium will be taken up by exhibits of farm implements and equipment, while tractors will be shown in the basement. Trucks and farm lighting systems will also comprise an important part of the displays.

### The Program

The program will comprise regular morning and afternoon sessions, at which men prominent in the implement truck and tractor trade from a wide section of the country will be speakers. Questions arising from advancing cost and restrictions of material and curtailment of output by war demands on manufacturing resources will feature the business sessions. Among the speakers will be Floyd R. Todd of Moline, Ill., vice-president of the John Deere Plow Co., who will represent the National Implement and Vehicle Dealers' Association

## Exports of Automotive Equipment for September and Eight Previous Months

	Month of September				Nine Months Ending September, 1918			
	1918		1917		1918		1917	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	13	\$197,700	1	\$4,000	28	\$417,455	138	\$1,065,707
Airplane parts		1,111,607		371,778		10,371,948		3,049,714
Commercial cars	1,280	3,215,206	1,314	3,903,067	7,967	19,258,345	10,817	27,202,010
Motorcycles	418	93,775	765	148,451	7,446	1,732,468	11,939	2,507,147
Passenger cars	3,305	2,593,236	4,038	3,432,290	32,048	29,616,551	48,767	37,090,838
Parts, not including engines and tires		3,441,758		1,802,051		25,548,133		21,091,926
Total (trucks, cars and parts value only)		\$9,250,200		\$9,137,408		\$74,423,029		\$85,384,774
ENGINES								
Automobile gas	1,275	\$231,725	1,204	\$144,490	23,024	\$3,081,984	24,392	\$1,762,070
Marine gas	426	153,319	907	17,225	4,040	2,001,715	8,255	1,594,099
Stationary gas	2,900	271,538	1,482	163,405	21,468	2,498,010	21,072	2,420,926
Tractor gas	2,339	2,754,360	1,323	2,089,227	19,728	20,598,312	8,423	11,287,734
Total value		\$3,410,942		\$2,569,347		\$28,171,021		\$18,064,829

### EXPORTS BY COUNTRIES SEPTEMBER, 1918

	Passenger Cars		Trucks	
	No.	Value	No.	Value
Argentina	81	\$69,675		
Australia	198	210,118		
British India	50	40,927		
British South Africa	50	223,912	196	\$244,967
Canada	1,001	317,998		
Chile	280	196,701	63	117,216
Cuba	134			
Denmark				
Dutch East Indies	145	163,344		
France	74	35,900	408	1,312,450
Mexico	168	167,632		
New Zealand	68	68,159		
Norway	30	60,677		
Philippine Islands	162	140,917		
Russia in Europe				
Spain	90	113,247		
United Kingdom			422	1,240,055
Uruguay	63	27,378		
Other Countries	761	756,686	191	300,518
Totals	3,305	\$2,593,236	1,280	\$3,215,206

### NINE MONTHS ENDING SEPTEMBER, 1918

	Passenger Cars		Trucks	
	No.	Value	No.	Value
Argentina	1,441	\$1,482,236		
Australia	3,239	2,729,539	43	\$39,863
British India	56	43,498		
British South Africa	812	663,272	1,234	1,505,744
Canada	8,539	6,425,319		
Chile	1,573	1,982,081		
Cuba	1,593	2,126,613	430	895,248
Denmark	2	4,100		
Dutch East Indies	709	834,241		
France	987	1,088,090	2,172	7,876,435
Mexico	1,585	1,170,203		
New Zealand	1,159	973,534		
Norway	126	301,574		
Philippine Islands	1,497	1,270,916		
Russia in Europe	10	8,325	2	5,454
Spain	673	806,086		
United Kingdom	340	959,044	2,180	6,440,815
Uruguay	1,189	695,317		
Other Countries	6,518	6,052,569	1,636	2,494,786
Totals	32,048	\$29,616,551	7,967	\$19,258,345

at the convention. Mr. Todd will speak on November 15 on the implement industry. Following are the exhibitors:

B. F. Avery & Sons Co., Omaha, Avery tractors and implements.  
Janesville Machine Co., Omaha, tractor plow and implements.  
Western Motor Car Co., Omaha, Diamond-T and Columbia trucks.  
Nebraska Moline Plow Co., Omaha, Universal tractors and equipment.  
J. I. Case Plow Works, Omaha, J. I. C. tractors.  
Nebraska Bull tractor Co., Omaha, Neb., Bull tractors.  
Turner Manufacturing Co., Omaha, Turner Simplicity tractors.  
Mid-West Truck & Tractor Co., Omaha, Turner tractors, Simplicity engines, Traffic, Wolverine and Onelda trucks.  
Noyes-Killely Motor Co., Omaha, Wisconsin tractors.  
J. I. Case Threshing Machine Co., Omaha, gas and oil tractors.  
Hart Parr Co., Charles City, Ia., Hart Parr 15-30 kerosene tractors.  
Jones-Opper Co., Omaha, Cleveland crawler tractors.  
Hanson-Tyler Auto Co., Omaha, Allis Chalmers tractors.  
International Harvester Co., Omaha, International tractors, implements.  
Globe Manufacturing Co., Terry, Ia., hand engines, electric washers.  
Sunderland Machinery & Supply Co., Omaha, feed grinders, tank heaters.  
John Deere Plow Co., Omaha, implements and vehicles.  
Parlin & Orendorff Plow Co., Omaha, tractor drawn implements.  
Associated Mfg. Co., Omaha, engines and separators.  
Henry & Robinson Hdw. Co., Omaha, implement supplies.  
Stover Mfg. & Engine Co., Omaha, engines and graders.  
R. H. Boomer Mfg. Co., Council Bluffs, Ia., implements.  
Oliver Chilled Plow Works, Omaha, tractor tools.  
Cushman Motor Works, Lincoln, Neb., motors and unit light plants.  
John Dav Rubber Co., Omaha, tank heaters and belting.  
Hayes Pump & Planter Co., Omaha, pumps and implements.  
Emerson-Brantingham Co., Omaha, implements.  
Philip Barnard Co., Sioux City, Ia., tanks.  
Avery Co., Omaha, Avery tractor plow.  
New Idea Sreadder Co., Omaha, implements.  
Joel Turney Co., Fairfield, Ia., wagons and farm trucks.  
Electric Wheel Co., Quincy, Ill., farm trucks and wagon boxes.  
Advance Rumely Co., Lincoln, Neb., Huber tractor.  
J. D. Tower & Sons Co., Mondota, Ill., corn cultivators.

#### Importation of Pig Tin

WASHINGTON, Nov. 2—Hereafter licenses for the importation of pig tin will be authorized by the War Trade Board where the applications, otherwise in order, cover shipments purchased prior to Oct. 1, 1918. The date of purchase of such shipments will be determined by the American Iron and Steel Institute. Licenses will be issued for importation of pig tin when the applications, otherwise in order, were to the United States Steel Products Co., regardless of the date of purchase. Licenses will not be issued for the importation of pig tin under any circumstances excepting those outlined above. Selling prices on the tin recently purchased by the Inter-Allied Tin Executive at London and allocated to the United States will be announced some time between now and Dec. 31, 1918. Consumers, jobbers and dealers requiring spot tin will be assisted in locating stocks if they will communicate with the Sub-Committee on Pig Tin, American Iron and Steel Institute, Room 1811, 71 Broadway, New York City.

## September Exports from New York

### Another Big Increase in Truck Figures—Parts Exports Also Satisfactory

NEW YORK, Nov. 4—A fully maintained gain in both the number and value of trucks exported from the port of New York is the principal feature of the figures for the month of September. August truck exports showed a gain of 95 per cent over July, and the increase in September is a fraction over 94 per cent as regards number and almost 70 per cent in value.

Passenger cars show a falling off of approximately 30 per cent in number and 28 per cent in value, as against the previous month's totals, but under existing manufacturing conditions this drop is not unexpected.

#### Parts Exports Increase 30 Per Cent

Exports of parts show an increase in value of over 30 per cent in comparison with the total of August exports, and as the August figures available at this time are not quite complete the actual improvement is undoubtedly appreciably greater.

Chile is our largest buyer of passenger cars, with 280 for the month, and England and France have taken between them 723 of the 862 trucks exported. These two countries also lead as pur-

chasers of automotive parts and Chile's share of the total is also big. Siam rejoins our list of customers after an absence of some time.

#### Government Needs Laborers

WASHINGTON, Nov. 4—More than 370,000 common laborers are required immediately for work in ordnance plants, Navy yards and docks and for cantonments and other army construction work, and this amount, it is said by the Department of Labor, will have to be taken from "non-essential" industries. The ordnance makers need 139,000 workers, the Construction Division 200,000, and the Bureau of Yards and Docks of the Navy Department 31,000.

Serious disorganization of labor supplying the machinery of the United States Employment Service is threatened, according to the Department of Labor, by the practice of some employers in asking for larger numbers of workers than they need or can use and the Department of Labor is requesting various employers to be more reasonable in their demands.

There is an instance of factories requisitioning 1500 unskilled men who upon arrival at the plant found no place to sleep and no place where they could be fed and as a result more than 50 per cent deserted as quickly as they could. Another instance is that of an employer asking for 100 skilled workers when less than 50 would have been sufficient. Many other examples are quoted by the Department of Labor.

#### AUTOMOBILE, TRUCK AND PARTS EXPORTS FROM NEW YORK FOR SEPTEMBER

	Cars		Trucks		Parts
	No.	Value	No.	Value	Value
Argentina .....	81	\$69,645	..	..	\$82,748
Australia .....	40	38,756	1	\$2,132	..
Barbadoes .....	..	..	..	..	2,204
Bolivia .....	..	..	..	..	1,373
Brazil .....	70	63,507	..	..	30,901
British Guiana .....	5	5,172	..	..	6,037
British India .....	..	..	..	..	379
British South Africa .....	50	40,927	..	..	..
British West Indies .....	7	4,369	..	..	1,012
Chile .....	280	317,998	25	28,796	113,897
Colombia .....	4	2,966	..	..	993
Costa Rica .....	..	..	..	..	163
Cuba .....	24	55,564	32	53,639	41,452
Danish West Indies .....	5	3,267	..	..	952
Dutch East Indies .....	..	..	..	..	4,080
Dutch Guiana .....	..	..	..	..	424
Dutch West Indies .....	1	480	..	..	166
Ecuador .....	2	1,600	..	..	426
Egypt .....	5	20,000	..	..	..
England .....	..	..	383	1,113,104	521,913
France .....	70	32,900	374	1,132,187	310,687
French East Indies .....	..	..	..	..	75
French West Indies .....	6	4,781	..	..	5,868
Greece .....	..	..	..	..	7,433
Guatemala .....	..	..	..	..	329
Haiti .....	2	2,402	..	..	1,621
Honduras .....	2	5,000	..	..	24
Iceland .....	..	..	..	..	1,521
Italy .....	..	..	10	21,817	8,122
Jamaica .....	6	6,534	..	..	1,371
Japan .....	5	11,522	11	13,905	..
Mexico .....	22	29,718	2	1,400	7,433
Newfoundland .....	3	3,515	..	..	525
New Zealand .....	4	3,556	..	..	..
Nicaragua .....	..	..	..	..	179
Norway .....	30	60,667	6	5,250	4
Panama .....	2	1,100	..	..	1,510
Peru .....	36	68,536	11	30,422	8,600
Philippine Islands .....	26	13,330	..	..	..
Salvador .....	5	4,293	..	..	..
Santo Domingo .....	22	24,755	..	..	4,605
Siam .....	..	..	1	2,917	..
Spain .....	88	111,122	..	..	1,832
Straits Settlements .....	1	850	6	9,261	22,621
Trinidad .....	2	3,049	..	..	3,877
Uruguay .....	63	27,373	..	..	3,746
Venezuela .....	6	10,183	..	..	5,601
	975	\$1,049,587	862	\$2,465,100	\$1,206,704

## Canadian Ford Is Prosperous

A Surplus of \$4,856,049 Is Shown for the Year—Fewer Cars Were Built

FORD CITY, ONT., Nov. 4—Although the Ford Motor Co. of Canada, Ltd., built only 46,914 cars during the fiscal year ended July 31 (3913 less than in 1917), the company's gross business totaled \$24,608,442. This is an increase of approximately \$800,000 over the total for the preceding year, and is due principally to an advance in price of passenger cars put in effect during the year.

The corporation's net profits for the year were \$2,358,192.94, an increase over last year of \$35,545. Its business profits tax for 1918 was \$167,951.

The balance sheet which is given herewith shows a surplus of \$4,856,049.03, or nearly \$2,500,000 more than last year. Total resources amounted to \$14,281,808.62, an increase of \$1,771,677 over the previous year. A 5 per cent cash dividend, distributed Oct. 14, 1917, and amounting to \$350,000, was the only disbursement to the stockholders during the fiscal year. There was no dividend payment the previous year. It was intimated another dividend might be declared in the near future.

Among the current assets, cash amounted to \$580,975.53, contrasting with \$2,066,456 last year. The reduction is largely accounted for by an increase in inventories, the aggregate of which, \$6,978,010.16, compares with \$3,859,214 a year ago, part of the increase in inventory also being attributable to the higher costs of materials. Of the total, the inventories for the home office totalled \$6,351,671.80, and is chiefly made up of manufactured parts of cars and trucks.

No change in capital stock was made during the year, the amount issued remaining at \$7,000,000 of the \$10,000,000 authorized.

The directors were re-elected as follows: Henry Ford, James Couzens, Gordon M. McGregor, Frank L. Klingensmith and W. R. Campbell.

### Weather Forecasts For Motor Routes

WASHINGTON, Nov. 4—The Weather Bureau of the U. S. Department of Agriculture has arranged, in co-operation with the State Highway Commission of Pennsylvania, to aid motor truck traffic during the coming winter over the Lincoln Highway between Pittsburgh and Harrisburg by giving out daily information of the weather conditions prevailing over the route and issuing weather forecasts and warnings of heavy snows and cold waves for the region traversed.

The plan is for assistant superintendents of highways at points along the route to report to the Weather Bureau office at Pittsburgh at 8 a. m. by telephone or telegraph the depth of snow or ice on the highway, giving its general condition. These reports are published

in the newspapers and furnished to the different automobile clubs, thus becoming available to automobile and motor-truck drivers passing over the highway. The forecasts and warnings are given public distribution and telegraphed to the superintendent of highways at Harrisburg, who gives instructions to his forces along the highway to make provisions for the anticipated weather conditions. This service was in operation last winter and gave great satisfaction. The Weather Bureau is ready to give similar service to other traffic routes as may be desired.

### Completing Military Highway Work

WASHINGTON, Nov. 4—Nine miles of concrete road between Alexandria, Va., and Camp Humphreys, Va., soon will be ready for use, marking the completion of planning and supervisory work done by engineers if the Bureau of Public Roads of the U. S. Department of Agriculture for the military authorities. The road from Alexandria to Camp Humphreys is the longest military highway outside of cantonments that has been planned and supervised by engineers of the bureau, although the total construction planned and supervised by these engineers aggregates several hundred miles and covers practically all the recognized types of construction, from sand and clay to first-class surfaces and concrete roads. Seventeen highway engineers and one superintendent of construction were detailed to military work by the bureau in July, 1917, the period of their assignments varying from 3 to 15 months.

## New Canadian Rule on Car Imports

Restrictions Modified to Permit Entry of Bodies and Parts Not Obtainable in Canada

OTTAWA, ONT., Nov. 1—The War Trade Board announces a new ruling in regard to import licenses for automobile bodies and chassis. It will be remembered that by order-in-council of June 3 the importation of automobiles valued at \$1,200 and upward at place of manufacture was prohibited except under license by the board. A memorandum of the department issued Sept. 17 declared that this prohibition also applied to the body and chassis of automobiles when the body or chassis together with the usual parts required to complete the automobile, amounted in value to \$1,200 or upwards, f.o.b. at place of export.

Regarding these restrictions on the importation of automobiles bodies and chassis, the War Trade Board has decided that where an automobile is for use on a chassis imported into Canada prior to June 16, 1918, upon proper evidence being submitted of the facts license for importation will be recommended. Furthermore the board will be disposed to recommend import license for bodies or other parts of cars not obtainable in Canada which are an essential requirement for the production of automobiles by bona fide manufacturers of automobiles in Canada.

### Balance Sheet of the Ford Motor Co. of Canada

Assets	
Cash on hand in bank.....	\$580,975.53
Accounts receivable—	
Sight drafts and foreign shipments.....	\$666,094.71
Open accounts (less bad and doubtful debts).....	160,255.34
Customs drawback.....	190,313.02
	1,016,663.07
Deferred charges—	
Insurance, taxes, etc.....	173,421.29
Stores accounts—	
Home office.....	\$6,351,671.80
Branches (less profit unearned).....	626,338.36
	6,978,010.16
Plant accounts (less depreciation)—	
Home office.....	\$4,335,981.37
Branches.....	1,196,756.20
	5,532,737.57
Patents.....	1.00
	\$14,281,808.62
Liabilities	
Purchase creditors, etc.....	\$1,157,500.78
Accrued pay roll and miscellaneous expenses.....	115,481.39
Contract rebates.....	646,301.96
	\$1,919,284.13
Reserves—	
Foreign shipping space.....	\$160,235.95
Uninsured risks.....	100,000.00
Business profits taxes.....	764,190.51
	1,024,426.46
Surplus—	
Balance July 31, 1917.....	\$2,445,139.53
Adjustment 1917 tax reserve.....	52,716.66
Profits for year.....	2,358,192.84
	\$4,856,049.03
Five per cent dividend paid Oct. 15, 1917.....	\$350,000.00
Business profits tax, 1918.....	167,951.00
	517,951.00
	4,338,098.03
Capital stock issued.....	7,000,000.00
	\$14,281,808.62



### Moon Director in Charge of Motor Transport Repair Yard

ST. LOUIS, Nov. 4—Earl J. Moon, a director and one of the founders of the Moon Motor Co. of this city, has been ordered from Fort Sam Houston, Tex., to France, where he will be placed in charge of one of the repair yards of the Motor Transport Corps. Moon was commissioned a lieutenant in the Motor Transport Corps Oct. 18.

A. W. Crossman has been appointed district representative of The Cleveland Tractor Co., with headquarters at 604 Brockman Building, Los Angeles. His territory comprises California, Washington, Oregon, Arizona, Utah, Nevada and Idaho.

Charles Brownell, advertising manager of the Ford Motor Co., was elected vice-president of the Better Business Bureau of Detroit at a meeting of the executive committee. Plans were made for increasing the scope of the work.

E. H. Geyer, for a number of years associated with the Byrne-Kingston Co. and the Kokomo Electric Co., both of Kokomo, Ind., has been appointed general sales manager of the Hercules Motor & Mfg. Co., Canton, Ohio.

J. Edward Demar has resigned as sales manager of Chas. E. Reiss & Co., Inc., New York, to accept the presidency of the Carlisle Sales Co., Inc., distributor of the Carlisle cord tire, with offices and showrooms at 237 West Fifty-eighth Street.

### Packard Builds 900 Liberties in October

DETROIT, Nov. 4—During October the Packard Motor Car Co. completed 900 Liberty engines, or thirty-three in every working day. The company exceeded by 10 per cent the quota of 825 set for it by the Aircraft Production Board. The daily production during the month fluctuated, governed largely by the supplies of raw materials. On two days, the high score of fifty was made, and three days, forty. Most of the time, however, the engine assemblies stood at approximately thirty-five per day.

### Texas Has 271,854 Vehicles

AUSTIN, Nov. 6—It is shown by the records of the State Highway Commission that there are 271,854 automobiles and motor trucks registered in Texas. It is estimated, however, that this registration is perhaps twenty thousand in excess of the total number of motor vehicles now in actual use in this State, that number having been probably junked since their registrations. It is estimated that there are about 250,000 automobiles and motor trucks now in use in Texas. No separate record is kept of automobiles and motor trucks. It is therefore not definitely known how many there are of each of these motor vehicles.

## Men of the Industry

### Changes in Personnel and Position

Harry W. Ford, former president of the Saxon Motor Car Corp., Detroit, is reported to have been given a commission with the Motor Transport Corps, to be located at Jacksonville, Fla., where he is at present.

E. M. Benedict, formerly of Toronto, and expert in shell manufacture, has been appointed general manager of the Jackson Munitions Corp., Jackson, Mich.

J. H. Gould, formerly of the J. H. Gould Co., Detroit, has been appointed chief engineer of the Buffalo Pressed Steel Co., Buffalo, N. Y.

### Tracy Influenza Victim

WASHINGTON, Oct. 30—Percy Tracy died here to-day a victim of influenza followed by pneumonia. Mr. Tracy, recently buyer of parts for the Army trucks under Christian Girl, who called him to Washington, had just lately accepted the position of trailer purchaser under Col. F. Glover in the Quartermaster Department. Prior to the war he was the buyer for 5 years for the Paige Detroit Motor Corp., and at one time acted in the same capacity for the Premier Motor Co.

### New Turner Tractor Distributor

PORT WASHINGTON, Wis., Nov. 6—The Turner Mfg. Co. has appointed the Owen Magneto Corp, Chicago, distributors for Northern Illinois and Northern Indiana and the western half of Michigan for the Simplicity Tractor.

### Navy Seaplane Aloft 9 Hours

WASHINGTON, Nov. 4—A navy seaplane equipped with a Liberty engine recently remained in the air for 9 hours, says a report received today from Admiral Sims. The seaplane carried a full military load, four men, regulation supply of gasoline, two bombs weighing nearly 500 lbs. and two machine guns. No additional gasoline tanks were carried.

### Sulphuric Acid Contract Plant

WASHINGTON, Nov. 5—A sulphuric acid contract plant will be located at Grand Rapids, Mich. The Construction Division of the Army has been ordered to erect and equip this plant at an estimated cost of \$1,500,000. The plant is to be situated upon a tract of land which is the property of the U. S. Government upon which a picric acid plant is now being erected. When in operation this plant will be of sufficient size to produce approximately 75,000 net tons per year.

### Capt. Gilson Promoted Major

RACINE, Nov. 4—Capt. James W. Gilson of Racine, Wis., formerly sales manager of the Mitchell-Lewis Motor Co., now the Mitchell Motors Co., and the Lewis Motor Car Co., Racine, has been promoted to major, according to word received from France. In 1916 he organized a battery of field artillery in Racine to go to the Mexican border, and a year later he formed a second unit in which he was placed in command as captain. Before his battery left Camp MacArthur, Tex., Capt. Gilson was assigned to the staff of Brig. Gen. Haan and went overseas with the now famous Thirty-second division. In France he was re-assigned to the staff of Brig. Gen. Irwin, 57th Field Artillery brigade, upon which he now is serving as a major. His command has been in the thick of the fighting north and northeast of Chateau-Thierry for more than 100 days.

O. G. Watson, secretary, Menominee Motor Truck Co., Menominee, Mich., has accepted a commission as a second lieutenant in the Motor Transport Corps and left Oct. 29 for Camp Holabird, Md., to enter active service. He has resigned as alderman of the First ward, Menominee.

Clifford F. Messinger, advertising manager, Chain Belt Co., Milwaukee, has been given indefinite leave of absence to accept a commission as a first lieutenant in the gas and flame division, Chemical Warfare Service, U. S. Army. He has departed for Camp Kendrick, Lakehurst, N. J.

T. J. Phillips, cost and production expert of the Kissel Motor Car Co., Hartford, Wis., during the last 2 years, has resigned to accept the position of controller of the Porto Rico Sugar Co.

### Crippled Men Need Cycles

WASHINGTON, Nov. 4—American manufacturers will be called upon to furnish scores of thousands of tricycles and motorcycles for men who have lost limbs in the war, Consul H. D. Van Sant, who is located at Dunfermline, Scotland, said recently in a report to the Department of Commerce. The consul said bicycles were becoming so scarce in Great Britain that wheels originally selling at \$25 or \$30 now bring from \$60 to \$70.

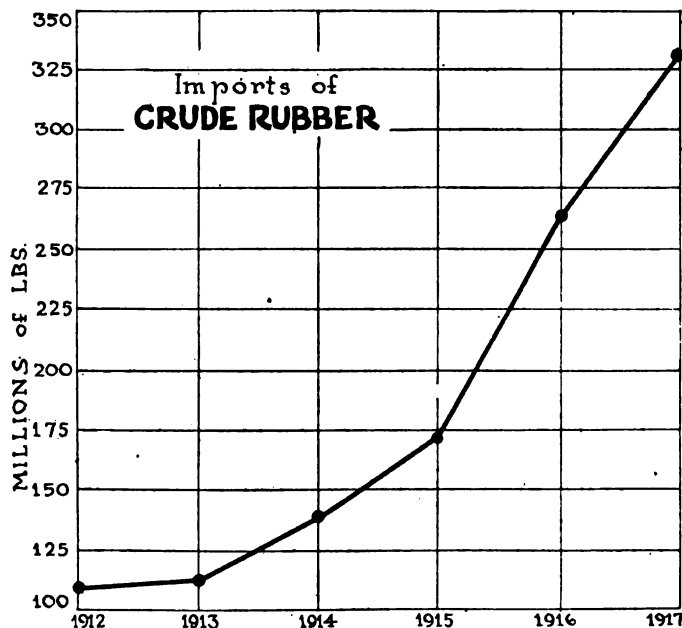
If the demand for bicycles and tricycles is to be met American manufacturers must get busy, Mr. Van Sant intimated. A little readjustment of munition making machinery would enable the manufacturers to devote their plants to the new needs, the consul said.

Mr. Van Sant estimates that veterans of the war in Great Britain alone will be able to use about a million wheels of all kinds. To supply the demand will require the employment of an army of men and women and will reabsorb into the industrial ranks many of the returning soldiers.

# AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>		<b>Burlap:</b>	
Muriatic, lb.....	.02 -.03	8 oz., yd.....	12.4 -15.85
Phosphoric (85%)..	.35 -.39	10 1/2 oz., yd.....	14.6 -18.6
Sulphuric (60), lb..	.008	<b>Copper:</b>	
<b>Aluminum:</b>		Elec., lb.....	.26
Ingot, lb.....	.33	Lake, lb.....	.26
Sheets (18 gage or		<b>Fabric, Tire (17 1/2 oz.):</b>	
more), lb.....	.40	Sea Is., combed, lb.	1.65 -1.70
Antimony, lb.....	.13 -.13 1/2	Egypt, combed, lb.	1.25 -1.35



The increase in the quantity of crude rubber imported in recent years marks the development of the cultivated varieties

Egypt, carded, lb..	1.20 -1.30
Peelers, combed, lb.	1.05 -1.20
Peelers, carded, lb.	.95 -1.05
Fibre, (1/4 in. sheet base), lb.....	.50
<b>Graphite:</b>	
Ceylon, lb.....	.07 1/2 -.25
Madagascar, lb....	.10 -.15
Mexican, lb.....	.03 1/2
Lead, lb.....	.08 -.09
<b>Leather:</b>	
Hides, lb.....	.18 -.35 1/2
Nickel, lb.....	.40
<b>Oil:</b>	
Gasoline:	
Auto., gal.....	.24 1/2
68 to 70 gal.....	.30 1/2
<b>Lard:</b>	
Prime City, gal..	2.50
Ex. No. 1, gal....	1.70
Linseed, gal.....	1.61 -1.62
Menhaden (Brown), gal.....	1.30 -1.31
<b>Petroleum (crude),</b>	
Kansas, bbl.....	2.25
Pennsylvania, bbl.	4.00

<b>Rubber:</b>	
Ceylon:	
First latex pale crepe, lb.....	.61
Brown, crepe, thin, clear, lb.....	.54
Smoked, ribbed sheets, lb.....	.59
<b>Para:</b>	
Up River, fine, lb..	.66
Up River, coarse, lb.....	.36 1/2
Island, fine, lb....	.55
Shellac (orange), lb.	.74 -.75
Spelter .....	.09 -.09 1/2
<b>Steel:</b>	
Angle beams and channels, lb. ....	.03
Automobile sheet (see sp. table).	
Cold rolled, lb.....	.06 1/2
Hot rolled, lb.....	.03 1/2
Tin .....	.76 1/2 -.77 1/2
Tungsten, lb.....	2.45-2.50
Waste (cotton), lb...	.12 1/2 -.17

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping.....	6.20	6.10
Automobile body stock, extra deep stamping .....	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock .....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
<b>Automobile Sheet Extras for Extreme Widths:</b>		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
<b>Black Sheet Extras to Apply to Narrow Widths:</b>		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Can Meet Transportation Emergency

WASHINGTON, Nov. 4—Pennsylvania can meet any motor transportation emergency that may arise within that State, according to a report filed to-day by the State Council of National Defense with the Council of National Defense.

When the Highways Transport Committee of the Council of National Defense recently undertook to organize subordinate committees in each State for a more thorough utilization of the nation's highway transport resources it obtained the most efficient, immediate co-operation in Pennsylvania.

It was unnecessary to create new machinery because the Pennsylvania Council of National Defense, in its Motors and Motor Trucks Department, already possessed a state-wide organization, which in large measure was carrying out the policies advocated by the highways transport committee.

The report presents a summary of Pennsylvania's motor activity. One of the first steps taken by David S. Ludlum, formerly State motors director and now chairman of the Pennsylvania Highways Transport Committee, was a service

registry of 25 per cent of the 300,000 passenger cars of the State, 10 per cent of the registered cars being held available for emergency at all times.

This service has been rendered in all counties for Liberty Loan drives, also in transportation of farm and munition workers and in some instances in moving military bodies. Particularly valuable service was given in transporting nurses, doctors, medical stores and in conveying stricken persons during the influenza epidemic. Trucks equipped as ambulances saved the day in many devastated districts.

## Calendar

### ENGINEERING

Nov. 14-15—New York, Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

### SHOWS

Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.  
Nov. 11-16—Pittsburgh, Pa. Fall Automobile Show, Motor Square Garden. Automobile Association of Pittsburgh.  
Jan. 13-19—Des Moines, Ia. First Tractor Show. Des Moines Thresher & Tractor Club. H. J. Clark, Mgr.

## Limit Garage Construction

WASHINGTON, Nov. 4—Garages, gasoline stations, store buildings and 14 other types of structures were listed yesterday by the War Industries Board as types of non-war construction which can be best postponed until after the war. The list issued includes: Churches, schools, hotels, office buildings, bank buildings, public buildings, moving picture houses, theaters and other amusement places, apartment buildings, water-work improvements, sewerage systems, garages and gasoline stations, sidewalks and park improvements.

## More Cleveland Additions

CLEVELAND, Nov. 4—Although the number of permits issued at the city building department the past week was not long, it contained a few permits for new construction work of considerable size. The Willard Storage Battery Co. took out a permit for a \$50,000 warehouse at 280 East 131st Street. The Lang Body Co. was granted a permit for a \$25,000 one-story factory addition, 16 by 80, at 3100 West 106th Street.

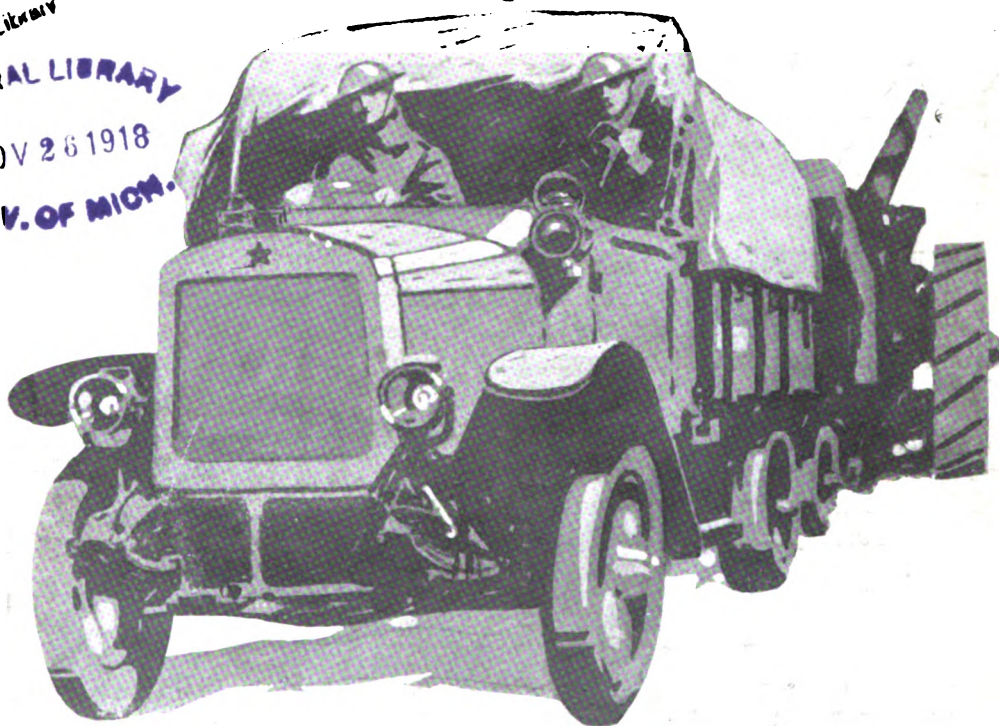
# AUTOMOTIVE INDUSTRIES

*The* AUTOMOBILE

## ATWATER KENT SCIENTIFIC IGNITION

Engineering  
Library

GENERAL LIBRARY  
NOV 26 1918  
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### BETHLEHEM TRUCKS

are equipped with dependable Atwater Kent Ignition.

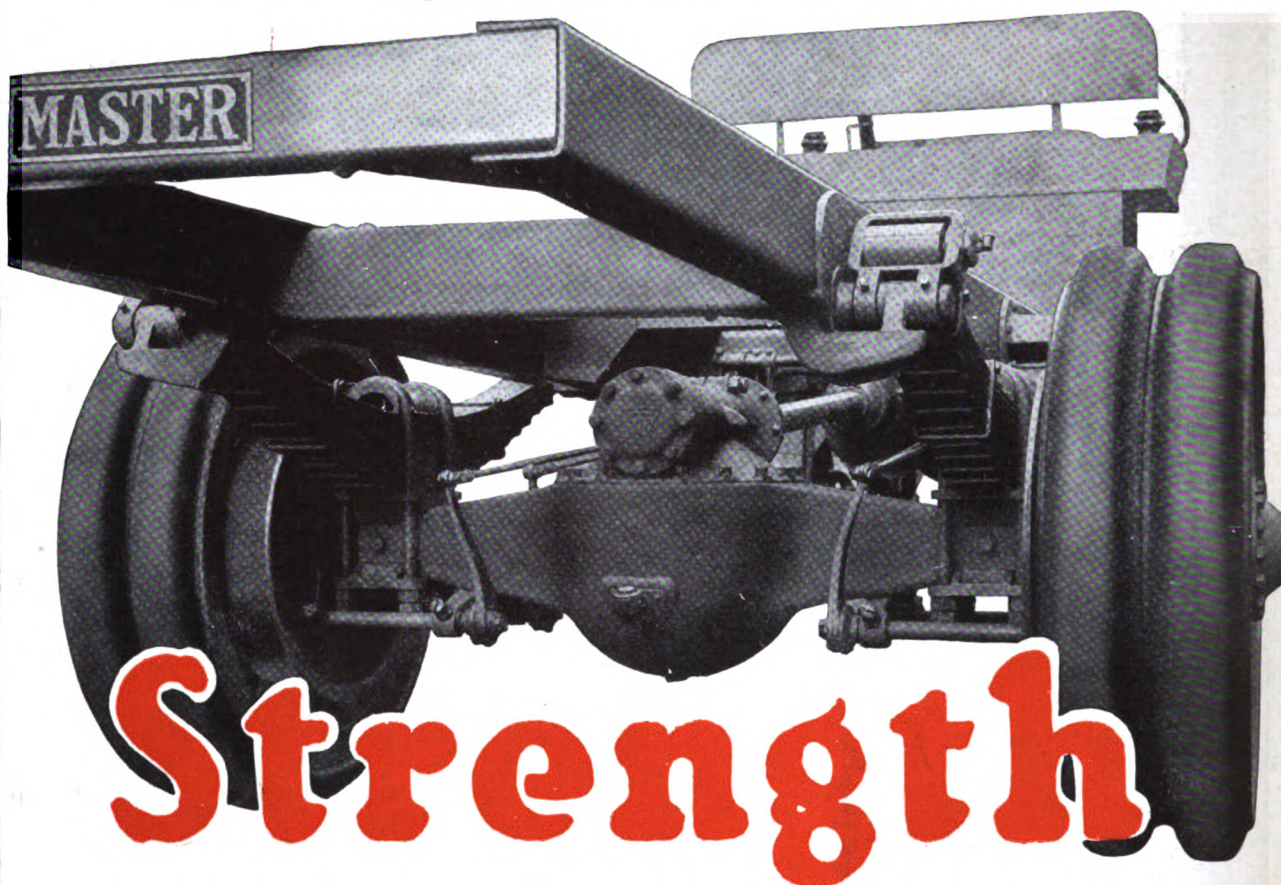
The same big, hot spark at all motor speeds. Will  
replace the magneto on any truck with better ignition.  
Be an Atwater Kent Dealer. Write for literature.

ATWATER KENT MFG. WORKS *Philadelphia*

4938 STENTON AVENUE



# The Thing Behind Master Trucks



**B**EHIND MASTER strength are master study and calculation—a triple alliance of knowledge, truck building experience and financial responsibility unequalled in the truck field.

Our engineers, not satisfied with making a truck "just good enough," determined to build the *best* truck possible to stand up under the *worst* possible road or load conditions.

Extra strength, balanced strength, the super-quality that means service are put into Master Trucks. When you buy these trucks you buy *sure* Transportation Service.

Every detail is scientifically right—every part strong, powerful and permanent. Strength—EXTRA STRENGTH—is the dominant Master quality.

Every Master owner is assured minimum upkeep cost and maximum hauls.

*Full Line—Six Sizes, from 1¼ to 6-Ton*

**MASTER TRUCKS, Inc., 3132-3138 S. Wabash Ave., Chicago**

*Until the War is won, Master Trucks will be sold for service only in essential industries as defined by the War Industries Board*

# MASTER TRUCKS

*Until the War is won, Master Trucks will be sold for service only in essential industries as defined by the War Industries Board*

**Master of the Load on ANY Road**



# AUTOMOTIVE INDUSTRIES

## THE AUTOMOBILE

XXXIX

NEW YORK, THURSDAY, NOVEMBER 14, 1918—CHICAGO

No. 20

## 50% Increase in Production Permitted

War Industries Board Reduces Restriction on Car, Truck and  
Tractor Output One-Half—Truck Makers Released from  
Pledge to Sell Essential Industries and Can Now  
Get Steel for 100% Production

DEMOBILIZATION NOT TO BRING DEMORALIZATION OF LABOR

Demand for War Materials Likely to Continue for Some Time—  
Gradual Disbanding of Army Planned—Makers Calmly  
Prepare for Return to Peace Conditions

**V**ASHINGTON, Nov. 12.—Production restrictions imposed by the War Industries Board have been lifted by 50 per cent insofar as remainder of the year is concerned, and it is expected that with the beginning of the new year restrictions of every nature will be eliminated that normal peace-time industrial activities will resume in full.

Passenger car manufacturers can produce 75 per cent of their total production in the last 7 weeks of 1917 during the last 7 weeks of this year.

Motor truck manufacturers can produce 100 per cent of their production for November and December, 1917, during the last remaining weeks of this year.

Farm tractor manufacturers who produced 100 or more tractors in the year preceding Sept. 30, 1918, can turn out 75 per cent of their production in the year ending Sept. 30, 1919. Farm tractor makers

who produced 10 or more tractors in the year preceding Sept. 30, 1918, can produce not over 100 tractors in the year ending Sept. 30, 1919. Similarly tractor makers who made less than 10 tractors in the year preceding Sept. 30, 1918, can turn out 20 tractors in the year ending Sept. 30, 1919.

Motorcycle manufacturers whose production has been restricted to 75 per cent for the last 4 months of this year compared with that period of 1917 can produce 87½ per cent of the production of the last 7 weeks of 1917 during the remainder of 1918.

Automobile tire production, which was curtailed 50 per cent, can proceed during the remaining weeks of this year at 75 per cent of the output for the corresponding period.

All of those industries which had been curtailed, states the War Industries Board in its announcement, can decrease their curtailment as fixed for the last 4 months of this year by 50 per cent for



the remainder of 1918. This percentage gives the figures stated above as the production figures for the remainder of the year.

For example, passenger car manufacturers were restricted to a production for the last half of 1918 of 25 per cent of the full production of 1917. This meant a production during the last 6 months of 1918 to 50 per cent of the output of the similar period of 1917. Consequently by reducing this curtailment by 50 per cent for the remainder of this year in accordance with the announcement of the War Industries Board there is a production cut of 25 per cent instead of 50 per cent allowing manufacturers to produce on a 75 per cent basis until January 1, 1919.

*All rules, regulations and conservation measures devised by the conservation division of the War Industries Board will be continued in full.* This means that the plans for reducing the numbers of sizes of pneumatic tires, truck tires and farm plows and the elimination of the uses of certain materials in motorcycles will continue.

#### Trucks on 100% Basis

Although trucks are not specially mentioned, the Automotive Section of the War Industries Board announced officially to-day that makers can consider themselves on a 100 per cent basis.

The clauses in the announcement to the effect that wholesale and retail dealers are relieved from their pledges to sell to essential consumers only and that makers are no longer required to obtain pledges from distributors, are said by the Automotive Section of the Board, to place the truck industry on 100 per cent output. The pledges which were given by manufacturers to conform to the allotment provided by the Automotive Section have not been terminated but will be shortly.

These pledges, however, should not stand in the way of 100 per cent production of any maker, said the Automotive Section to-day, as the allotments granted, it was said, were up to and over the 100 per cent production of the 18 months preceding July 1, 1918.

#### Can Supply All Truck Demands

It was pointed out to the representative of AUTOMOTIVE INDUSTRIES that in fixing these allotments where makers had met with adverse conditions in 1917, the production of the first six months of 1918 was used as the basis, and where makers had started in business since July 1, 1918, their facilities for manufacture and the stock on hand of parts and materials were used as a basis.

This arrangement would assure a liberal allotment. According to the reports received on truck production and stock on hand by the Automotive Section, manufacturers will be able to meet all demands for trucks during the remainder of the year.

Such in brief is the latest ruling of the War Industries Board, given to the industrial world immediately following the signing of the armistice with the Central Powers.

Not only is the production of cars, trucks, tractors

and motorcycles permitted to increase by 50 per cent over the previously allowed output, but all restrictions covering the sale of trucks to what have been termed essential industries also are removed, thus permitting makers to sell to capacity to every trade.

The removal of this restriction automatically removes the restriction placed upon steel makers who heretofore have been compelled to furnish steel only for essential uses but who now can sell truck makers all the steel they require.

#### Priority Assistance Assured

Furthermore, the Priorities Division also announces that it will assist all industries insofar as it is possible by means of priorities to secure the materials that will make for normal business, but priorities will be particularly given for the supply of the army and for the production of food, gas, oil, clothing, minerals and for aiding public utilities.

At the same time comes word that all official objection to shows has been withdrawn.

The National Automobile Chamber of Commerce is at present considering the matter of holding the National expositions in New York and Chicago and the sentiment is that if the various manufacturers can prepare sufficient models for them they will be held.

Manager Sam Miles states that it is necessary to take a mail vote of members and that if they are favorable to shows, as they were before the ban was placed on them, they will be held.

In this event, and in view of present conditions it is probable that the Chicago show would be held first, in the Coliseum as usual, with the New York show later and likely in Madison Square Garden.

#### May Continue Shows

Consideration is being given the possibility of holding dealer shows as well. The National Association of Show Managers, representing local exhibitions all over the country, has called an early meeting to be held in Cleveland, at which the question will be threshed out.

The War Industries Board has also removed all restrictions as regards the construction of Federal, State or Municipal highways, roads, bridges, etc., and for the development of mines including oil and gas wells. The order decreasing the amount of curtailment also applies to all agricultural implements, road making machinery, oil and gas consuming devices and all other commodities which have been restricted in output.

Non-war building construction is now allowed to a certain extent and any structures or additions or repairs not costing over \$10,000 can be made without permits while those not costing over \$25,000 can be made if a permit is secured from the State Council of Defense. Any building begun prior to September 3, 1918, and which has substantially developed can be completed without permit.

Dealers in raw materials and semi-finished and finished products are released completely from all of the pledges they have made to the Priorities



Division as regards the sale and distribution of the commodities they handle.

The Revenue Bill which is still in the hands of the Senate Finance Committee, it is now expected in view of the armistice will probably be reduced importantly in part. Nothing definite has been announced as yet, however, as regards the reduction of the contemplated taxes on automobiles, trucks, motorcycles and gasoline.

Thus, the first question of the industrial world as to what resumption of normal industry will be

allowed has been answered promptly by the War Industries Board.

The Fuel Administration up to this time has announced no relaxation from the restrictions it imposed on non-war industries and in fact has stated that no immediate reduction of the Government program for production or conservation of coal or oil during the winter will follow the signing of the armistice terms. Cessation of hostilities will unquestionably relieve the demand for bituminous coal, however.

## Complete Text of War Industries Board Ruling

All of the rules, regulations, restrictions and directions embodied in orders and circulars issued by the Priorities Division of the War Industries Board are continued in effect subject to the following modifications:

### SECTION 1.

Section 5 of revised Circular 21, issued by this division as of date Oct. 15, 1918, dealing with non-war construction is hereby amended so as hereafter to read as follows:

Section 5—Construction projects not requiring permits or licenses from non-war construction section. Construction projects falling within the following classifications are hereby approved, and no permits or licenses will be required therefrom from the non-war construction section.

1—Construction projects approved in writing by the Facilities Division of the War Industries Board.

2—All farm and ranch buildings, structures or improvements.

3—All buildings, structures, roadways, plant facilities or other construction projects of every nature whatsoever, undertaken by the United States Railroad Administration, or by any rail or water transportation company, organization or utility (whether or not under the direction of such administration) or by the American Railway Express Company, or by the owner or operator of any telegraph or telephone line.

4—The construction, maintenance, improvement or development by Federal, State or municipal authorities of highways, roads, boulevards, bridges, streets, parks and playgrounds.

5—The construction, extension, improvement, maintenance or repair of any public utility, including water supply systems, sewer systems, light and power facilities and street and interurban railways.

6—The construction, extension or repair of all irrigation and drainage projects.

7—Construction projects connected with the extension, expansion or development of mines of every character whatsoever or connected with the production and refining of mineral oils and of natural gas.

8—The construction, alteration or extension, or repairs or additions to plants engaged principally in producing, milling, refining, preserving, refrigerating or storing foods and feeds.

9—The construction of new or the alteration or extension of existing schoolhouses, churches, hospitals and Federal, State or municipal buildings involving in the aggregate a cost not exceeding \$25,000.

10—The construction of new buildings or structures not embraced in any of the foregoing classifications, or the repairs or additions to, or alterations or extensions of, existing buildings or structures, in either case involving in the aggregate a cost not exceeding \$10,000.

11—The construction of new buildings or structures not embraced in any of the foregoing classifications, or the repairs or additions to, or alterations or extensions of, existing buildings or structures, in either case involving in the aggregate a cost not exceeding \$25,000; when approved in writing by the State Council of Defense or its duly authorized representatives.

12—Buildings begun prior to Sept. 3, 1918, where a substantial portion of the building has already been constructed.

### Building Material Production

### SECTION 2

All limitations on the production of building materials, including brick, cement, lime, hollow tile and lumber, are hereby removed, and the materials so produced may be sold and de-

livered for use in connection with any building project for which no permit or license is required under Revised Priority Circular 21, as further revised by Section 1 hereof, or to any project authorized by permits or licenses issued in pursuance of said circular. All limitations upon the production or use of lime or crushed or pulverized limestone in any form for agricultural uses are hereby removed.

### SECTION 3

Restrictions upon industries and manufacturers in their production, or in their consumption of materials for commodities hereafter in this section enumerated, as such restrictions are expressed in orders and circulars issued by this division, are hereby so modified that such restrictions for the respective periods provided for in such several orders and circulars shall be less than the restrictions to the extent of 50 per cent of such restrictions. The commodities referred to are as follows:

1—Agricultural implements and farm operating equipment, including tractors.

2—Road machinery.

3—Coal, coke and wood-burning cooking and heating stoves and ranges.

4—Gas ranges, water heaters, room heaters, hot plates and appliances.

5—Oil and gasoline heating and cooking devices.

6—Electrical heating and cooking devices and appliances.

7—Black galvanized and enameled ware and tin plate household utensils.

8—Refrigerators.

9—Ice cream freezers.

10—Washing machines.

11—Clothes wringers.

12—Family sewing machines.

13—Electric vacuum cleaners.

14—Metal beds, cots, couches, bunks and metal springs for same.

15—Boilers and radiators.

16—Baby carriages.

17—Corsets.

18—Bicycles.

19—Electric fans (including motors).

20—Builders' hardware.

21—Padlocks.

22—Stepladders.

23—Scales and balances.

24—Rat and animal traps.

25—Talking machines (including motors and accessories).

26—Talking machine needles.

27—Clock-watches and clocks.

28—Watch movements and watch cases.

29—Hand stamping and marking devices.

30—Safes and vaults.

31—Lawn mowers.

32—Pottery.

33—Pocket knives and similar products.

34—Linoleum.

35—Rag felt floor covering.

36—Sporting goods.

37—Glass bottles and glass jars.

38—Tin plate.

39—Pianos, including piano players, automatic pianos and parts.

40—Pneumatic automobile tires.

41—Passenger automobiles.

42—Cash registers.

Nothing herein contained shall be construed to release any industry or manufacturer from the strict observance of the rules and regulations of the Conservation Division of the War Industries Board as applicable to such industry or manufacturer.

## SECTION 4

Dealers (wholesale and retail) in raw materials, semi-finished and finished products are hereby relieved from the obligation to give and require pledges relating to such commodities, notwithstanding any provision for pledges in any order or circular heretofore issued by the Priorities Division, and notwithstanding any stipulation in any pledge that they will require pledges from those who buy from them for resale; provided, however, building materials and other products shall not be sold and delivered for use in connection with any non-war construction projects save those for which no permit or license is required under priority circular No. 2, as revised by Section 1 hereof, or with the terms of orders and circulars heretofore issued, and comply with all pledges heretofore or hereafter given, save that they are hereby relieved from the provisions in such pledges as require manufacturers to exact pledges from those who buy them for resale.

## SECTION 5

The Priorities Division of the War Industries Board will, as far as practicable, assist industries in procuring materials, fuel, transportation and labor to enable them to increase their operations to normal limits as rapidly as conditions may warrant. Precedence must, however, be given to stimulate and increase the production of cargo ships and supply the requirements of the Army and Navy of the United States, as well as to provide for this nation's proper proportion of the enormous volume of materials, equipment and supplies as have been required for the reconstruction and rehabilitation of the devastated territories of Europe. Precedence must also be given to such activities as will tend to stimulate the production of foods and feeds, of coal, of natural gas, of oil and its products, of textiles and clothing, and of minerals; and to provide for deferred maintenance, additions, betterments, and extensions of railroads, telegraph and telephone lines and other public utilities, and to permit and stimulate the intensive development of inland waterways.

The War Industries Board has advised manufacturers of woolen sweaters and similar articles that the tentative schedule issued by the Conservation Division for the restrictions of the variety of their products would not be put into effect.

# War Work Contracts Not to Be Cut Short

## Pershing's Requirements Likely to Be Heavy for Months—Contracts for Future Production First to Go

By Allen Sinsheimer

**W**HAT will the United States do with unfinished war contracts? The armistice found the War Department totally unprepared for peace, and cablegrams are passing between here and the American Expeditionary Forces constantly this week to determine which war activities must be continued for the present, which can be gradually curtailed and which can cease at once. Conferences are also being held, and it is expected that definite news on this subject will be made public shortly.

Ninety per cent of the war contracts contained cancellation and termination clauses allowing for "termination in the public interest" by which payments will be made by the Government in the event of termination of the contracts for articles completely manufactured at the time and for raw materials, articles in process of manufacture and the contractor's outstanding obligations incurred in good faith in connection with the performance of the contract.

Provision is also made for payment by the Government on account of depreciation of plants and equipment. In return the Government is released from the obligation to take the remaining articles, not manufactured, specified in the contract and to pay anticipated profits to the contractor on the unfinished portions of the contract.

It is expected that all of these contracts which should be terminated in the public interest will be, and that the manufacturers will be satisfied with the decisions of the Board of Contract Adjustment which settles the amounts due the contractors.

In those contracts without cancellation or termination clauses and which the Government may desire to turn back, it is expected that the contractors will also be satisfied with a settlement made on the basis of the provisions contained in those contracts which have termination clauses as stated above.

For a precedent in this matter the Government has the practice which followed the Civil War. At that time the contracts had no cancellation clauses but all were cancelled and contractors were forced to the Court of Claims, at which they met with little success. They have this

same option to-day if they are dissatisfied with the findings of the Board of Contract Adjustment or the Secretary of War, to whom those findings can be appealed.

The delay in curtailment of war activities is caused by the ignorance of the authorities in this country of the desires of General Pershing. The Motor Vehicle Section of the Quartermaster Department anticipates, however, that it will completely cancel the last order for 25,000 B trucks which was placed recently and will take all of the preceding order for 8000 of these trucks, which is now about 50 per cent completed. It is expected that the orders for the A and the AA trucks which were recently started on by the manufacturers will be reduced from 40 to 60 per cent, depending on the needs of the Motor Transport Corps of the A. E. F. The contracts placed with the Packard company for 4000 Military tractors will be recalled. Similarly, the Ordnance Department engaged in tractor production and the Bureau of Aircraft Production which controls the output of airplanes are taking steps to reduce production, but neither of these departments have yet reached definite decisions.

The War Industries Board and the Fuel Administration are both temporary departments created for the duration of the war, and they retain authority until peace is formally proclaimed. •

At present a committee appointed by President Wilson is investigating conditions to ascertain whether these departments should be continued by congressional legislation following the declaration of peace, or whether they should be merged with the respective established Government bureaus, the Fuel Administration, for example, merging with the Department of the Interior, or if a reconstruction committee should be formed to take over the work of these departments or if possibly the Council of National Defense which is a permanent department can assume the more important functions which they give up with the relinquishment of their authority.

The War Trade Board, which is also a temporary department and which may delegate its work to the Department of Commerce, announces that for the present the control exercised over imports and exports will con-

tinue indefinitely to assure shipping space for the constant flow of supplies for the American and Allied forces which will be required for many months to come and to prevent the flooding of the United States with foreign orders which would strip this country of its immediate available commodities and which would come with any lifting of the present embargoes.

In view of the permanency of the Council of National Defense, which department was created prior to the war and, by the bill creating it, can continue after, it is expected that the Highways Transport Committee which is a part of the Council will be continued and will operate on a broader scope than heretofore, working particularly with the Food Administration and the United States Shipping Board, developing roads to facilitate food production and distribution and its delivery to the ships for overseas consumption.

#### Work for All

The Motor Transport Corps also recently organized in the army is expected to continue with increasing importance for the time being, as the overseas forces will operate their motor vehicles widely as heretofore and the M. T. C. controlling operations and maintenance will continue this work. The Motor Vehicle Section of the Quartermaster Department, purchasing motor vehicles, will likely discontinue or be reduced importantly as soon as the production and procurement of the remaining vehicles necessary for the army is completed.

Plans for control of labor following demobilization include a scheme for "demobilization for peace as we mobilized for war." This means that the men to be first re-

leased from the army will be those who are the heads of families or who are skilled workers necessary to peace time industries.

It is also planned to use the Department of Labor Community Boards to bring employers and workers in contact.

"It is clear that there is work enough," said Secretary of War Baker to-day, "in the United States for all the labor in the country. Many Government activities like the ship building industry will continue uninterruptedly and others will gradually be readjusted."

It was further stated that there should be no fear of keen competition and surplus of labor caused by the demobilization because these men will be distributed to their own localities and can thus be quickly assimilated by local industries.

Manufacturers who have been in Washington in the past few days state that they are trying to retain as much of their war work as possible until they can gradually change their equipment from a war to a peace basis and thus by the continuing operations hold their labor organizations together and be ready for large peace production when all conditions allow it.

The work of reclaiming the vast amounts of materials and supplies in plants will be carried out by the War Department in co-operation with the War Industries Board. A considerable part of the material, including particularly motor vehicles, will be disposed of abroad, while those remaining will be brought back to the United States. The Belgian Government is negotiating now for the purchase of American Army trucks and automobiles in France.

## No Labor Flood Expected with Demobilization

### Army to Be Released Not Faster Than Places Open for Men—Europe Will Have Enormous Labor Demand

THERE is no idea in industry that an overnight change will have to be made from war to peace work. Under the direction of a wise government which fully realizes the problems of labor and materials involved in shifting from one kind of manufacturing to another, it is confidently expected that changes will be so gradual that no chaos will result. Manufacturers will immediately start work to secure peace business. They will begin to build up their sales organizations, which have been depleted since war compelled an abandonment of peace production.

One of the fears which has been expressed frequently but which on careful analysis appears absolutely groundless, is that the country will be flooded with labor due to the demobilization of the army. There is a pent-up demand for labor in such fields as building and a great many others which have been temporarily classified as non-essential from a war standpoint.

This demand alone will absorb all of the army which can possibly be released during the coming nine or ten months. The Labor, War and Navy Departments and the War Industries Board are determined not to disband the army any more rapidly than employers find places for the men. The War Industries Board has sent questionnaires to employers in all industries asking the needs of each for men and in other ways is seeking to secure an accurate knowledge of labor demand.

It is very probable that the War Department will take advantage of the machinery used in the draft to assist in systematic demobilization. In fact, it has already been suggested that General Crowder be put in charge of the task of preserving the proper labor balance during demobilization operations. It must not be forgotten that a considerable army will have to be maintained in France or elsewhere in Europe pending final peace negotiations, and the great work of policing and reconstruction.

Andre Tardieu, General Commissioner for Franco-American war affairs, has already appealed to the United States for aid in rebuilding France. This is only a first suggestion of the fact that in spite of the vast armies which will be demobilized, the world will be short of manpower to undo the damage of the past four years. France alone has lost 2,500,000 men. In other words, 1/15 of her population is missing at the very time when all her resources are necessary for rebuilding, and these men who are lost represent the youngest and strongest of the nation.

The war expenditure of France, 120,000,000,000 Francs, is a heavy burden on the shoulders of this nation. Unhappily, the territories which have been invaded were the wealthiest of France, and although in area they did not exceed 6 per cent of the total country, they paid 25 per cent of the total taxes. There have been 350,000



homes destroyed, and it will require 600,000,000 days of work to rebuild them, without considering the inside furnishing.

Some knowledge of the need for farm tractors and other mechanical implements in France to take the place of what has been lost, may be gained from the fact that 454,000 machines and carts of an agricultural nature have been destroyed. The loss in horses and cattle amounts to over 1,500,000. These items have a valuation of approximately \$1,200,000,000.

The valuation of other industrial material from the invaded region as compared with the total resources of

France may be gained from the figures of 1913, when it amounted to 94 per cent of the total divided as follows: Flax for spinning, 90 per cent; iron ore, 90 per cent; pig iron, 83 per cent; steel, 70 per cent; sugar, 70 per cent; cotton, 60 per cent; coal, 55 per cent; electric power, 45 per cent. Of all this, the plants, machinery, mines and so forth have been totally destroyed.

To reconstruct over 2,000,000 tons of pig iron and nearly 4,000,000 tons of steel alone will be required. The raw material alone required to build up what has been destroyed will total \$10,000,000,000. France needs America's help in this.

## Makers Plan Return To Peace Basis

### Demand For War Materials Will Continue Some Time—Few Cancellations for Future Deliveries

**D**ETROIT, Nov. 12—Detroit automobile manufacturers are not greatly concerned over switching back from war production to peace-time outputs. While every company expects cancellations from Washington, the various officials do not believe these will come all at one time.

The consensus of opinion among the automobile men is that war-time production will go on unabated for a time and that when the allied governments see what turn things are going to take in Europe preparation will be made for the cutting out of war work. This will be tapered off in a manner that will permit the manufacturers to change over gradually to production of passenger and commercial vehicles.

#### Few Cancellations Received

Not a single company, as far as is known at this time, has received a cancellation from Washington, except on far distant future deliveries. An order was received and put into effect about 10 days ago cutting out all overtime work in the plants and building operations where plant extensions for war work were being made.

The manufacturers are a unit in the belief that no industrial depression will occur during the time the industry is getting back to normal. With the great demand for cars and trucks that is bound to come they figure their shops will be working full time and at top speed at an early date after peace is concluded.

#### Await Government Action

Future plans for the automobile industry will depend entirely on the action of the Government, according to C. D. Hastings, vice-president of the Hupp Motor Car Corp. Hupp production of war materials is going on as usual, the only changes ordered by the Government being elimination of overtime work and cessation of all building operations on plant extension.

"Whatever we hear now is only gossip," said Mr. Hastings, "for the officials in Washington, I do not believe, know just what will be done as yet. There have been a great many contracts cancelled, but in our opinion war work will be cut down gradually to allow for the change over to automobile manufacturing. With cancellation of war contracts spread over a fair period of time there should be no industrial depression.

"Our company could begin the manufacture of automobiles to-morrow, if permitted to do so. Going back to production of motor cars will depend entirely on what the Government allows us in the way of materials, and I do not think there will be much of a change before Janu-

ary 1. It is likely we will know shortly after the beginning of the New Year what is to be done."

The Ford Motor Co., which is perhaps doing more war work than any other automobile company, is going ahead with the production of war materials. F. L. Klingensmith, treasurer, said: "We are going right on with all our war business. Our production is just as great this week as last, and until the Government instructs us to cease manufacturing we will go on as usual."

#### Maxwell Continues Production

"There has been no stoppage in our production as yet," said Walter E. Flanders, of the Maxwell Motor Co., Inc. "We will have to do whatever the Government tells us, but as yet we have had no instructions. Cutting out war contracts now would force us to lay off all our factory employees. It is too early yet to tell what will happen."

No cancellations of war contracts have been received to date by the Paige-Detroit Motor Car Co., H. M. Jewett, president, announces. The Government cannot afford to cancel all contracts simultaneously, Mr. Jewett says, for the reason that chaos would result instantly.

"War production will be reduced gradually," Mr. Jewett asserted, "and in this way the industries will be kept busy and materials already on hand can be used up. Otherwise these materials would be a tremendous loss to the Government. All the trucks and tractors now in France and those in the process of manufacture will be needed in the reconstruction work in northern France and Belgium. This will leave a great demand for the same machines in this country, so that the various companies will go quickly into large production at the earliest possible moment.

#### Depend Upon Supplies

"We are building automobiles now and plan to gradually increase our output, according to the availability of steel and other supplies. I believe all the manufacturers doing war work will follow a similar plan and thereby get quickly back to peace-time production. The steel now going into war equipment will be sufficient to take care of car and truck production.

"An enormous building program has been held up on account of the war and this will have to be taken care of. It means the employment of thousands of men and the use of a large amount of material. We look for everything to run as smoothly as though there had never been a change in manufacturing."

# Extracts from Von Richthofen's Diary

Famous German "Ace" Was Credited with Having  
Shot Down Eighty-Two British and French  
Airplanes—He Commanded the Famous  
"Flying Circus"

## PART I

**EDITOR'S NOTE.**—Rittmeister Freiherr Manfred von Richthofen was considered the greatest pilot of the German army. He accounted for eighty-two enemy machines before meeting his death at the hands of a British airman in May, 1918.

On his body was found a personal letter from the German army commander of the Somme area urging him to lead his squadron for at least one reconnaissance despite the fact that British aerial superiority had become so evident that scouting was attended by almost insuperable difficulties. He was buried by his enemies with full military honors as a gallant fighter and a worthy antagonist.

### My First Solo-Flight

THERE are some moments in one's life which tickle one's nerves particularly, and the first solo-flight is among them. One evening my teacher, Zeumer, said: "Now go and fly by yourself." I must candidly confess that I felt like replying, "I am afraid," but this is the word which should never be used by a man who defends his country, therefore, whether I liked it or not, I had to swallow it and get into the machine. Zeumer explained to me once more every movement in theory.

I scarcely listened to his explanation, for I was firmly convinced that I should forget half he was telling me. I started the machine. The aeroplane went the prescribed speed, and I noticed when I had left the ground. After all, I did not feel timorous, but rather elated. Now I did not care for anything. I would not have been frightened whatever had happened. Scorning death, I made a large turn to the left, stopped the engine near a tree, exactly where I had been ordered to do so, and looked forward to what would happen. Now came the most difficult thing, the landing. I remembered exactly the movements I had to make. I acted mechanically and the machine moved quite differently from what I had expected. I lost my balance, made some wrong movements, turned a cartwheel on hitting the ground, and succeeded in converting my machine into a battered mess of wreckage. I was very sad, looked at the damage I had done to the machine, and had to suffer from other people's jokes.

### I Leave Russia for France

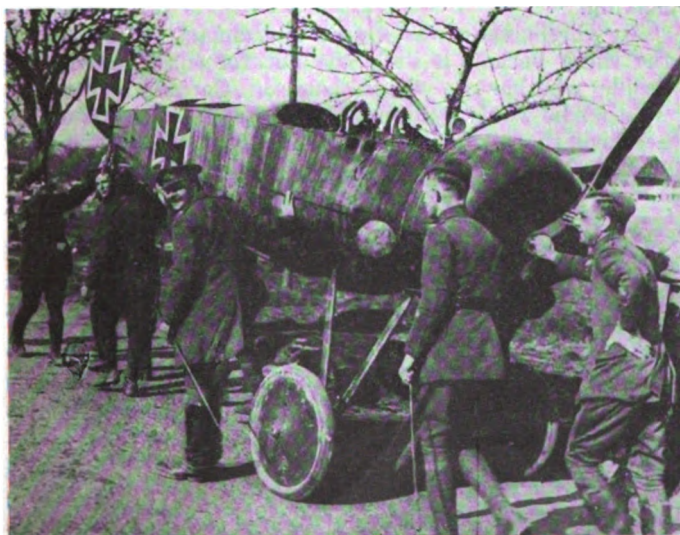
The August sun was almost unbearably hot on the sandy flying ground at Kovel. While we were chatting among ourselves one of my comrades said: "To-day the great Boelcke is coming on a visit to us, or rather to his brother!" In the evening the great man duly arrived. He was vastly admired by all, and he told us many interesting things about his journey to Turkey. He was just returning from Turkey, and was on the way to Headquarters. He imagined that he would go to the Somme to continue his work. He was to organize a fighting squadron. He was empowered to select from the Flying Service those men who seemed to him particularly qualified for his purpose.

I did not dare to ask him to be taken on. I did not feel bored by the fighting in Russia. On the contrary, we made extensive and interesting flights. We bombed the Russians at their stations. Still, the idea of fighting again on the Western Front attracted me. There is nothing finer for a young cavalry officer than the chase in the air.

The next morning Boelcke was to leave us. Quite early somebody knocked at my door, and before me stood the great man with the "Ordre pour le Mérite." I knew him, as I have previously mentioned, but still I had never imagined that he came to look me up in order to ask me



CAPTAIN BARON VON RICHTHOFEN



This Fokker triplane is supposed to be the machine which von Richthofen was using when brought down by a single bullet through the heart





*A German photograph showing the end of Immelmann, one of their star airmen. He had a long list of victories*

to become his pupil. I almost fell on his neck when he inquired whether I cared to go with him to the Somme.

Three days later I sat in the railway train and traveled through the whole of Germany straight away to the new field of my activity. At last my greatest wish was fulfilled. From now onward began the finest time of my life.

At that time I did not dare to hope that I should be as successful as I have been. When I left my quarters in the East a good friend of mine called out after me: "See that you do not come back without the 'Ordre pour le Mérite.'"

#### [Major Hawker

I was extremely proud when one fine day I was informed that the aviator whom I had brought down on the 23rd of November, 1916, was Major Hawker, the English Immelmann.

In view of the character of our fight, it was clear to me that I had been tackling a flying champion.

One day I was blithely flying to give chase when I noticed three Englishmen who also had apparently gone a-hunting. I noticed that they were interested in my direction, and as I felt much inclination to have a fight I did not want to disappoint them.

I was flying at a lower altitude. Consequently I had to wait until one of my English friends tried to drop on me. After a short while he came sailing along and wanted to tackle me in the rear. After firing five shots he had to stop, for I had swerved in a sharp curve.

The Englishman tried to catch me up in the rear while I tried to get behind him. So we circled round and round like madmen after one another at an altitude of about 10,000 feet.

First we circled twenty times to the left, and then thirty times to the right. Each tried to get behind and above the other.

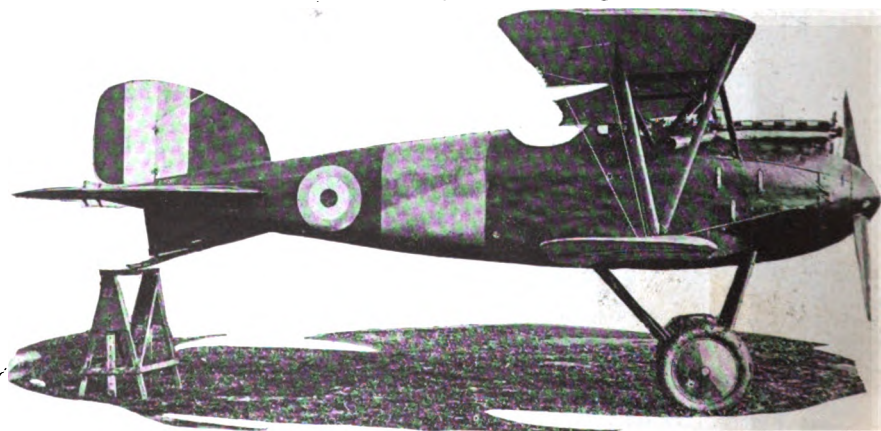
Soon I discovered that I was not

meeting a beginner. He had not the slightest intention to break off the fight. He was traveling in a box which turned beautifully. However, my packing case was better at climbing than his. But I succeeded at last in getting above and beyond my English waltzing partner.

When we had got down to about 6000 feet without having achieved anything particular, my opponent ought to have discovered that it was time for him to take his leave. The wind was favorable to me, for it drove us more and more toward the German position. At last we were above Bapaume, about half a mile behind the German front. The gallant fellow was full of pluck, and when we had got down to about 3000 feet he merrily waved to me as if he would say, Well, how do you do?

The circles which we made around one another were so narrow that their diameter was probably no more than 250 or 300 feet. I had time to take a good look at my opponent. I looked down into his carriage and could see every movement of his head. If he had not had his cap on I would have noticed what kind of a face he was making.

My Englishman was a good sportsman, but by and by the thing became a little too hot for him. He had to decide whether he would land on German ground or whether he would fly back to the English lines. Of course he tried the latter, after having endeavored in vain to



*A German Albatross of the latest single-seater scouting type. This machine was brought down by a British airman*



escape me by loopings and such tricks. At that time his first bullets were flying around me, for so far neither of us had been able to do any shooting.

When he had come down to about 300 feet he tried to escape by flying in a zig-zag course, which makes it difficult for an observer on the ground to shoot. That was my most favorable moment. I followed him at an altitude of from 250 to 150 feet, firing all the time. The Englishman could not help falling. But the jamming of my gun nearly robbed me of my success.

My opponent fell, shot through the head, 150 feet behind our lines. His machine-gun was dug out of the ground and it ornaments the entrance of my dwelling.

### I Get the "Ordre Pour le Merite"

I had brought down my sixteenth victim, and I had come to the head of the list of all the flying chasers. I had obtained the aim which I had set myself. In the previous years I had said in fun to my friend Lyncke, when we were trained together, and when he asked me: "What is your object? What will you obtain by flying?" "I would like to be the first of the chasers. That must be very nice." That I should succeed in this I did not believe myself. Other people also did not expect my success. Boelcke is supposed to have said, not to me personally—I have only heard the report—when asked: "Which of the fellows is likely to become a good chaser?" "That is the man!" pointing his finger in my direction.

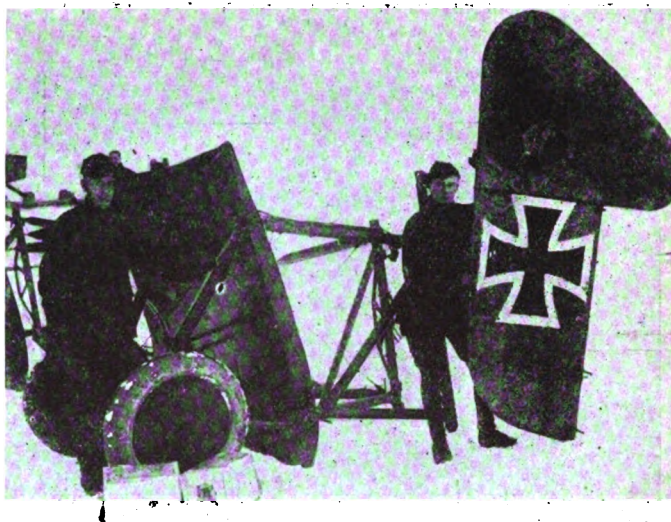
Boelcke and Immelmann were given the Ordre Pour le Mérite when they had brought down their eighth aeroplane. I had downed twice that number. The question was, What would happen to me? I was very curious. It was rumored that I was to be given command of a chasing squadron.

One fine day a telegram arrived which stated: "Lieutenant von Richthofen is appointed Commander of the Eleventh Chasing Squadron."

I must say I was annoyed. I had learned to work so well with my comrades of Boelcke's Squadron, and now I had to begin all over again working hand in hand with different people. It was a beastly nuisance. Besides, I should have preferred the Ordre Pour le Mérite.

Two days later, when we were sitting sociably together, we men of the Boelcke's Squadron, celebrating my departure, a telegram from Headquarters arrived. It stated that His Majesty had graciously condescended to give me the Ordre Pour le Mérite. Of course my joy was tremendous. It was balm on my wound.

I had never imagined that it would be so delightful to command a chasing squadron. Even in my dreams I



*Tail of one of the newest Friedbrichafner machines. The relative size can be gaged from the man who is holding it*

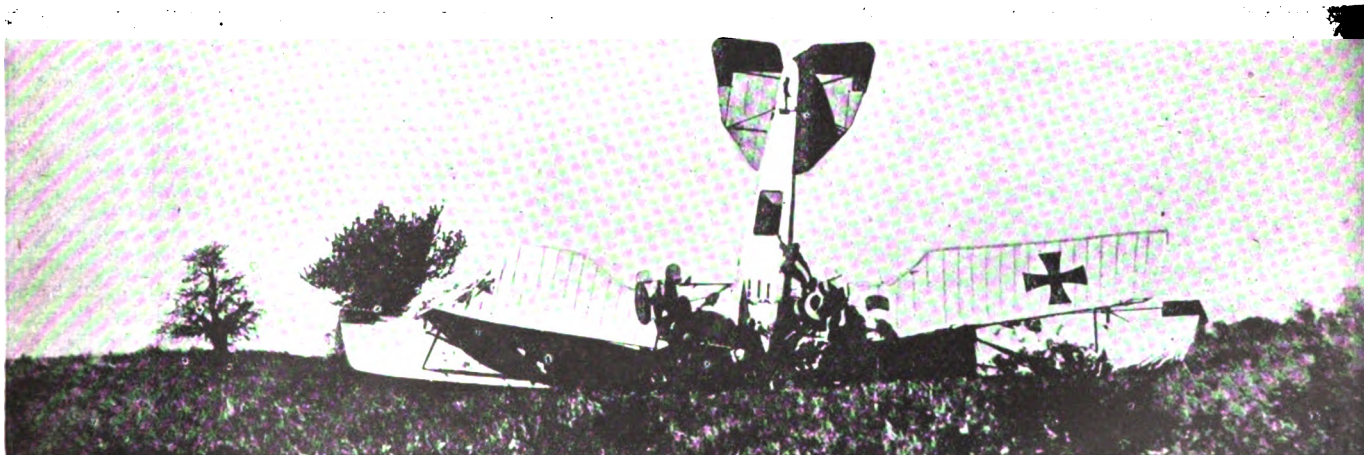
had not imagined that there would ever be a von Richthofen's squadron of aeroplanes.

### English and French Flying\* (February, 1917)

I was trying to compete with Boelcke's squadron. Every evening we compared our bags. However, Boelcke's pupils are smart rascals. I cannot get ahead of them. The utmost one can do is to draw level with them. The Boelcke stäffel has an advantage over my people of 100 aeroplanes downed. I must allow them to retain it. Everything depends on whether we have for opponents those French tricksters or those daring fellows the English. I prefer the English. Frequently the daring of the latter can only be described as stupidity. In their eyes it may be pluck and bravery.

The great thing in air fighting is that the decisive factor does not lie in trick flying, but solely in the personal ability and energy of the aviator. A flying man may be able to loop and do all the tricks imaginable, and yet he may not succeed in shooting down a single enemy.

\*This was evidently written when the French air service, although equipped with machines which were the best available at the time, were handicapped somewhat in comparison with that of the Germans. Conditions were very different later on, as has been evidenced by France's practical domination of the air.



*A German plane shot down behind the British lines. The panel seen in the fuselage is used by the gunner in the event of an attack from below*





*A machine of unknown type brought down by British fliers on the Italian front. It struck the ground with such violence that the undercarriage was torn off and the wings collapsed*

In my opinion the aggressive spirit is everything, and that spirit is very strong in us Germans. Hence we shall always retain the domination of the air.

The French have a different character. They like to set traps and to attack their opponents unawares. That cannot easily be done in the air. Only a beginner can be caught, and one cannot set traps, because an aeroplane cannot hide itself. The invisible aeroplane has not yet been discovered. Sometimes, however, the Gallic blood asserts itself. The Frenchmen will then attack. But the French attacking spirit is like bottled lemonade. It lacks tenacity.

In Englishmen, on the other hand, one notices that they are of Germanic blood. Sportsmen easily take to flying, but Englishmen see in flying nothing but a sport. They take a perfect delight in looping the loop, flying on their back, and indulging in other tricks for the benefit of our soldiers in the trenches. All these tricks may impress people who attend a sports meeting, but the public at the battle front is not as appreciative of these things. It demands higher qualifications than trick flying. Therefore, the blood of English pilots will have to flow in streams.

#### My Record Day

The weather was glorious. We were ready for starting. I had for visitor a gentleman who had never seen a fight in the air or anything resembling it, and he had just assured me that it would tremendously interest him to witness an aerial battle.

We climbed into our packing cases, and laughed much about him. Friend Schäfer thought that we might give him some fun. We placed him before a telescope and off we went.

The day began well. We had scarcely gone to an altitude of 6000 ft. when an English patrol of five machines was coming our way. We attacked them by a rush, as if we were cavalry, and the hostile squadron lay destroyed on the ground. None of our men were even wounded. Of our enemies three had plunged to the ground and two had come down in flames.

The good fellow down below was not a little surprised. He had imagined that the affair would look quite different, that it would be far more dramatic. He thought the whole encounter had looked quite harmless until suddenly some machines came falling down looking like rockets. I have gradually become accustomed to seeing machines falling down, but I must say it impressed me very deeply when I saw my first Englishman fall, and I have often seen the event again in my dreams.

As the day had begun so propitiously, we sat down and had a decent breakfast. Of course, all of us were as hungry as wolves. In the meantime our machines were again made ready for starting. Fresh cartridges were got and then we went off again.

In the evening we were able to send off the proud report: "Six German machines have destroyed thirteen hostile aeroplanes."

Boelcke's squadron had only once been able to make a similar report. At that time we had shot down eight machines. To-day one of us had brought low four of his opponents. The hero was a Lieutenant Wolff, a delicate-looking little fellow, in whom nobody could have suspected a redoubtable hero. My brother had destroyed two, Schäfer two, Festner two, and I three.

We went to bed in the evening tremendously proud, but also terribly tired. On the following day we read with noisy approval about our deeds of the previous day in the official communiqué. On the next day we downed eight hostile machines.

A very amusing thing occurred. One of the Englishmen whom we had shot down, and whom we had made a prisoner, was talking to us. Of course, he inquired after the red aeroplane. It is not unknown even among the troops in the trenches, and is called by them "le diable rouge." In the squadron to which he belonged there was a rumor that the red machine was occupied by a girl, by a kind of Jeanne d'Arc. He was intensely surprised when I assured him that the supposed girl was standing in front of him. He did not intend to make a joke. He was actually convinced that only a girl could sit in the extravagantly painted machine.

(To be concluded)

# Heider Friction Drive Tractor

Made in Two Sizes with Ratings of 9-16 and 12-20 Hp.—Engine Slides Back and Forth in Making Changes of Speed—Fiber-Faced Wheel Is Driving Member, Which Obviates Formation of Flat Spots

**T**HE outstanding feature of the Heider tractor, manufactured by the Rock Island Plow Co., Rock Island, Ill., is its friction drive, which enables a considerable number of tractor speeds and belt speeds to be obtained without the use of shifting gears. In the Heider the usual order of things in friction drives is reversed in that the fiber wheel is the driving member and the metal disks are the driven members, there being one disk for the forward speeds and one for the reverse. This arrangement overcomes the chief objection which has been made to the friction drive in the past, namely, that if the vehicle gets stalled and the drive slips it takes only a short time when a flat spot is worn on the friction wheel, and the drive is then very jerky in operation.

Another advantage of this arrangement of the drive is that when the tractor is pulling hard, and consequently the most power has to be transmitted, the fiber wheel engages the disk close to the outside rim, giving the best leverage and generally the best conditions of operation.

## Waukesha Engine Used

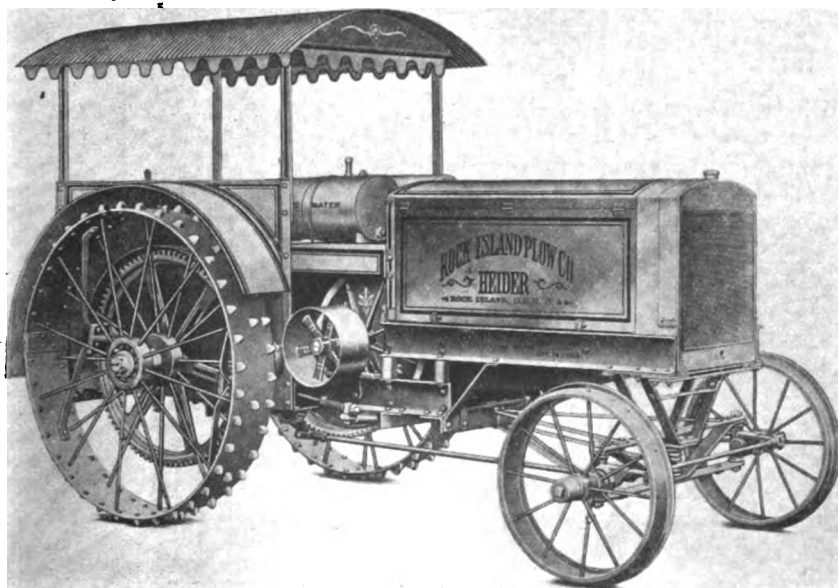
The Heider is made in two models, one having a 9-16 hp. rating and the other a 12-20. Both models are equipped with Waukesha engines. The 12-20, which is the model specially dealt with in this article, has a 4-cylinder engine of 4½ in. bore by 6¾ in. stroke. As the Waukesha engine is well known to our readers it is not necessary here to go into details of its construction. It has cylinders of the L-head type and is designed to burn either gasoline or kerosene. Lubrication of the engine is by the splash system. The engine is arranged longitudinally at the forward end of the frame and instead of being mounted rigidly on the frame is placed in guides so that it can be slid forward and back in order to obtain variations in gear reduction. The cooling system has a capacity of 9½ gal. A 22 in. fan is mounted back of the radiator at the forward end of the engine space and is driven by a 1½ in. flat belt.

The fuel problem has been handled somewhat differently on the Heider than it is usually handled. Considerable supplies of both gasoline and kerosene may be carried, and the operator can use whichever fuel he considers best suited under the particular working conditions. There are two cylindrical fuel tanks mounted longitudinally in the cab. Each tank has a capacity of 14 gal. One of the tanks is designed to hold only kerosene, while the other tank has two compartments, one for gasoline and the other for water, each compartment having a capacity of 7 gal. The water is fed to the engine when kerosene is used as fuel in order to prevent pre-ignition and knocking. The water feed can be controlled from the cab. Air is drawn in through a Bennett dust separator.

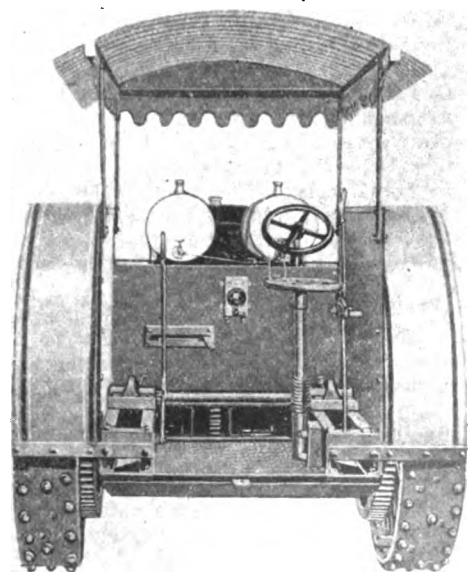
Beneath the carbureter, which is accessibly located, there are two large inspection plates in the crankcase, which can be readily removed when it is desired to get at the bearings. The lower half of the crankcase also can be readily removed, and this gives access to the main and connecting-rod bearings for inspection and adjustment. The pistons and connecting-rods can be taken out at the bottom without removing the crankshaft.

Ignition is by a Dixie magneto with starter coupling. As the engine is arranged to be slid lengthwise on the frame in making changes of speed, all of its accessories are carried on the engine so that they slide with it. This applies even to the spark, throttle and water control levers, which are mounted on a wooden bar extending back through an opening in the dashboard.

The friction wheel is integral with the flywheel of the engine and has a facing of fiber. The two driven friction disks are mounted on opposite sides of the flywheel close to the frame side members. These disks are 26 in. in diameter, while the wheel is of 20 in. diameter. When the tractor is at rest, the two friction disks are out of contact with the friction wheel. They are brought into contact with the rim of the wheel by axial displacement of the shaft on which the friction disks are mounted. Moving this shaft to the left brings the

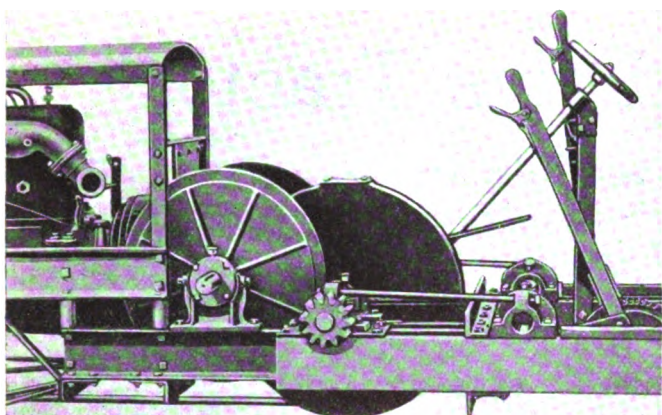


The Heider 12-22 tractor with canopy top



A view in the operator's cab





Side view of friction drive and inclosed gears

right hand disk in contact with the wheel and gives forward motion, whereas moving the shaft to the right brings the left hand disk in contact with the wheel and gives the reverse speed. The pressure necessary for moving the shaft and placing wheel and disk in contact is transmitted to the shaft through a ball bearing thrust cage carried by the shaft. This shaft is carried in self-aligning ball bearings at both ends, these ball bearings taking the radial load only. From the shaft carrying the two friction disks the power is transmitted through a spur pinion and large spur gear to the differential shaft. This pair of spur gears is inclosed in a cast iron housing and operates in a bath of oil. The ends of the differential shaft carry the bull pinions that mesh with the bull gears on the driving wheels. The pinions are cut and hardened, while the large gear wheels are cast. By means of the friction drive a speed range of 1 to 4 m.p.h. is obtainable, in seven steps. The normal plowing speed is  $2\frac{1}{2}$  m.p.h.

The belt drive is also taken through the friction wheel and the right hand disk. When it is desired to do belt work the spur pinion on the friction disk shaft is slipped out of mesh with its gear. To this end it is provided with a grooved extension with which a shifting fork engages, and the pinion is shifted by means of a lever in the driver's cab.

#### Details of Heider

The frame of the Heider 12-20 is built up of 6-in. channels. The front axle is of the built-up type and has a coiled spring at the center through which the forward end of the frame is supported on it. The axle, of course, is steadied by means of radius rods extending to a cross member of the frame at about midlength. Steering is effected by means of a hand wheel in the cab which operates through a worm and worm wheel and a link and lever connection to the steering knuckles at the ends of the front axle. The front axle is swiveled on a ball joint at the center so that the running gear of the tractor can accommodate itself to uneven ground.

The frame is slung under the rear axle, giving a low-hung construction and unusual stability. This low construction is of particular importance in connection with orchard cultivation, for which work the canopy is removed.

The seat is mounted on a vertical post with a coiled cushioning spring on it. In the rear view of the tractor, showing the inside of the cab, will be seen a substantial horizontally movable lever extending through the dashboard, by means of which the driving pinion can be shifted in and out of mesh. To the right of the steering post is the lever by means of which

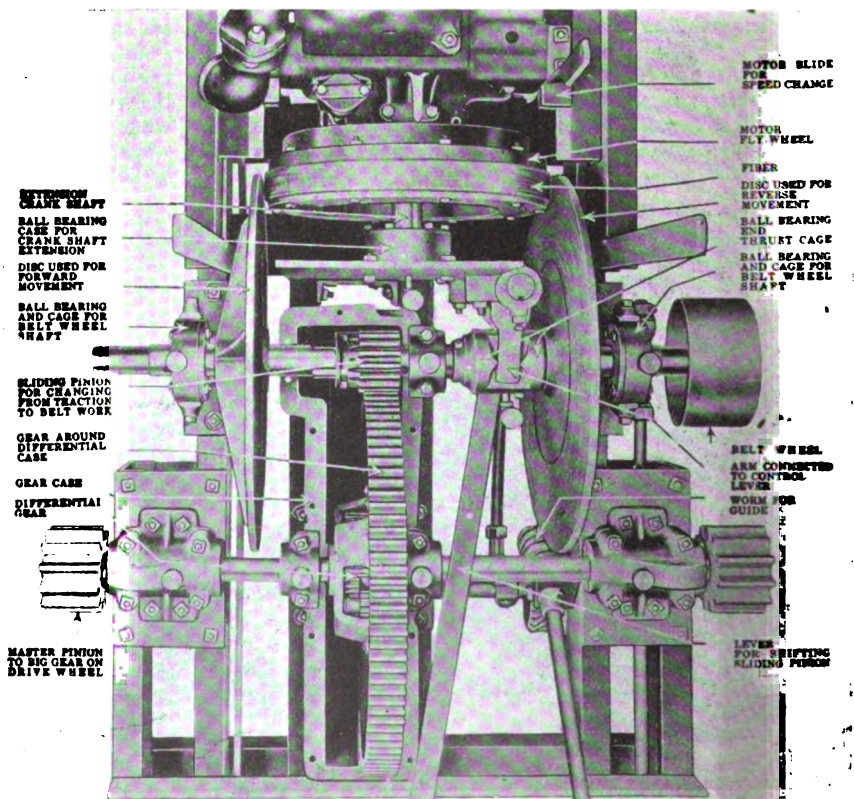
one or the other of the friction disks is forced in contact with the friction wheel and to the left of the steering post is another lever, for sliding the engine forward or back to vary the speed reduction, which moves on a quadrant with seven notches. There are no pedals, as the tractor has neither clutch nor brake, the reversing disk being used also for braking purposes. It is claimed that the machine can be thrown from high speed into reverse instantly without danger of injury.

#### Wheel Equipment

The wheels are ordinarily furnished with small pyramidal lugs and large cone lugs. For unusual soil conditions the company can furnish extension rims and also angle cleats, these being extras. However, the use of neither one nor the other of these is advised unless actually called for by the conditions, as both consume power.

The 12-20 model has a wheelbase of 96 in. The rear wheels are 57 in. in diameter and 10 in. wide, while the front wheels are 30 in. in diameter and 5 in. wide. The belt pulley is 14 in. in diameter and has a 7 in. face, and by means of the friction drive it is possible to obtain pulley speeds varying all the way from 100 to 800 r.p.m. The drawbar is so arranged that the hitch is 19 in. from the ground; it swings laterally and has a range of adjustment of 24 in. There is a sheet metal gear guard over the top half of each bull gear and a mud guard over the top half of each driving wheel. The sides of the cab join the mud guards. A corrugated sheet metal top over the seat is supported on four uprights. The weight of the Heider 12-20 tractor complete is 6000 lb.

AS in the case of the standard Brinell machine, there are limitations to all ball hardness testers. In those cases in which the metal is extremely hard a permanent deformation of the ball results. Where the test specimen is soft, the ball penetrates so closely to the supporting surface or anvil that the hardness of the latter affects the results. Small narrow specimens of hard steel crack under test and soft narrow ones permit of an easy lateral flow which affects the accuracy of the test. Fortunately, with the exception of thin pieces such as sheets, none of the above cases are so extremely common as to materially curtail the use of the Brinell machine.



Plan of friction and gear drive

# Paige-Detroit Brings Out 2-Ton Truck

assembled of Standard Parts and Will Sell for \$2,950—Body Designs to Be Extended on Completion of Government Contract

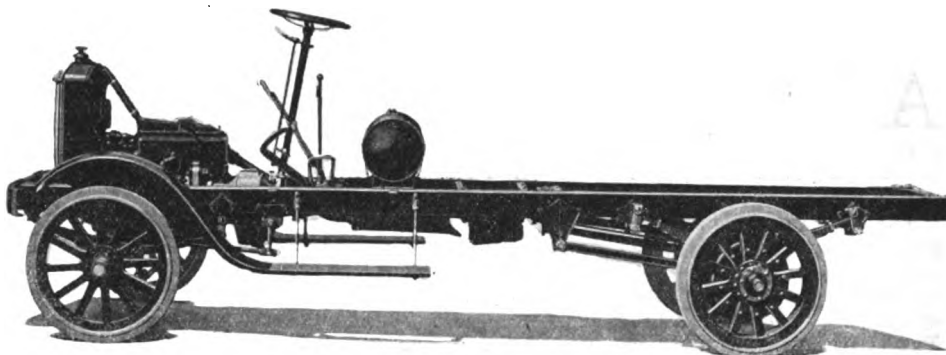
The Paige-Detroit Motor Car Co. now on the market with its new 2-ton truck. This truck has been under development for some time and is now assembled model mounted on a chassis of 150 in. The Paige company has been building, during the last few months, on Government order a number of trucks for overseas. The 2-ton model is the first effort of the concern to market commercial trucks of this capacity and marks the entrance into the commercial vehicle field of another of the big list of passenger car concerns which have previously confined their efforts to that field.

A limited number of the new Paige truck will be distributed. As soon as the company can meet its Government obligation it will increase its production of this model and will widen the scope of body design in order to take advantage of various fields of transportation.

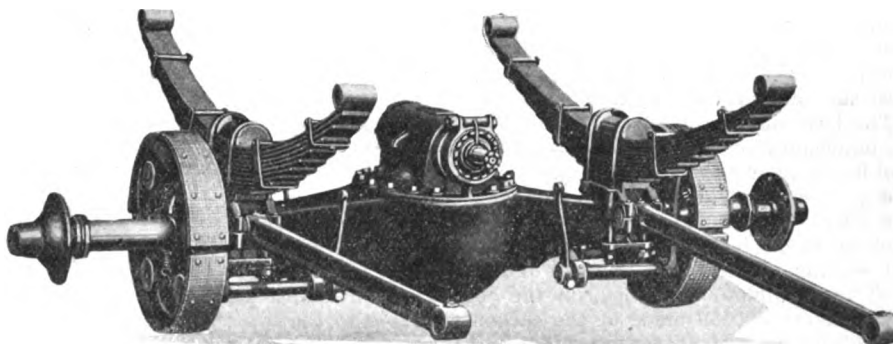
The chassis sells for \$2,950. It is rated at 2 tons capacity. The frame is made up of pressed steel on a semi-truck design. The truck is mounted on tires 36 x 4 front and 36 x 7 rear. The wheels are wood with spokes.

The units composing the chassis are a product of well-known concerns in the parts field, the engine being a Continental, the gears Timken, the carburetor a Stromberg, the governor a Bosch, the ignition Bosch and the remaining list in keeping. The power plant is a unit type, the Continental engine being a 4-cylinder 4 1/4 x 5 1/4, with the cylinders cast together. The valves are on the right side. Water circulation is used for cooling, the pump being centrifugal type and the radiator a spiral finned tube. The timing is set spark and no starting or lighting system is provided. The carburetor is a Stromberg, 1 1/4 in. size, fed by a fuel tank.

The drive is delivered from the engine through a dry multiple disk clutch having twelve plates. The gearset is selective



Side view of Paige 2-ton truck chassis



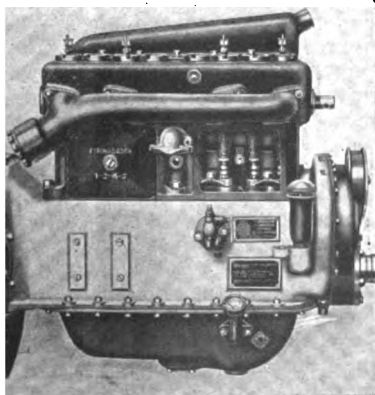
Rear axle with springs and radius rods

sliding, located amidship, while the final drive is through a worm gear. The total reduction in high gear is 8 1/2 to 1 and in low gear 34 to 1.

A Timken worm-driven type of rear axle is employed, mounted on Timken roller bearings throughout. The front axle is also a Timken design, with full Timken bearings. The brakes are on the rear wheels, the bands being 3 1/2 by 1/4 in. material.

THE British National Committee of the International Aircraft Standardization Board has been constituted and has taken temporary offices at the headquarters of the British Engineering Standards Committee. The National Committee is under the chairmanship of Sir Arthur Duckham.

National committees are also being formed in America, Canada, France and Italy. The constitution of the International Commission has been agreed upon and approved, and the Inter-Allied Conference held in London last March is to be considered as the first meeting of the Commission, the second meeting, which will be held in London, being scheduled for the beginning of October next. During the war the Ministry is to be consulted regarding the nomination of British delegates, and after the war any other nation desiring to join the International Commission, according to the statutes, "may do so subject to the approval of the Commission."



Continental engine of Paige truck



Inclosed driver's cab

# Tests of Benzol as Motor Fuel

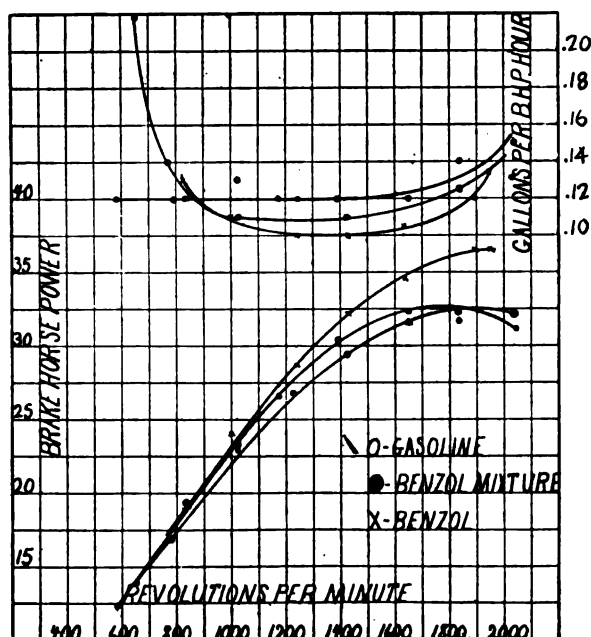
Increased Maximum Engine Horsepower and Reduced Fuel Consumption per Horsepower-Hour Shown by Trials Conducted by Automobile Club of America

AT the request of the Barrett company, New York, the Technical Committee of the Automobile Club of America conducted a series of tests with benzol and a benzol-gasoline mixture as fuel for internal combustion engines, and for the purpose of comparison all of the runs were also made on gasoline.

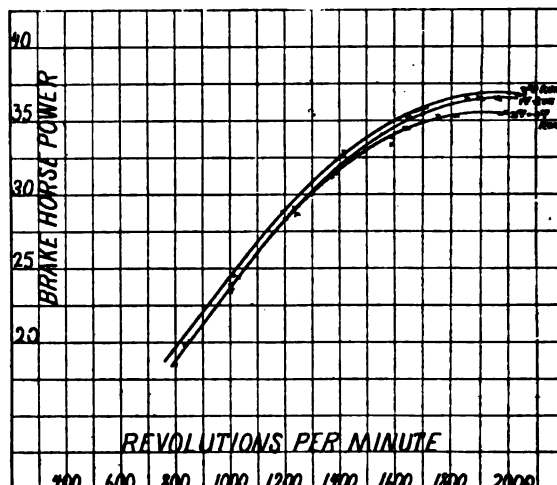
The tests were conducted with a 4-cylinder Continental engine of 3½ in. bore by 5 in. stroke, direct-connected to an electric cradle dynamometer. The engine was equipped with a Stromberg carbureter, Bosch DU-4 magneto and Titan AC spark plugs, the points of which were set 0.015 in. apart. The brake horsepower developed at different speeds between 600 and 2000 r.p.m. was determined when the engine was being run on gasoline, then with a mixture of three-quarters benzol and one-quarter gasoline, and finally with straight benzol. A run of several hours' duration at approximately 1000 r.p.m. was also made successively on gasoline, benzol, and the mixture of the two. All of these tests were made with the throttle valve wide open.

The first run was made on gasoline and the results of the hp. determinations are plotted in Fig. 1. In the same illustration is also shown the fuel consumption at the different speeds. The engine was next allowed to run for 6½ hours at an average speed of 1064 r.p.m., during which run it developed an average of 24 b.hp. and consumed 19.1 gal. of fuel or 2.94 gal. per hour. This is at the rate of 0.122 gal. per hp.-hr.

At the completion of this run the engine was dismantled and a determination made of the carbon adhering to the top of the pistons, which amounted to 1.8 grams. After the engine was assembled again and fresh oil was put into the crankcase, the carbureter adjustment was changed to give a leaner mixture, and the time of ignition was shifted so that the mixture fired 12 deg. after top dead center instead of on the dead center as in the previous run. The engine was



Horsepower and consumption curves for three different fuels



Results of three horsepower runs on benzol

then run on the benzol-gasoline mixture for a determination of the hp. and fuel consumption curves. From the results plotted in Fig. 1 it will be seen that below 1000 r.p.m. there was no appreciable difference in the power developed with the gasoline and with the benzol-gasoline mixture respectively. Above this speed the mixture gave slightly less power, but between 1820 and 2000 r.p.m. the power was greater than with gasoline. A decrease in the fuel consumption was observed above 880 r.p.m., as compared with the run on gasoline, the greatest decrease occurring between 1100 and 1400 r.p.m.

After the horsepower determinations were completed the engine was run for 4½ hr. at an average speed of 1066 r.p.m., during which time it developed an average of 26.6 b.hp. and consumed 13 gal. of fuel. During this run the consumption was at the rate of 2.89 gal. per hr. or 0.109 gal. per brake hp.-hr. This is a decrease of 10.7 per cent from the run on gasoline. It is stated in the report that the engine ran more uniformly during this test than during the test with gasoline and appeared to labor less.

An examination of the engine after this run showed less carbon on the pistons; in fact, if it had not been for a small amount of oil carbon around the edges of two of the cylinders there would not have been enough carbon to weigh.

After the engine had been cleaned and reassembled, four horsepower runs were made on straight benzol. The results of all four runs are plotted in Fig. 2, while the curve plotted in Fig. 1 as obtained with benzol gives the results of the first run. This curve shows an increase in the power developed by the engine with benzol over that produced with either gasoline or the benzol-gasoline mixture throughout the whole speed range. A great deal more power was obtained with benzol than with gasoline, especially at the higher speeds, the increase amounting to 18 per cent at 2000 r.p.m., 9.3 per cent at 1400 r.p.m. and 2 per cent at 800 r.p.m. The fuel consumption which is plotted on the same sheet indicates a decided decrease as compared with gasoline between 930 and 1800 r.p.m. Above the latter speed the decrease becomes less and less, and below 930 r.p.m. the fuel consumption rapidly increased.

Next the engine was run for a period of 4½ hr. on benzol  
(Continued on page 845)



# Labor Representatives Lack Sufficient Power

Confidence Between Employer and Employee Difficult Because Their Representatives Cannot Obligate the General Body to Any Definite Line of Action

By Harry Tipper

"THE third essential, therefore, that I would postulate is that both employers and employed should be efficiently organized in order that industrial problems may receive a broader and more statesmanlike consideration. In many ways Labor is more efficiently organized than Capital, but there are indications of a fatal defect in some Labor organizations, which, if not corrected, may well prove their undoing. I refer to the tendency on the part of the rank and file to refuse powers to their leaders, and to throw over agreements that they have negotiated. It is not characteristic of democracy, but of mob rule, that every agreement should be subject to ratification by a plebiscite, for collective bargaining and even collective negotiation becomes impossible unless the representatives on each side are endowed with authority."—W. L. HICHENS, *Chairman Cammell, Laird & Co., Ltd.*

THE defect in labor organization which Mr. Hichens refers to has been very much in evidence in the war period. The large majority of strikes which have occurred in this period have been carried out by local bodies of workers against the express wish of the general leaders of the organizations and in direct contravention of agreements made by those leaders in the names of the organizations involved.

## When Labor Agreed

When the labor shortage was not so acute and the only prospect of securing a greater share of the remuneration was through the strength of a general organization, the worker was willing to abide by the dictates of the general body to that extent, although even under those conditions there are plenty of instances of the disregard of agreements made by the representatives of labor.

Under the war shortage of man-power for industry, the possibilities of securing greater pay have been sufficiently alluring to particular sets of workmen in individual localities to induce them to strike against their own agreements and against their

direct responsibilities to their own organization constitution.

There is little doubt that the efficiency and character of the labor organizations has been weakened by this decrease in the power of the regularly constituted representatives and the elected authorities.

In political matters it would be impossible to have any orderly government if the whole body of the people were to pass upon every individual action of its representatives and change their decision at will; and this would be equally impossible if groups of the people were to disregard the obligations incurred by their representatives and act against such obligations and outside their agreed constitution.

There is some danger that we have not thoroughly learned this lesson even in political matters.

It is sure that any collective bargaining, which is to leave industry in a stable condition to pursue its normal functions of production and distribution, must be made between men who are capable of obligating the bodies of which they are the accredited representatives.

There is a feeling of lack of confidence in the conferences and discussions between employers and labor organizations at the present time, due in part to the lack of power held by the representatives in many cases and the impossibility of their obligating the general body of labor to any given line of action.

## No Value in Separate Action

If this tendency to separate action continues on the part of groups within the labor organization, as it has been observed during the war period, then the occupational labor organization as it is at present constituted will be without any value for the purpose of decision of industrial relations.

The reason for this lack of power and this partial disintegration of the labor organization is fundamental. The question of wages and conditions of work is an immediate and local one. The amount

paid in a distant shop under different conditions is of little importance.

The real problem lies in the position of the worker in his individual shop and in his individual locality.

Were it not for the constant migration of labor and the disregard of labor necessities by the employer, the place of the occupational labor organization would be still weaker, and in that respect the comment upon the situation in Great Britain is very significant, especially so when it is recorded that the labor unions in that country are very strong and in the key industries comprise a majority of the workers.

These questions of responsibility and decision, which have arisen out of the tendency to "mob rule" in labor organization, especially exhibited during war time, give the employer greater opportunity to institute a different method of collective bargaining in his own organization, which promises greater benefits to the workman and a greater measure of responsibility in agreement, as well as a more important incentive to stability of labor and lessened turnover.

### Two Points to Observe

In this connection there are two points to be observed in the results of the experiment recorded in last week's *AUTOMOTIVE INDUSTRIES*, which indicate the character of agreement between employer and employee when considering the matter for the benefit of their local necessities.

It will be remembered that the organization in this particular plant consisted of a body composed of representatives of the workmen, a similar body composed of the salaried executives of the company, a joint conference body between these two, and a final approving body consisting of the officers of the corporation.

It will also be noted that this experiment has been operating for a period of 3 years, or sufficiently long for some basis of understanding to be reached between the different bodies and some degree of confidence to be established.

Without this latter point the results would be of little value, because the real value of such organization cannot be determined until sufficient time has elapsed for a considerable degree of personal acquaintance and confidence to be established.

It will be remembered that the representatives of the workers brought up the question of wage increases at frequent intervals during the last period covered by the report, in common with workers all over the country.

At first these increases had been paid arbitrarily as increases in wage scales. Later, however, the organization of salaried representatives, although feeling that temporary increases should be established, did not feel that the scale should be increased when the scale of prices upon which it was based might recede and make the wage disproportionate and a burden upon the business.

As a final conclusion of the conference between this body and the representatives of the workers, it was agreed to increase the pay by a separate

amount corresponding to the cost of living, to be given in separate envelopes, to be called cost-of-living bonus and to be based monthly upon Bradstreet's index scale.

This is the first time in the records which the writer has examined during a long study of the subject that the wage scale has been based, definitely, upon a cost-of-living basis and allowed to fluctuate at monthly intervals upon that basis.

It is a fundamental change, because it allows the amount of the wage to be variable while the base upon which it is calculated is fixed and understood.

Such a system could never have been put in motion by an employer without involving him in serious labor trouble and perhaps ruining his organization. It could never have come out of the discussions between industrial groups and occupational labor organizations as generally constituted, for the plan would have had no opportunity to be studied.

It came, however, out of the intimate discussions by men who had become thoroughly acquainted, who were interested in the same plant, the same local conditions and the same organization, and it is far in advance—as an experiment in wage calculation—of anything so far recorded.

Of course one successful record, even though it does involve an attempt at wage-making based upon something more than a trade, is not sufficient to indicate a solution; but it does add another to the tendencies which indicate possibilities of solution in the frank and firm tackling of the problem by giving the worker of the individual organization a hand in the decision as regards his own condition, this to be accomplished through permanent machinery which permits the growth of acquaintance and confidence that must be the forerunner of any successful decisions.

A number of such experiments are being established and an article in the near future will be devoted to the analysis of a recent plan.

### Hall-Scott Completes Tests of Twelve-Cylinder Engine

**I**NCORPORATING many of the features of the six-cylinder Hall-Scott engine, together with some new ones, the new A-8 twelve-cylinder airplane engine has just been given its final test at the West Berkeley, Cal., plant of the Hall-Scott Motor Car Co.

The A-8 type engine has a horsepower rating in excess of 450 and a weight of less than 900 pounds. It is stated that the first block tests, late in July, had to be stopped after the engine was placed on the stand, gradually warmed up and run, because it was evident that the power developed was too great for the testing stand. A special one is being built, and a dynamometer of 600 hp. rating has been sent for, on which the final test will be completed. The engine is fitted with a four-blade propeller.

Its twelve cylinders are of 5 in. by 7 in. bore and stroke and are of the pressed steel jacketed type, similar to those which are used in the construction of the Liberty engine. Standardized gears are used throughout, and with the cylinders are made interchangeable with 4, 6 and 8-cylinder engines of the A-5, A-7 and L-6a types of Hall-Scott motor.

We are informed by representatives of the Hall-Scott company that this A-8 twelve-cylinder engine was completed and ready for its preliminary tests May 1, 1917, and had been placed on the testing block, when Col. E. J. Hall, now of the Aviation Service, its designer, was called to Washington.

# The Willard Tractor Battery

Comprises Extra Heavy Plates and Thread Rubber Insulators in Thick Walled Rubber Jars—Battery Supported on Rubber Bumpers and Coiled Springs Are Inserted in the Hold-Down Rods

THE present year has witnessed the advent of electrical starting and lighting equipment on tractors. The successful application of this equipment on automobiles and trucks during recent years developed a new branch in the manufacture of electrical apparatus for this service. The success of this system lies fundamentally in the fact that it is possible to store enough energy from an electric generator at a low rate of charge and have it available at high rates of discharge to start any size of internal combustion engine. This is accomplished by the use of the lead-acid type of storage battery.

Tractor engineers and manufacturers were at first dubious as to whether or not a storage battery would stand the severe service to which it would be subjected if placed on a tractor. The storage battery manufacturer met this situation, however, by developing a new type of battery for tractor service. This battery was built more substantially mechanically and insulated with the threaded rubber insulation instead of wood separators.

During the present year, two large tractor manufacturers used electrical apparatus with a storage battery as regular equipment of their tractors. The next year will witness many more applications of this system.

## Supported on Rubber Cushions

The accompanying illustration shows the new type of tractor battery and mounting as recommended by the Willard Storage Battery Co. of Cleveland, Ohio. Although this battery was developed to withstand the severest vibrations, it is mounted on rubber bumpers, as shown, as an extra precaution. A small coiled spring is placed in the hold-down member over the handles of the battery to take the slight rebound of the battery mounted on these cushions. Formerly, wherever the vibration was severe, such as in truck service, the storage battery was mounted in a cradle supported by four helical springs. All experimental tests on

this new bumper mounting and also service conditions are said to show the new mounting of the battery to be superior in every way to any spring suspension that has been devised.

In the manufacture of the battery, plates 11/64 in. thick are used. These plates are insulated with heavy threaded rubber insulators, the type of insulation that replaced the wood separators on many of the batteries used on automobiles and trucks during the past two years. The material used in the manufacture of the hard rubber jar is required to meet the severest specifications of tensile strength and percentage of elongation. The thickness of these jars has been increased 50 per cent over that used in the automobile type of storage battery. The case containing the cells is made of extra heavy hardwood, the sides being fastened together by means of two long bolts between the cells of the battery.

## Tested on Jarring Board

In the development of this tractor battery a bumping platform was used to give the battery the severest vibration test. The battery was fastened to this platform rigidly without the use of rubber cushions or spring suspensions. A four-point cam arrangement dropped this platform on a solid anvil at a rate of 560 vibrations per minute. In a test of 30 hours' duration the battery was subjected to approximately one million bumps. It was necessary for the battery to withstand this test without any failure before the final construction was approved as satisfactory. Subsequently some of these batteries were tested by doubling the length of time to 60 hours; the battery withstood this test also without failure.

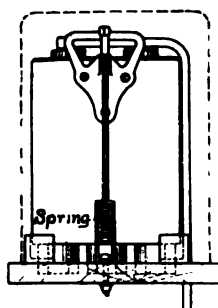
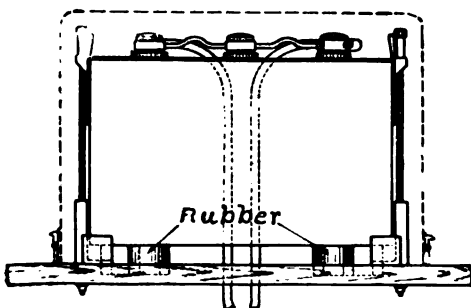
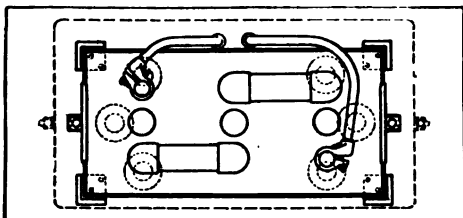
As a result of these tests and also the excellent service given on heavy duty trucks, the Willard Storage Battery Co. recommends the application of this battery for all truck and tractor service:

## Book Review

*Electrical Equipment of the Motor Car*, by David Penn Moreton and Darwin S. Hatch. Published by U. P. C. Book Co., 243-249 West Thirty-ninth Street, New York. 506 pages; 4 1/4 x 7 in. Price, \$2.50.

The volume under review is a reprint of a series of articles which appeared in *Motor Age* of Chicago during the past year. It covers the whole field of electrical equipment, including lighting, starting, ignition, signalling, gear shifting and transmission apparatus, and was written specially for the benefit of the automobile owner and repairman. A great deal of space is devoted to the principles of electricity which are explained with the aid of hydraulic analogies. Magnetism and electromagnetic induction are dealt with equally extensively and next the principles of generators and motors are taken up. There are also chapters on switches, electric lamps and electrical instruments. Following the section on starting and lighting comes that on ignition, which comprises five chapters, one treating of the subject in general, one being devoted to magnetos, another to battery-generator ignition, another to spark plugs and the last to ignition wiring and timing. The two concluding chapters of the book relate to electric signals and accessories and to electric gearshifts and transmissions respectively.

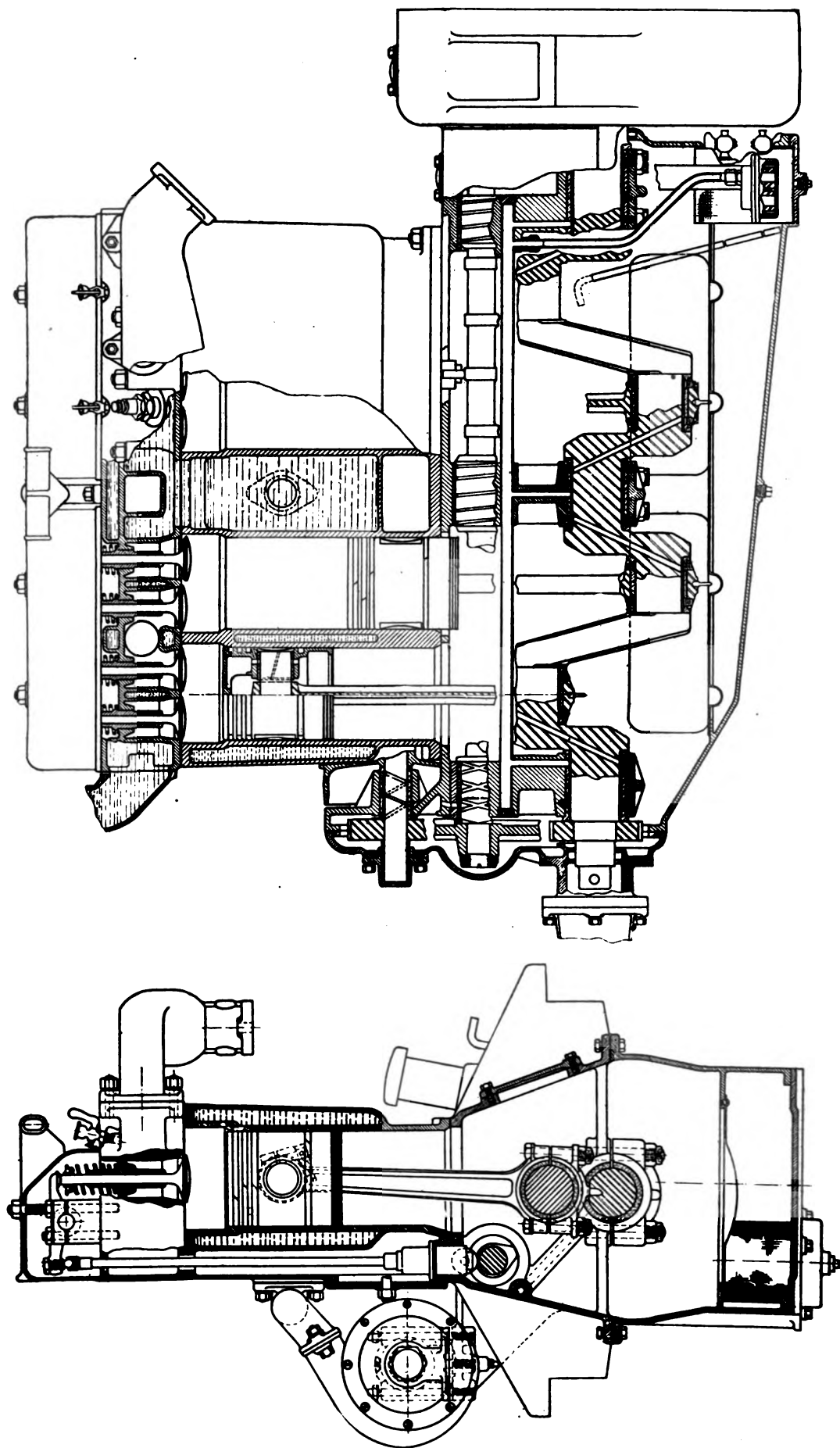
The treatment of the subject is of an easily understood character and the text is well illustrated.



Three views of Willard tractor battery mounted on rubber bumpers



## Sectional Views of Beaver Tractor Engine



*This engine is made in two four-cylinder models,  $4\frac{1}{2}$  x 6 in. and  $4\frac{3}{4}$  x 6 in. respectively. The right-hand view is specially drawn to bring out features of the cooling and lubricating systems*

# Beaver Kerosene Tractor Engines

Of the Valve-in-Head Type—Made in Two Sizes, of 4½ and 4¾-In. Bore Respectively, and in Unit Power Plant and Independent Types

**T**HERE are two sizes of the Beaver four-cylinder tractor engines, both of which are very much alike, there being only a difference of ¼ in. in the cylinder bore, and all parts of the two engines with the exception of the cylinder block, pistons, piston rings, and piston pins, are identical. There is also a slight difference in the length of the push rods, as the larger bore engine requires a somewhat greater compression space and its cylinder block is ¼ in. higher than the other. One of the engines has 4½ x 6 in. cylinders and the other 4¾ x 6.

The four cylinders are cast in a block, and each is fully surrounded by water. The cylinder heads, which contain the valves, are removable, and a copper-asbestos gasket is placed between the cylinder block and the head casting.

The pistons are of conventional design, with three rings above the piston bosses and one below. The piston pins are clamped tight in the connecting-rods, and rock in bronze bushings in the piston bosses.

The crankcase consists of two iron castings which are joined in a horizontal plane through the crankshaft axis. The engine is made in two types, one with bell housing and the other without, to meet the different requirements of customers. The bell housing type is practically always made with provisions for three-point support, two arms being cast on the bell housing and a turned hub provided centrally at the forward end of the crankcase for support on a cross member of the frame. On the other hand, engines without the bell housing are ordinarily furnished with four supporting arms on the upper half of the crankcase, as shown in the cross-sectional view.

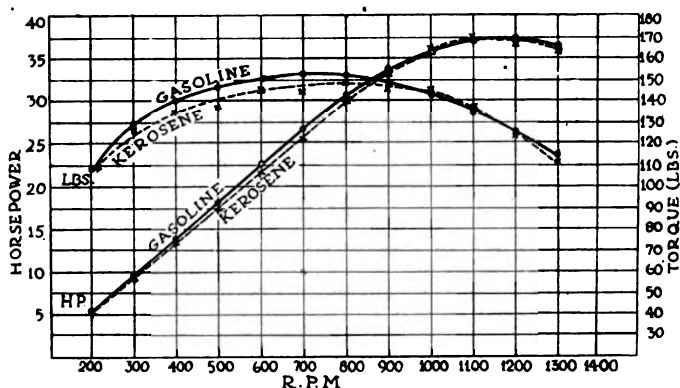
## Crankcase Design Varies

In some designs the lower half of the crankcase is provided with a removable bottom plate, and after this plate has been taken off, the sheet steel splash basin can be taken out through the opening in the bottom of the case, in order to be able to get at the bearings. In the bell housing design, however, the bottom of the crankcase lower half is made integral and hand holes with cover plates are provided on either side, through which the main and connecting-rod bearings can be adjusted.

A crankshaft of very rugged design is used. It is of the usual medium carbon steel drop forged type, with three supporting bearings. The dimensions of these bearings (front to rear) are as follows: 2¾ x 3½, 2¾ x 3½, and 2¾ x 4½ in. The crankpin bearings are 2¾ x 2¾ in. and the piston pin is 1½ in. in diameter. The camshaft also is supported in three bearings, the dimensions of which are as follows (front to rear): 1¾ x 3, 2½ x 3½, and 2 x 2 5/16 in. At the forward end of the camshaft there is a very heavy bushing, and the design is such that the whole camshaft with its integral cams can be withdrawn from the engine through the forward end.

The camshaft journals are cut with helical grooves which tend to distribute the oil and to clean the bearings. The main and connecting-rod bearings are of the bronze-backed, babbitt lined type, while the camshaft bearings are bronze bushed. The camshaft driving pinion, and the accessories shaft gear are made of steel, while the camshaft gear is of cast iron. Woodruff keys are used to fasten these different gears to their shafts.

Beaver engines are designed to burn kerosene, and are provided with special vaporizing manifolds in which the inlet manifold is completely surrounded by the exhaust manifold. The engines are of the low-compression type, as desirable for burning kerosene, and the interior surfaces of the combustion



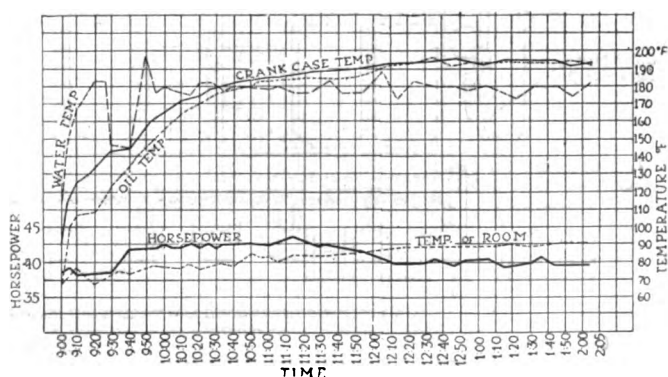
Horsepower and torque curves of 4½ x 6 in. engine

chambers are completely machined. The valve seats and spark plug bosses are entirely surrounded by water. The valves are made of as large a diameter as can be gotten into the cylinder heads, and have a lift of ¾ in. In order to reduce the frictional losses within the engine the cylinders are offset ½ in. from the crankshaft axis. A magneto bracket is provided, and usually a magneto is used for ignition, but in case it is desired to fit a generator and use battery ignition the generator can be mounted on the magneto bracket.

The valves are operated through the intermediary of tappet rods extending up the sides of the cylinders and rock levers on top of the cylinder heads. The cam followers are of the roller type, and their stems are made hollow for the sake of lightness. There is a screw adjustment with ball and socket joint at the upper end of the tappet rod. The rock levers rock on a stationary shaft which is clamped between pillow blocks and caps, and are provided with bronze bushings. The entire valve mechanism on top of the cylinder head is inclosed by cast iron housing, held in place by some of the studs which serve to fasten the pillow blocks to the cylinder head.

Lubrication is by force feed to the main and crankpin bearings, with additional oil feed by splash. There is a gear type oil pump in the lowest part of the oil well, at the flywheel end. This pump is driven from the rear end of the camshaft through helical gears. From the pump the oil is forced through a distributing pipe cast in the upper half of the crankcase and through branch drill holes therefrom to the main bearings, and from the latter it passes through the drilled crankshaft to

(Continued on page 862)



Record of 5-hr. endurance test on full open throttle at 900 r.p.m.

# Maybach 300-Hp. Aircraft Engine

Lubricating System—Details of the Oil Pumps, of Which Three Are Used—Cooling and Ignition Systems—Carbureter and Fuel Feed System

## Part III

**S**EVERAL details of the lubrication system have been completely redesigned in the new Maybach engines. The former single oil pump, which was of the plunger type, has now been replaced by three separate oil pumps of the gear type. These, as shown in Fig. 1, are fitted in the bottom of the base chamber. The main oil-pressure pump is at the rear end, while the two scavenger pumps are situated one at each end of the base chamber.

The general principle of the lubrication system is here clearly shown in the special diagrammatic drawing, Fig. 19, which is to a great extent self-explanatory. In this diagram the lubrication system is shown with all the oil pipes and oil-ways marked in black. The system briefly described is as follows: Oil is delivered from the separate oil tank by the pressure oil pump, which is the rearmost pump of the two at the rear of the sump, and forces oil under pressure to the crankshaft journal bearings through an external oil main, which runs the whole length of the crankcase on the induction side, as shown in Fig. 20.

From this main oil pipe oil is forced to the journal bearings through oil ways drilled diagonally in the crank chamber casting through the transverse webs which support the housings of the journal bearings; these are lubricated by a wide helical oil groove cut in the bearing white metal. For the lubrication of the crank pins and the connecting-rod small-end bearings, the well-known Maybach system of centrifugal pressure lubrication is adhered to. In this system the oil, which is forced out through the ends of the journal bearings, is collected by the oil scoops, which are bolted to the outer sides of each crank web, as shown in the view of the crankshaft already referred to.

By centrifugal action the oil is forced up the outer surface of each crank web and led through a channel into the hollow crank pins, thence through a small hole bored radially in each crank pin to the connecting-rod big-end bearings. From the big-end bearings the oil is forced upward to the small-end bearings, with their floating piston pin bushes of cast-iron, through the steel pipe fixed in the center of the connecting-

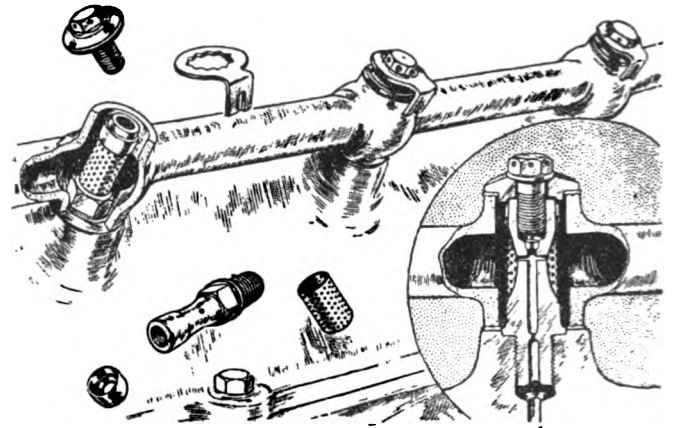


Fig. 20—Sketches of oil distributing pipe outside crankcase

rods. Details of this design have already been given. Fig. 18 is a detail sketch of one of the aluminum oil scoops, which are bolted in pairs to the crank webs by a bolt which passes through the center of the end crank pin. From the front end of the main oil pipe a steel pipe is connected by a union, which leads to a hole drilled in the crankcase casting, and serves to lubricate the bearings of the camshaft intermediate gears. A restricting plug is fitted into the end of this oil lead, and a similar restriction is provided in the end of the main leading back into the crank chamber, as shown in the lubrication diagram.

A check valve, it will be noticed, is fitted in the main oil supply system. This check valve, together with a small spring-loaded pressure relief valve, is situated inside a small detachable valve chamber, which is attached to the bottom of the crank chamber just beneath the main oil pump. It will be noticed in the lubrication diagram that the excess oil pressure is delivered back into the oil pipe on the supply side of the pump. An oil pressure gage is connected to the main oil lead as shown, and small oil pipes are also taken from the main pressure pipe to the small crank chamber of the fuel pump, and also to the water pump driving spindle.

The two scavenger oil pumps, situated one at either end of the base chamber, are designed so as to draw off the return oil which collects in the small detachable oil sumps in the bottom of the oil base, and to return it to the tank from either end. These scavenger pumps are connected together by a steel pipe, 21 mm. diameter, the ends of which are coupled to the suction ports of the two gear oil pumps. This interconnection of the two pumps to a certain extent balances the oil return to the tank from the front and rear ends of the oil base, enabling both scavenger pumps to operate at any angle of the engine. A small quantity of oil is always carried in the oil base, as shown in the lubrication diagram. The cam-

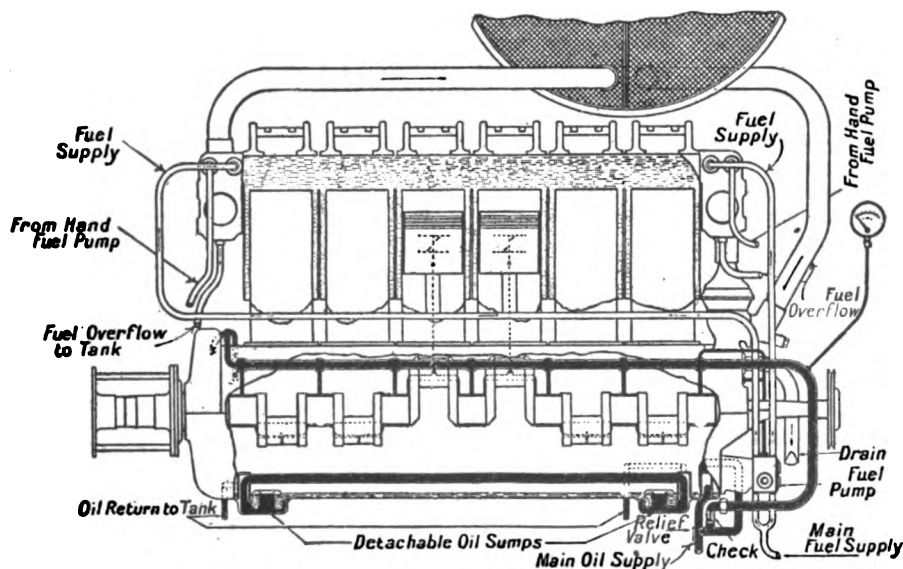


Fig. 19—Diagrammatic representations of oiling and cooling systems



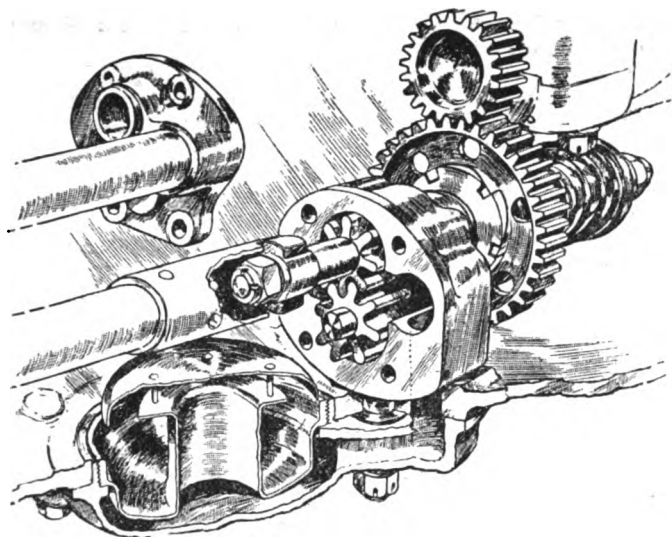


Fig. 21—Sketch of front oil pump

shafts, tappets and cylinder walls are splash lubricated by the surplus oil thrown off of the crankshaft and oil scoops; and the camshaft and magneto gears are lubricated through oil ways cut in the camshaft bearings at either end. Baffle plates are fitted below the cylinders in the recesses machined in the top face of the crank chamber, as shown in Fig. 22.

#### Constructional Details of Oil Pumps

No provision is made for lubricating the roller bearings of the overhead valve rocker spindles, and no oil holes are made in their brackets for hand lubrication. The general design of all three oil pumps and their delivery is the same. The general construction is clearly shown in the sketch of the front scavenger pump, Fig. 21. A pair of pump gears of the usual formation, 30 mm. diameter, work in a body casting of cast iron. The top pump gear is of steel, and is machined integral with the driving spindle of the pump, while the lower pump gear is made of gun metal. The oil pumps are secured to the machined seats cast on the bottom of the oil base by a stud in each case, which also serves to hold the small detachable oil sumps in position. These oil sumps consist of aluminum castings, into the cupped center of which is screwed a spun brass oil trap, formed as shown in the sectional perspective sketch. These oil sumps are connected to the suction ports of the oil pumps by a passage formed in the sump body castings.

All three oil pumps are driven at the same speed, the two scavenger pumps being connected together by a light tubular shaft which engages with dog clutches at either end; the pressure oil pump is driven off the spindle of the rear scavenger pump through a dog clutch extension of the spindle. The method of driving the oil pumps at the front end of the engine is interesting and unusual. As shown in the sketch, Fig. 21, the driving gear wheel which is mounted on the front extension of the pump spindle is provided with a spring-loaded face ratchet, the teeth of which are cut inside the gear as shown, and engage with similar teeth cut on a flange on the front of the pump driving spindle. The strength of the spring is such as to allow the driving gear to overrun the driving spindle, and apparently in the event of backfiring, all the oil pumps become inoperative, and oil would thus be prevented from being sucked back into the oil base by the two scavenger pumps.

An interesting feature in the lubrication system of these engines is found in the small separate oil filters, which are provided at the top of each of the diagonal oil ways drilled through the webs of the main journal bearing housings. The small filters are screwed into the bosses, which are cast on the outside of the crank chamber, and to which the detachable main oil pressure pipe is attached.

In Fig. 20 the method of attaching the main oil pipe by a set screw and a cap fitted with a leather washer is shown. The set screw is screwed into the top of the filter plug at the top of the drilled oil lead, and a small jet or drilled plug

is fitted below the set screw, the plug being let into a small recess cut in the top of the oil lead. The bore of this plug corresponds to the bore of the restriction formed in the oil lead drilled in the filter plug just below as shown. This device is apparently provided to allow for a special plug to be attached in place of any of the six set screws, which can then be coupled to a pressure gage, thus giving the oil pressure at any of the main bearings.

Further details of the formation of the oil passages drilled through the crankcase to the journal bearings, and also of the construction of the main bearing caps, are given in the sketch, Fig. 22, which shows the underneath view of the top half of the crank chamber. The oil is led round the bearing bolts through circular oil grooves cut in the face of the bearing housings. The small holes drilled in the crankcase above the joints, as shown, communicate with recesses machined around the bolts. These holes are made to prevent the oil from being forced upward out of the engine through the bolt holes in the crank chamber.

#### Water Pump and Water Cooling System

Details of the construction of the water pump are shown in the sectional drawing, Fig. 23. The body of the water pump is attached to the top face of the separate aluminum casting which forms the cover of the magneto driving gears. This gear cover is attached by bolts and studs to the rear end of both the top and bottom halves of the crank chamber. As may be seen in the general arrangement drawing of the engine, the water pump spindle is driven through a dog clutch at its lower end by a short vertical spindle running in a bronze bush bearing; this spindle is driven by a bevel gear meshing with the main bevel fixed on the rear end of the crankshaft.

The water pump vertical spindle, which is 20 mm. in diameter, runs in a bronze bearing, which is lubricated by a screw grease-lubricator. The top portion of the pump spindle bearing is cupped to form the housing for a thrust ball race, above which is fixed the pump rotor.

The pump rotor is a gun-metal casting, having six helical vanes 110 mm. in diameter. The rotor is fixed to the pump spindle on a taper and key, and is locked by a domed nut and locking washer.

The lower half of the pump body is an aluminum casting with an inlet passage 54 mm. in diameter, to which the diag-

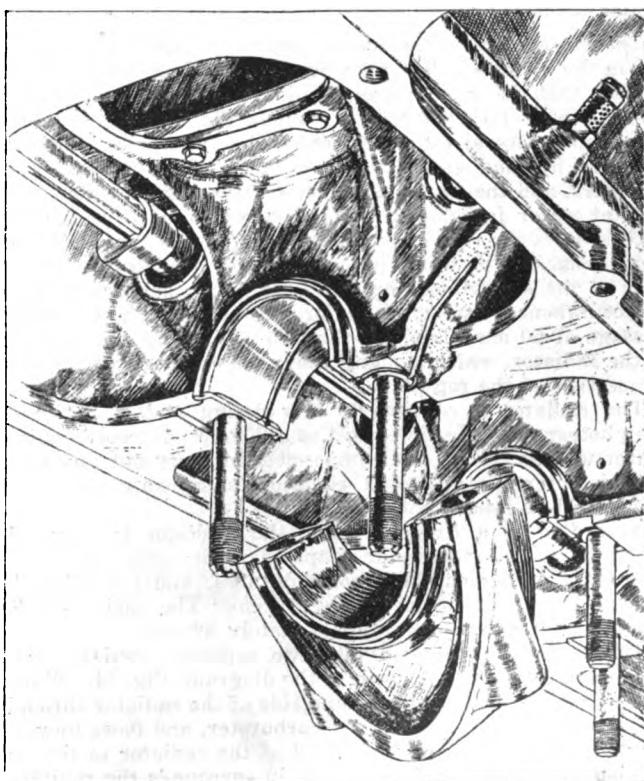


Fig. 22—Details of main bearings and oil leads to them

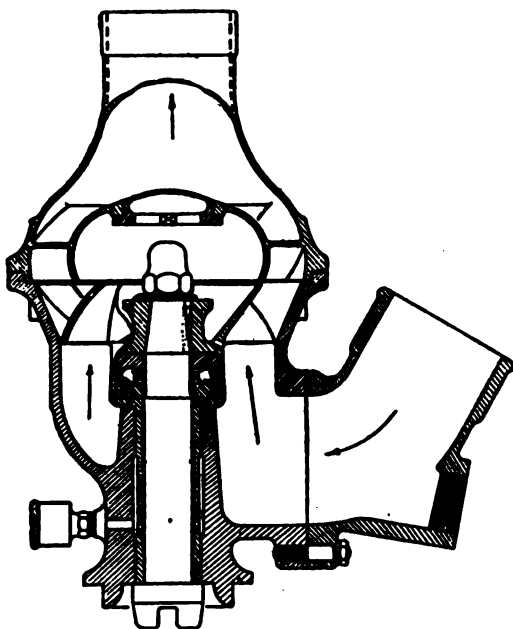


Fig. 23—Section through water pump

onal water pipe from the radiator is coupled by a rubber connection. The top half of the water pump body, which is a gun-metal casting, is formed with six helical passages leading in a reverse helical direction to the water pump rotor. These passages connect with the common vertical outlet passage in the top of the body casing as shown in Fig. 23. The outlet diameter is 50 mm. The center portion of the top body casting inside the helical passages above the pump rotor is domed and fitted with a threaded plug 38 mm. in diameter. This plug is drilled with a 3.5 mm. hole, evidently to prevent an air lock. Two 3 mm. holes are also drilled in the bottom of the rotor between the vanes for the same purpose. It is noticeable that the steel ball thrust race is working to all intents in the water flow, and must therefore suffer by corrosion.

#### Water Circulation

The circulation of the water cooling system is clearly set out in the diagrammatic drawing, Fig. 19, from which it will be seen that the water pump delivers directly into the bottom of the water jacket which surrounds the body of the rear carburetor. As already mentioned, the two carburetors are attached by long studs to the ends of the front and rear cylinders, and the water, after passing through the rear carburetor water jacket in a special passage round the throttle valve, enters the rear cylinder through the two circular water joint flanges. The water passes through the passages cast in each of the six cylinder heads to the front carburetor water jacket, whence the water is forced out through a vertical passage of 50 mm. diameter through a diagonal pipe leading to the radiator, which is slung above the engine from the center section of the top plane.

The radiator is of entirely new design and is shown in the photograph (Fig. 24) fitted to a 260-hp. Mercedes engine. Unfortunately, it has been impossible to carry out any tests on this interesting type of radiator, a separate report on which will be issued later.

According to a French report, this radiator is very efficient. It is of semicircular shape in front elevation, and is formed of hexagonal honeycombed tubes, and exceptionally deep in cross section, measuring 22 cm. The radius of the semicircle in elevation is approximately 32 cm.

The radiator is divided into two separate sections by a vertical baffle plate, as shown in the diagram, Fig. 24. Water enters the bottom of the left-hand side of the radiator through the pipe leading from the front carburetor, and flows upward through the tubes of the left-hand of the radiator to the top portion of the tank which completely surrounds the radiator. The water passes over the top of the dividing baffle plate, through the right-hand section to the bottom of the radiator,

and out at the rear side, which is connected with a 50 mm. pipe to the inlet passage of the water pump.

As will be noticed, the front of the radiator is fitted with a blind, which is operated by a cable from the pilot's seat.

The two Bosch ZH-6 type magnetos are mounted on brackets cast on the rear end of the base chamber, and are driven at 1.5:1 engine speed directly off the rear end of the camshafts. The ignition point is set 38 deg. early. Two Bosch 3-point plugs are somewhat inaccessibly fitted in the head of each cylinder between the twin water connections as previously described. The plug bosses are water cooled. The high-tension cables are carried in fiber tubes bolted to the cylinders, and the leads to the plugs are taken through fiber blocks mounted on the sheet-metal brackets on the cylinder heads.

Order of firing—1-5-3-6-2-4.

#### Carbureters

The two carburetors are attached to the heads of the front and rear cylinders, as already described, and their general construction is shown in the cross-sectional drawing, Fig. 26. The carburetors follow the distinctive principles of the well-known Maybach design, but are slightly modified in many of their details as compared with the earlier engines.

These carburetors are designed to be used in conjunction with a fuel pump system, and in place of a float chamber employ two small constant-level overflow tanks inside each carburetor. This method obviates the necessity for using pressure release valves in the fuel system. Referring to the sectional drawing of the carburetor, Fig. 26, they are constructed of a cast aluminum water-jacketed body, in the center of which is mounted the rotary barrel-type throttle, open on one side to the curved passage to the induction pipe, and on the other to the mixing chamber above the jets. The main air supply is taken through a passage cast in the aluminum carburetor body directly below the throttle, and the extra air supply is automatically controlled by a guillotine type shutter, which works vertically just in front of the jet control lever. The throttles of both carburetors, together with the mechanically controlled jets and the extra air shutters, are all interconnected.

The working principle of the carburetors and the functions of the various parts are more clearly demonstrated in the purely diagrammatic sectional drawing, Fig. 25, which is, to a great extent, self-explanatory. Fuel is delivered by the fuel pump into the small tank A of each carburetor through a restricting jet B, shown in the diagram. The fuel in these small tanks or reservoirs is kept at a constant level by means of the overflow pipe C, which leads back to the main fuel tank, via the small lower tanks D below the jets which are supplied through the pipe E. An air vent F, fitted with a baffle plate, is provided in the top of the constant level tank A, which is also connected to the main fuel tank by a pipe G, leading to a hand fuel pump, or may be plugged and not used, as was the case in the Rumpler biplane. The main and pilot jets consist of two holes drilled in the top cover of the lower reservoir D, and are similar in principle to the White & Poppe jets. The area of the jet openings is mechanically controlled by means of a small hole drilled eccentrically in

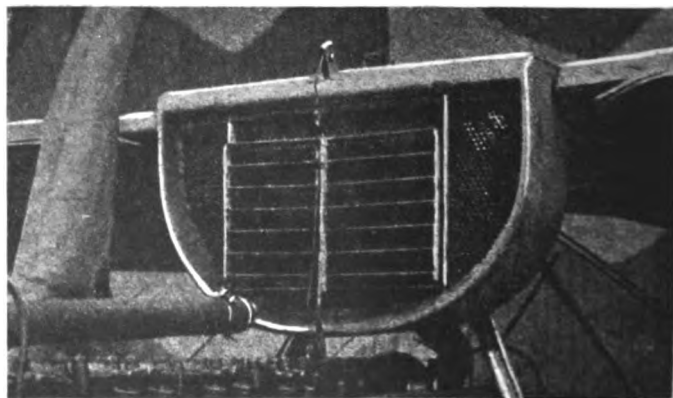


Fig. 24—Radiator and shutter

the jet cap *H*, which, as previously described, is connected by levers to the throttle and air control levers. The function of the top tank *A* is apparently to deal with the large excess of fuel delivered by the fuel pump at high speeds, while the lower tank, which is gravity fed, provides a constant fuel level for the jets.

The mixture strength at any point on the throttle curve is governed by purely mechanical means, there being no venturi of special jet arrangement. The jet depression is obtained by restricting the air flow at what approximates to a sharp-edged orifice; consequently the loss through the carburetor is very high compared with a carburetor using a venturi tube to get the jet depression.

Contrary to usual practice, the jet depression actually increases on throttling down, the depression being about four times as great at half throttle as at full throttle.

#### Control Adjustment

When running slowly, the throttle is slightly open, the supplementary air port closed, and the air shutter practically closed; in this position the small or pilot jet only is open. On opening the throttle, the supplementary air port commences to open in conjunction with the throttle opening. The main air shutter automatically opens in proportion, admitting more air, which passes directly across the top of the jets, and the jet area increases until the main jet orifice is fully open.

Owing to the interconnection of the control levers, there comes a point when the supplementary air port area increases

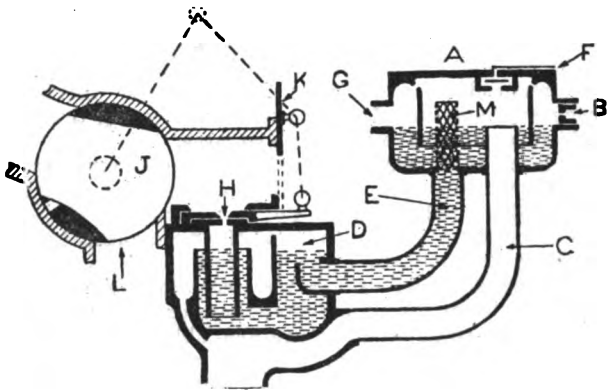


Fig. 25—Diagrammatic sketch of carburetor

out of all proportion to the increase in the jet area, the latter reaching a limit with no further increase by reason of the arrangement of the levers. This point represents the opening for maximum power at ground-level. If the throttle is opened beyond this point, the air supply rapidly becomes out of proportion to the jet opening and fuel supply. By this arrangement a simple form of altitude control is provided.

The various positions for "slow running," "slow speed," "full speed" and "altitude" are marked on the body of the carburetor, and are indicated by a pointer attached to the throttle lever of the rear end carburetor. By means of these markings on the carburetor the correct settings of the throttle lever can be checked when the engine is installed in the machine.

The translation of these markings on the carburetor is as follows:

- LE = Leer = Running Light.
- LA = Langsam = Slow Speed.
- V = Voll = Full Speed.
- H = Hohe = Altitude.

The induction pipes are aluminium castings and are of exceptionally neat design, being, as shown in Fig. 3, joined together in one straight pipe. A cast aluminium baffle plate drilled in the center with a 20 mm. hole is provided in the center of the two induction pipes between the front and rear three cylinders. This baffle is evidently fitted to equalize the gas supply to all cylinders.

Fig. 27 clearly shows the construction of the interesting type of band clip which is used for making the connections

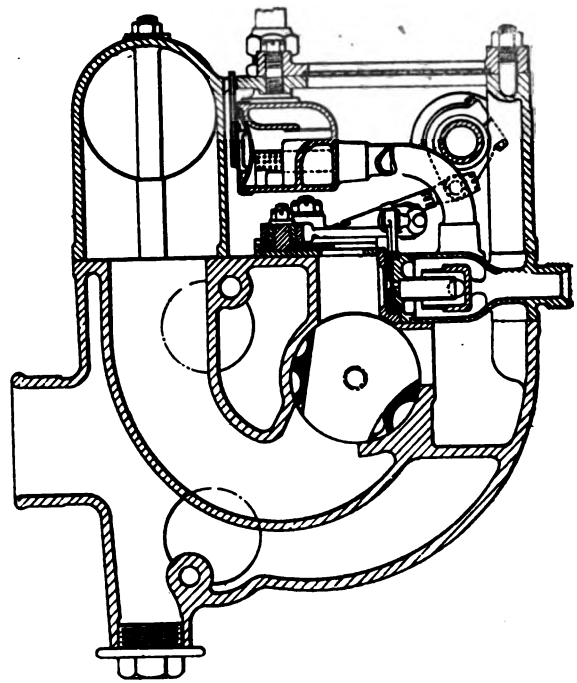


Fig. 26—Sectional view of carburetor

in the induction pipes, and also for most of the water joints on these engines. These clips are now extensively used on all enemy engines. The method of using these clips is here-with reprinted from the previous report on the 230-hp. Benz engine.

The clips are made of thin strips of annealed spring steel; these are wound twice round the rubber rings and fastened by small steel links and bolts. In starting to make this joint, the end of the steel band is first bent over the bottom bar of the connecting link, and then wound twice round the rubber ring, the free end of the steel band passing through the center portion of the connecting link on the second winding. The end of the steel band is then fastened to the top end of the link by coiling the end several times round the small bolt in the head of the link, the end of the steel band being bent over for about 2 mm. and inserted into a slot cut in the bolt, so that by turning the bolt in the link the steel band is wound tightly round the ring joints, and owing to the position and shape of the link, remains fixed.

(To be continued)

IT is stated that during a recent French offensive the consumption of gasoline for the army and air service was at the rate of 1800 tons per day, which represents a daily consumption of approximately 500,000 gallons of gasoline.

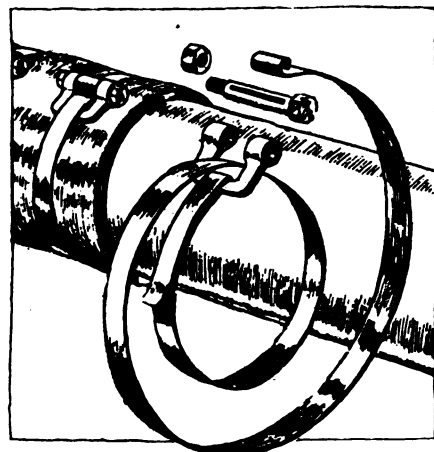


Fig. 27—Sketch of spring hose clip and details





# The F O R U M



## The Magneto Patents Situation

By C. W. Curtiss

*General Manager, Splitdorf Electrical Co.*

THE Federal Trade Commission having granted the Splitdorf Electrical Co. a license under certain Bosch patents, various conflicting notices have appeared in the press concerning the matter.

It is true that the Splitdorf Electrical Co. has been granted a license by the Federal Trade Commission to use two United States patents owned by Robert Bosch of Stuttgart, Germany. I do not believe these patents have been used to any extent by the Bosch Magneto Co., of Springfield, Mass.

Splitdorf Electrical Co. was ordered to make use of these patents by the Secretary of War at the direction of the President of the United States in connection with magnetos for war airplane purposes. The patents do not relate in the remotest degree to the principle of construction embodied in the Dixie magneto which is made under numerous United States and foreign patents owned or operated under by the Splitdorf Electrical Co. only.

The Bosch patents in question relate merely to details, standard practice abroad, which the Government authorities wanted for the following reasons:

### Interchangeable Binding Post

Patent 1,030,817 relates to a binding post for connecting electric cables. This is a detail of construction commonly used abroad and with which European aviators and mechanics are familiar. Naturally by incorporating this detail in the Dixie magneto, cables on foreign magnetos would then readily interchange with the American product, and probably for this reason the Splitdorf Electrical Co. was instructed to use this patent. There are many other ways of attaching a cable to a magneto, and some of them covered by the Splitdorf patent applications pending may even be preferable to the one shown in the patent, but as this was already being used abroad, it was adopted as standard here. The accompanying figure taken from this patent shows the Bosch type of binding post employing a pointed screw piercing the conductor and securing it in place in the insulated brush holder or distributor.

### Hand Magneto for Starting

Patent 1,014,824 relates to an ignition system, wherein a high tension starting magneto is connected to the main magneto in such a way that the starting magneto may be operated by hand in order to furnish a starting spark. The accompanying figure from patent 1,014,824 shows this arrangement.

The main magneto A is connected to the spark plugs in the usual manner. From the distributor of the main magneto

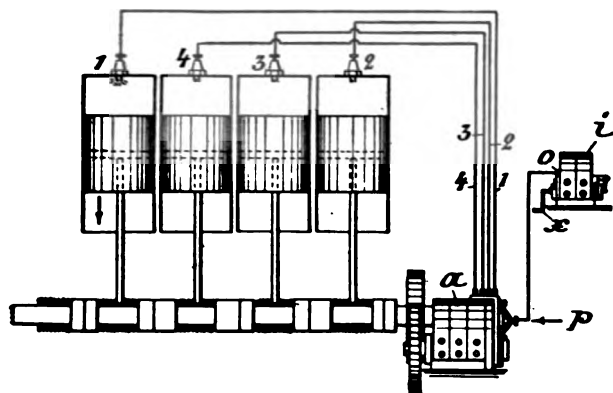
a cable P is connected to the starting magneto I and when the latter is rotated by means of the crank X high tension current will flow into the distributor of the main magneto where it is distributed by means of an auxiliary brush located behind the usual moving brush of the distributor, thereby being connected to whatever cylinder is under compression, and in no way relating to or interfering with the functioning of the main magneto. As soon as the engine has started, the service magneto A operates in the usual manner, the hand starting magneto I being stopped. This arrangement of using a hand starting magneto is standard on many foreign airplane engines, and it was desired to have the American practice conform for the sake of uniformity. There are several other ways of accomplishing the same results, and this patent is not vitally essential to American needs, although its use is desirable for the reason stated.

### Splitdorf Improved Magneto

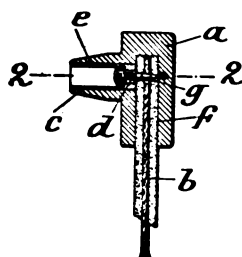
An improved method is shown in U. S. patent 1,260,985, property of the Splitdorf Electrical Co., by which method the high tension wiring to the starting magneto is eliminated and the arrangement simplified as compared to the Bosch patent. Splitdorf Electrical Co. has manufactured several hundred thousand magnetos for the Allies since the beginning of the war. The Dixie magneto has been standardized and is being produced in great quantities to meet the present emergency, the Splitdorf Electrical Co. now being the largest manufacturer of magnetos in this country.

In addition to furnishing magnetos direct from their own factory for war purposes, the Splitdorf company has arranged to permit the Bosch Magneto Co. of Springfield, Mass., and the Ericsson Mfg. Co. of Buffalo, N. Y., manufacturers of the Berling magneto, to make for war purposes only, and only for the duration of the war, certain Dixie magnetos under the Splitdorf Dixie patents; therefore three sources of supply for the Dixie magneto are available. In addition the Splitdorf company will furnish the necessary drawings and engineering information so that the product of all three factories will be standardized, uniform and interchangeable.

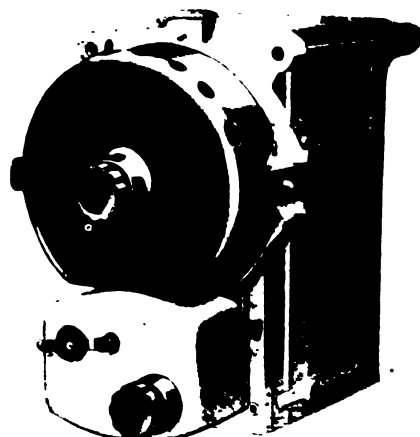
The standardized Dixie magneto enables one magneto to be used for 4, 6, 8, 12 and 16 cylinder engines, and 8 and 12, 45 degree cylinders, with a total of only 16 extra pieces to make up any one of the necessary assemblies. This arrangement, devised and developed under the direction of the Splitdorf company's chief engineer, Carl T. Mason, eliminates the necessity of having several types of magnetos and hundreds of repair parts therefor at the supply depots, and marks not only a distinct advance in the art, but is a notable example of an all-American contribution to winning the war.



Drawing from U. S. Patent No. 1,014,824



Bosch binding post (Patent No. 1,030,817)



Dixie standardized aircraft magneto

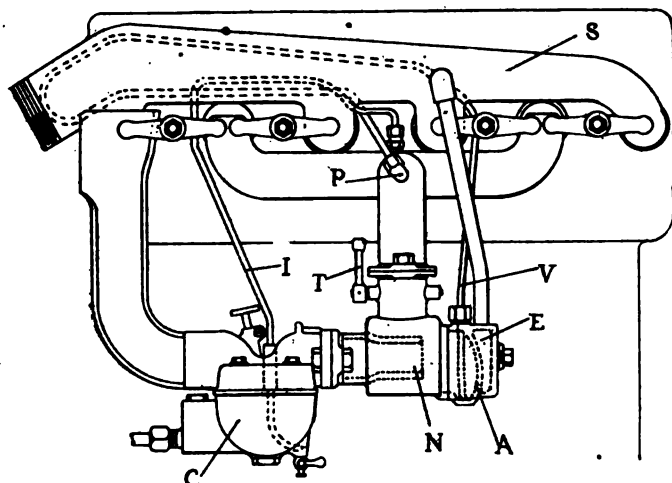


Fig. 1—California vaporizer fitted to engine

## Kerosene Vaporization

By L. E. French

THE tube and the hot spot systems of vaporizing heavy fuels for internal combustion engines may be combined successfully in a single equipment, and the two effects may be automatically balanced in such a way that when one is at a minimum the other is at a maximum. This principle is embodied in a vaporizer for which the writer is responsible but which has not yet been placed on the market.

Referring to the illustration, Fig. 1, C is a standard carburetor which discharges its mixture through the nozzle N against the hot spot E. As the charge enters the expansion chamber A the lowering of its velocity causes the heavier particles to be precipitated and collect in the pocket at the bottom. The vaporizer tube V dips into this pocket, passes through the exhaust and discharges into the intake at P. The throttle being placed at the point T causes a difference of pressure between the two ends of the vaporizer tube. This draws air through the tube, together with the liquid and vapor collecting in A.

An idling tube I provides a vaporized mixture on closed throttle.

Fig. 2 shows the variation in the intake suction which occurs in an engine driving a car on a smooth, level road, and also the variation of the exhaust temperature. It will be noted that at the time the exhaust temperature is a minimum the intake vacuum is a maximum and vice versa. This has an important bearing on the action of the vaporizer. Where the hot spot system alone is relied upon, the surface heated must be made large enough to take care of the vaporization at the lowest exhaust temperature.

With the system in question, when the throttle is closed, there is a very strong suction on the vaporizer tube which draws the maximum quantity of air through the tube at this time. Thus when the exhaust temperature is down to its lowest point practically all the air of the mixture is heated by passing through this tube and the high velocity assists in breaking up the fuel. The more volatile particles of the fuel are evaporated on the hot spot E, while the less volatile are taken care of by the tube V. An experimental glass insert in the vaporizer tube has shown that the amount of liquid passing through the tube varies inversely with the volatility of the fuel being used.

On open throttle the increase in the exhaust temperature enables the hot spot to take care of a larger percentage of the evaporation.

In an article by Mr. Tice in the March 14 issue of AUTOMOTIVE INDUSTRIES he makes the following statement:

"In the case of kerosene particularly, the unsaturated hydrocarbon content is quite appreciable; and it is well known that among these substances polymerization, or the formation of resinous condensation products, occurs under these conditions. These latter leave a considerable and very obnoxious solid deposit when heated to dryness.

"The result is that with the heated passage method of pro-

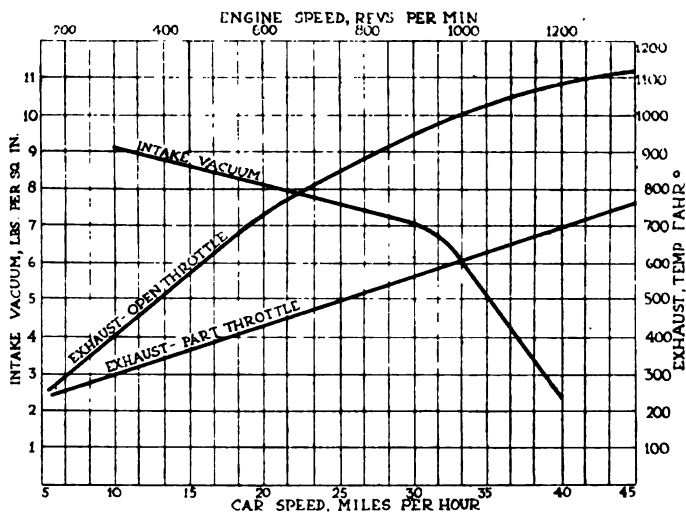


Fig. 2—Variation of intake suction with car speed

gressive evaporation all this residual matter and whatever polymerization products may have been formed are brought to dryness within a comparatively small portion of the length of the passage. The obvious result is a deposition in the passage of solid matter. This reduces its efficiency as a heat transmitter, and increasingly reduces the capacity of the passage. Naturally the smaller the bore the sooner will it be choked to an extent to interfere with the functioning of the engine."

The apparatus with which Mr. Tice tried this experiment was no doubt one in which the velocity of the air through the vaporizer tube was comparatively low.

With the high suction and consequent high air velocity employed in the system in question there is no deposition of solid matters in the tube. This may be partly due to the constantly varying suction which would prevent the vaporization point from remaining constant. At all events, in a recent run from Cincinnati to San Francisco with this apparatus, where fuel was obtained in ten different States, there was no formation of solids in the vaporizer tube, although it is safe to assume that the bore of the tube was considerably less than the one to which Mr. Tice refers.

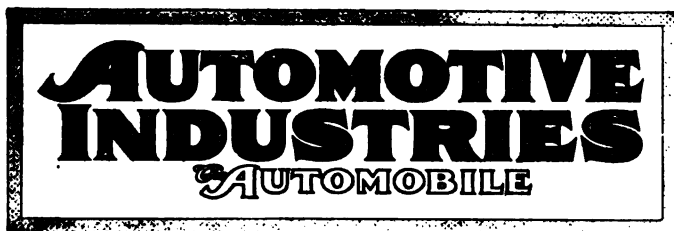
## Tests of Benzol as Motor Fuel

(Continued from page 834)

at an average speed of 1077 r.p.m., during which run it developed an average brake hp. of 25.9. It consumed 13.2 gal. of fuel, which is at the rate of 2.78 gal. per hr. or 0.107 gal. per brake hp.-hr. This corresponds to a decrease in fuel consumption of 12.3 per cent as compared with gasoline. After the test was completed the engine was again taken apart for the purpose of determining the amount of carbon deposited on the pistons, valves, valve caps and spark plugs. The pistons were practically clean at the center, there being a little oil carbon around the edges. This was less than after the run on the mixture. There was a little carbon on the valve caps, but this was of such a texture that it could be easily removed. The porcelains of the spark plugs were clean and the inlet valve showed no carbon at all.

The test with 90 per cent benzol (motor fuel) showed that it was capable of giving a greater brake horsepower throughout the speed range of the engine than was obtainable with commercial gasoline. The increase varied from approximately 4.4 per cent at 800 r.p.m. to 19.4 per cent at 2000 r.p.m. Above 930 r.p.m. the fuel consumption with benzol was less and the engine ran more uniformly, and less carbon was deposited. The reason for the great increase in brake horsepower with benzol is thought to be the fact that it vaporizes more easily and that a mixture of benzol vapor and air burns completely and leaves very little carbon residue. Nothing was changed on the engine during the tests except the timing of the spark and the setting of the carburetor.

The tests further proved that a fuel mixture consisting of three parts of 90 per cent benzol and one part gasoline gave a brake horsepower equal to or slightly lower than that obtained with gasoline.



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## The Outlook for Tractor Exports

FROM the beginning of the tractor industry in this country there has been a very gratifying demand for its products abroad. It is in the nature of things that farm tractors are needed most in newly developed countries where the individual holdings are large and the available farm labor is relatively small in amount. During the past two years the demand for tractors in England, France and Italy was so great that in spite of the great scarcity of shipping, the Governments of these countries found shipping space to carry many hundreds of tractors from here. When peace returns there will be an increased demand for tractors in every one of the countries which participated in the war, because of the enormous reduction in horses and farm laborers, and of the need for placing all available acreage in cultivation again as soon as possible. There are not wanting signs that this state of affairs is fully realized in the different countries.

In France a national association of tractor manufacturers and traders recently held a demonstration to encourage the development of this branch of industry and large industrial concerns in other countries have had representatives here to study American practice in this field. With our lead of several years in tractor design, the urgency of the foreign demand and the obstacles to a rapid development of new industries in the war-ridden countries it should not be difficult for us to build up a large export trade in tractors.

## Reform in Engineering Education

THERE has been a good deal of complaint in the past that the methods of instruction employed in our engineering schools do not meet practical requirements. The student is being taught a lot of principles and a lot of theory, but he is not shown the application of these to practical problems. The result is that when he graduates he is not fit to immediately enter upon responsible work, but must virtually pass through another course in the factory to learn the methods by which engineering problems are solved in practice.

A great deal of time is necessarily spent in engineering courses on such subjects as pure mathematics and theoretical mechanics. These are subjects in which the engineer should be well grounded, yet unless he is given opportunity to apply his mathematics and mechanics to practical problems during his college course he is apt to forget much that he learned before he has a chance to use it. There may be, later on in the course, instruction in machine design and on steam and gas engines, yet the application of the principles taught the student in his mathematics classes is not made sufficiently clear to him, and as a result his mathematical equipment becomes largely a useless tool.

In the education of lawyers the same observation has been made. That is, the student is taught legal principles and precepts, but the connection between these and the cases that arise in the law courts every day is often not sufficiently obvious to make their application easy. To meet this condition the "case system" of instruction was introduced in law schools. The professor picks out a certain number of cases that have come up in the courts and analyzes them, showing how legal principles are applied in each.

It has recently been suggested that a similar method be used in engineering instruction. By collating a set of problems that come up in the work of the practicing engineer, analyzing these problems for the students and showing them how the solutions can be obtained by the application of mechanical principles and engineering data, the teacher could impart to his students, along with the fundamentals of mechanical science, their applications in everyday work, and the young engineer upon entering the drafting room or shop would then not meet with the same difficulty in utilizing the knowledge he has acquired that he often meets with at the present time.



## The Necessities of Reconstruction Are at Hand

**T**HE collapse of the Central Empires brings the end of hostilities. The work of reconstruction is at hand. There is no place in reconstruction for the wildly excited optimist who cannot wait to lay one stone carefully upon another.

There is no place for the pessimist who fears to go to work lest the design be changed after he has started, and there is just as little for the reactionary who must let everything drift in the hope of Providential intervention.

It is a time for confidence.

Confidence, which springs from the belief that man is greater than his machines.

Confidence, which knows that industrial machinery, financial systems, methods of trade are but the tools with which the spirit of man works out its purpose.

Confidence, which springs from sanity of thought, clear planning and careful action.

It is to you, industrial leaders, manufacturers, engineers, constructors of all kinds, that the country must look for that courageous confidence and careful operation which characterized the building of our industrial supremacy.

It is your influence—so much larger than you imagine—your reputation for practical wisdom, which must be exerted to impress on employee, dealer, neighbor and all business men the fact that the serious problems of reconstruction will presently vanish if they are vigorously tackled.

Your influence and action should express that faith which can actually move mountains of difficulty—faith in our citizens, faith in our country and faith in our industrial ability.

The new structure of American industry must be more beautiful, more permanent, more useful.

The difficulties of its building are but the opportunities of its builders.

It is time to be ready, feet on the ground, stable and solid, facing the problems confident of ability to overcome them.

# □ Latest News of the

## 8 Months for Plants to Come Back

Manager Reeves of N. A. C. C. Estimates This Time Will Be Necessary

NEW YORK, Nov. 8—It will take the motor car manufacturers as a whole about nine months to get back to 100 per cent production, stated Manager Alfred Reeves, of the National Automobile Chamber of Commerce, to-day. Getting out of the war will be almost as big a job as getting in.

Factories now, he said, have not stocks sufficient for production and would have to acquire new stocks before production could assume any great proportions. The return to normal would be gradual. The factories, which now are at 50 per cent or less, would come back by degrees and would hit first 50 per cent, then 75 per cent and then 100 per cent. This means that before-the-war production cannot be expected much before next September.

Schwab is said to be turning back 30 per cent of his ship steel, which he is unable to use because of the status of the shipyards, due to various causes.

Steel, Reeves believes, will be rationed for some time during the beginning of the peace period.

Many of the manufacturers have, during the lull in normal manufacture, been experimenting with new engineering and body designs, and, while before-the-war models might come through in a few months, the new designs could not be expected in quantity before the end of next summer.

At a meeting of the Chamber directors yesterday statistics produced showed the industry to have shipped on a 48 per cent basis in September and on 40 per cent or less during October.

In September the carloads shipped were: 1917, 20,538; 1918, 9900. October: 1917, 21,403; 1918 (incomplete figures), 8000.

Roy Chapin reported that at the elections the road bonds of Pennsylvania for \$50,000,000 and of Illinois for \$60,000,000 were carried, to pull both States "out of the mud."

It was coincidental that the day war was declared the Chamber was in session, and wired the Government an offer of co-operation for war work. Yesterday while the Chamber was meeting the United Press report of peace came, which later proved to be unconfirmed, and the Chamber at once wired an offer of its services for reconstruction.

Manager Reeves, who has maintained his home in Yonkers, N. Y., just outside

New York City, and a war residence in Washington, has removed his family to the Capital, and will reside there permanently until developments warrant his return.

Reeves expressed gratification at the co-operation effected a few days ago in Washington when representatives of the car makers, parts makers, jobbers and dealers entered into a joint session on war problems.

### Peace and the Motor Stock Market

NEW YORK, Nov. 14—Any anticipations that the signing of the armistice would result in a wave of buying throughout the country generally have proved unjustified. The usual rises or falls of a few points in leading motor stocks have occurred, but there has been nothing in the way of spectacular dealing and it seems likely that everything will continue on a normal basis until such time as the market adapts itself to the new conditions.

It is conceivable that the uncertainty surrounding the steel situation in view of the amended statement that France is likely to need at least 10,000,000 tons for reconstruction work has had its effect, despite the announcement that passenger car manufacturers would benefit materially and immediately by the revision of priority orders covering the supply of raw material.

Reconstruction schemes also may have a far-reaching effect on the post-war plans of the automotive industry.

## Washington S.A.E. Section Formed

WASHINGTON, Nov. 13—A Washington section of the Society of Automotive Engineers was inaugurated here to-night at a meeting of members of the society and guests when it was voted that a petition asking the creation of the section be presented to the parent organization. The meeting was attended by several hundred and presided over by Herbert L. Chase. Discussions about the value of a section and its co-operation with the Government were combined with talks on internal combustion engine work in the Army and Navy by officers present at the meeting. Temporary officers were elected for the section as follows: Colonel James Furlow, Motor Transport Corps, temporary chairman; Orral A. Parker, Division of Military Aeronautics, temporary vice-chairman; Herbert L. Chase, temporary secretary, and Arthur B. Cumner, Washington representative for the Autocar Co., temporary treasurer. Dec. 11 was set as the date for the next meeting.

(Continued on page 860)

## Reconstruction Body Proposed

President Considering Formation of Commission to Supervise Industrial Transition

NEW YORK, Nov. 14—Reconstruction of industrial activities undoubtedly will be one of the greatest problems with which manufacturers will have to contend, now that the signing of the armistice with the Central Powers has become an accomplished fact. Already there have been grumblings of discontent from labor. Telegrams are pouring into Washington from manufacturers throughout the country who are anxious regarding their workers and regarding the contracts for which they are obligated to the Government.

Just what steps will be taken to clarify the situation, and to insure the release of thousands of workers from war work and their transfer to other industries, it is too early to predict. Some inkling of how this may be accomplished, however, comes from Washington, where it is stated that President Wilson already has under consideration the appointment of what is termed a Reconstruction Commission. It would be the duty of such a commission to develop a program for the conversion of the country's business from a war to a peace basis. Should such a commission be appointed it likely would be advisory rather than executive, with its plans to be carried out by existing government departments.

It is stated that consideration being given such a commission includes representation of commercial, industrial, labor, agricultural and social interests. It is thought that such a commission, composed of men thoroughly qualified to handle the complex problems of the situation, could lay down a program which would be more satisfactory, both to capital and labor, than any program that might be arranged by a congressional committee.

Along with the telegrams of inquiry which are reaching Washington are coming hundreds of suggestions for means of transferring war labor to peace labor without too much of a jolt. It is suggested that the reconstruction committee might operate not only in formulating a plan but also as a clearing house for such suggestions. It would take up, in addition to the adjustment of labor problems, the distribution of war materials at present contracted for, or in the hands of manufacturers with war contracts, so that supplies could be equitably distrib-

(Continued on page 860)

# Automotive Industries □

## Tractor Curtailment Order Is Modified

**American Tractor Association Succeeds in Having Restrictions on Smaller Makers Reduced—Want Official to Pass on all Tractor Matters—Would Eliminate Converters**

WASHINGTON, D. C., Nov. 12—Manufacturers of farm tractors who have new designs ready for the market are to be permitted to go ahead with the development of their plans, and under a ruling which has been obtained by the War Service Committee of the American Tractor Association, they will be assured of such production as will secure them a place in the trade during the coming year.

Following conferences between this committee and the Priorities Division of the War Industries Board restrictions curtailing the production of tractors during the year ending Sept. 30, 1919, have been very materially modified.

Instead of limiting the larger manufacturers to 75 per cent of the iron and steel used in the previous year and virtually cutting off the smaller manufacturers, the new regulation gives the small men a fair chance to develop while conditions affecting the larger makers are not greatly altered.

The revised ruling secured through the efforts of the American Tractor Association and issued over the signature of Judge Edwin S. Parker, Priorities Commissioner, follows:

### The New Regulations

(a) That the tractor makers who have produced less than ten tractors during the first period (year ending Sept. 30, 1918), are in the primary experimental stage, and that they are not to produce more than twenty tractors during the second period (year ending Sept. 30, 1919). Provided, however, that such tractor makers as have, prior to Nov. 1, 1918, contracted and placed absolute orders for a substantial portion of the parts for more than twenty tractors for delivery during the second period may produce such number of tractors (not exceeding 100) as may have been so contracted for and ordered.

(b) That the tractor makers who have produced and had in field operation ten or more tractors during the first period are in the secondary development stage, and that they are not to produce more than 100 tractors during the second period.

(c) That makers of tractors other than farm tractors, whose development stages shall be comparable to those of the tractor makers described in the preceding paragraphs are to produce according to the same rules.

(d) That tractor makers who have produced and sold more than 100 tractors during the first period, and all other manufacturers of farm operating equipment who are past their primary and secondary development stages, will receive during the second

period not exceeding 75 per cent of their receipts of iron and steel during the first period; provided that the tractor makers described in this subdivision may produce at least 100 tractors.

The revised decision not only assists the smaller manufacturers of tractors but also helps the makers of parts. Many of these who are depending upon new tractor concerns, many of them already having large contracts for parts which had necessitated considerable increases in manufacturing facilities, instead of facing a large and certain loss of business and money, will now be able to protect themselves at least in part.

The case presented by the American Tractor Association set forth the foregoing facts and substantiated them by an array of figures secured through a questionnaire which was sent out to tractor manufacturers and parts makers by the association. The returns from this questionnaire were collated and tabulated, and presented such conclusive evidence in favor of the demands of the association that in simple justice a revision could not be denied.

The requests of the association were formulated in a brief which was presented to the Priorities Division at a hearing before Rhodes S. Baker, Assistant Priorities Commissioner. These were summed up under five heads, as follows:

### The Association Requests

1. An official to be appointed by the War Industries Board to pass on all matters pertaining to farm tractor production and distribution, and allotment of materials.

2. A Farm Tractor Committee, to be representative of the entire farm tractor industry, including manufacturers of finished tractors, tractor parts and tractor accessories, to be formed to co-operate with this official.

3. A ruling to be made on the number of tractors of each model to be permitted to be manufactured by each concern, with due regard to the amounts of actual capital invested and available for use in the tractor business.

4. A ruling to be made to prohibit entirely the manufacture of attachments for converting automobile and motor trucks into tractors for farm use.

5. Inventories as of Oct. 1, 1918, to be submitted in itemized form to the Government tractor official, together with all other information that will enable him to make an equitable allotment in each case.

Not all that was asked for by the association was granted. Neither was it al-

together denied. In a letter from Mr. Baker to B. F. Sprankle, chairman of the War Service Committee of the association, after expressing regret that the Priorities Division could not grant all the modifications of Circular 35 asked for, he continues: "Your committee, however, may feel free at any time to bring the matter to us again for reconsideration if, in your judgment, war conditions or the war program shall be substantially different from the present."

### Expect Further Modification

Since this letter was written the armistice with Germany has been signed and the war has ended. War conditions are "substantially different," and the War Service Committee believes that the war program also will be different in the near future. This emboldens individual members of the committee to predict that while it may be some time before it can be announced officially, nevertheless it is practically certain that further concessions will be granted to the manufacturers of tractors. Indeed, some go the distance of asserting that it will be perfectly safe for tractor manufacturers to go ahead in furtherance of their plans as made prior to the original restrictive ruling of the Priorities Board, confident in the belief that the radical change in war conditions will permit of the early removal of all sorts of restrictions on industry.

One of the projects which the association will push is that of a permanent tractor and parts exposition, to be located on the first floor of the Joseph Leiter building, south of Van Buren Street on State Street, Chicago, formerly occupied by Siegel, Cooper & Co. The step preliminary to bringing this project before the members of the association will be taken up at a meeting of the executive committee, which will be held in Chicago the latter part of this week.

### Propose S. A. E. Meeting Jan. 13-14

NEW YORK, Nov. 14—Plans are maturing for a January meeting of the Society of Automotive Engineers. The sentiment is in favor of such a meeting which might be made to cover a great many technical subjects devoted to post-war activities. The thought is to make this gathering a real war work meeting. The dates tentatively suggested are Monday and Tuesday, Jan. 13 and 14. It is proposed to have a general meeting of the Standards Committee on Sunday, Jan. 12 and the usual dinner on Tuesday evening, Jan. 14. In all probability the meeting will be held at the New York headquarters of the Society, The Engineering Societies Building, 29 West 39th Street.



## September Exports to Latin America

New York Ships Automotive  
Products Valued at  
\$1,205,359

NEW YORK, Nov. 11—During the month of September 651 passenger cars valued at \$784,670, 70 trucks valued at \$114,257, and parts to the value of \$306,432 were exported from this port to Latin American republics. The aggregate value amounted to \$1,205,359, a gain of 4.7 per cent over that of the previous month, and one of 10.7 per cent over the average monthly total for the first nine months of 1918.

From January to September, 1918, inclusive, automotive products valued at \$9,799,733 were exported from New York to Latin American ports. The figures have not been limited to this total by lack of orders, as conditions are excellent throughout South and Central America, and the demand for cars, trucks and parts is increasing rapidly. There is still a shortage of transportation, but our shipbuilding program provides for greatly increased accommodation in the near future, and it is therefore reasonable to expect that our trade will increase very appreciably as soon as more vessels are available.

Chile, the country of nitrates, is our best buyer of passenger cars. Cuba leads as a truck purchaser, and Argentina is a long way in front of the others as a buyer of parts.

### New South American Export Rules

WASHINGTON, Nov. 11—Export shipments for the eastern coast of South America, including Brazil, Uruguay, Paraguay and Argentina, will be licensed under new regulations, following Nov. 18, 1918, by which the various shipments will be marked for preferential or non-preferential treatment by the War Trade Board. The new ruling applies to the shipment of all commodities except coal, coke and fuel oil.

### Revoke Chrome Import Licenses

WASHINGTON, Nov. 9—All outstanding licenses for the importation of chrome ore except those covering shipments from Cuba, Canada and Brazil, are revoked after Nov. 11, 1918. Hereafter no licenses will be issued for the importation of chrome ore except licenses covering shipments from Cuba, Canada and Brazil.

### Individual Rubber Import Licenses

WASHINGTON, Nov. 11—All articles manufactured of rubber and imported from Canada or Newfoundland will hereafter require individual import licenses from the War Trade Board.

### Permit Iron Ore Imports

WASHINGTON, Nov. 11—The War Trade Board announces in a new ruling

that licenses will now be issued for the importation of a maximum total of 70,000 tons of low phosphorus iron ore from Spain, Sweden, Norway and North Africa, provided the maximum is imported before July 1, 1919. This amount permitted to come forward will be allocated by the Bureau of Imports.

### Campaign to Save Oil

WASHINGTON, Nov. 8—A campaign to save oil has been inaugurated by the United States Fuel Administration calling attention to the oil that is wasted by leakage. The campaign was started by mailing thousands of letters to oil producers and consumers. Following is the statement:

Dear Sir, "Save Oil":

A recent inspection conducted by one of the largest railway systems in this country developed that 25 per cent of all barrels containing oil were leaking, many of them wasting large quantities. It is not the waste of this oil alone, but there are thousands of dollars of damage done to foodstuffs and other merchandise caused by these leaking barrels. Leakage of this nature, occurring on all the railroads handling barreled oil shipments throughout the United States results in thousands of gallons of oil being daily wasted.

The conservation of oil is a war necessity and is therefore of great importance. I trust that you will give due consideration to every possible way by which your cooperation can be put in the very best condition and thus reduce the leakage loss to the minimum. It has been noted that second-hand wooden barrels are, in some cases, being used after being repainted without being given the necessary attention of re-coopering and that iron and steel barrels are not being properly sealed.

I earnestly hope you will give your whole-hearted co-operation in this matter and in every way endeavor to "stop the leaks and save the drops."—United States Fuel Administration, Oil Division, W. Champlin Robinson, Director of Oil Conservation.

### Importation of Nickel Matte

WASHINGTON, Nov. 11—Nickel matte can now be imported from Australasia provided it is used as ballast in sailing vessels carrying wool and that the maximum quantity to be loaded in any one ship will be 15 per cent of the dead-weight carrying capacity of such ship.

## To Discuss Problems of Reconstruction

Conference of War Service  
Committees Will Meet at  
Atlantic City

WASHINGTON, Nov. 9—Preliminary plans for the War Emergency and Reconstruction Conference of War Service Committees to be held at Atlantic City, Dec. 4, 5 and 6, are announced by the Chamber of Commerce of the United States.

Reconstruction will be given a prominent place on the program, as it is recognized this subject must be taken up by business men to the end that there may be placed at the command of the Government all available sources of information. The work of reconstruction suggests the creation of a federation of all war service committees that whatever study and planning is carried on may be on behalf of all business. War industries and non-war industries are concerned equally in the determination of reconstruction problems. All European countries already are under way with reconstruction plans.

The Atlantic City conference, a call for which was sent out last week by the War Service Executive Committee of the Chamber of Commerce of the United States, will include four general sessions and numerous group and committee meetings. Into the final session will be brought for final action all the proceedings of the meetings.

There will be four general sessions participated in by all the delegates. On Dec. 4 there will be both morning and afternoon sessions, and on the 5th and 6th morning sessions. The chamber is engaged now in obtaining the best speakers available to discuss among others the following suggestions: Reconstruction, industrial relations, raw materials and their control, price control, economic legislation affecting combinations, export and import operations, finance, etc.

The conference will be divided into groups at three sessions, the first to be held on the evening of Dec. 4, the second

EXPORTS OF AUTOMOBILES, TRUCKS AND PARTS FROM NEW YORK TO LATIN-AMERICAN COUNTRIES DURING NINE MONTHS ENDING SEPTEMBER, 1918

	Cars		Trucks		Value of Parts
	Number	Value	Number	Value	
Argentina .....	991	\$1,065,323	33	\$32,921	\$1,135,144
Bolivia .....	11	15,191	2	9,000	4,850
Brazil .....	1,033	766,278	35	37,114	187,733
Chile .....	1,477	1,854,682	81	98,097	358,870
Colombia .....	99	69,711	1	600	20,197
Costa Rica .....	41	20,100	..	..	1,034
Cuba .....	512	586,619	227	523,665	563,787
Ecuador .....	58	61,177	..	..	6,243
Guatemala .....	5	8,099	1	322	2,704
Haiti .....	79	44,790	9	8,789	18,126
Honduras .....	20	19,927	..	..	5,214
Mexico .....	179	177,407	34	74,110	56,507
Nicaragua .....	29	20,731	..	..	1,150
Panama .....	48	39,043	28	19,623	29,983
Paraguay .....	1	2,500	1	875	763
Peru .....	450	549,301	57	126,535	69,910
Salvador .....	57	32,971	..	..	3,731
Santo Domingo .....	193	149,022	12	10,100	31,415
Uruguay .....	1,107	619,355	11	11,000	117,156
Venezuela .....	95	74,652	5	15,900	40,181
	6,485	\$6,177,379	537	\$968,651	\$2,653,708

on the afternoon of Dec. 5, and the third on the evening of the same day.

On the evening of Dec. 4 each war service committee will meet with its chairman to consider the problems of reconstruction as they affect that particular industry, as well as to take up other problems which the war has demonstrated are vital to industry.

On the afternoon of Dec. 5 the war service committees will meet in groups which are related as to their use of basic materials and as to their distribution problems, etc.

With these groups will meet the commodity or section chiefs of the War Industries Board. Related groups will form themselves into ten major groups on the evening of Dec. 5 to take up the question of raw materials, price control and subjects arising from related group meetings.

After the general meetings of the committees of the related groups and of the major groups it is hoped there will be presented definite recommendations covering the reconstruction period, with the possibility of creating an executive committee empowered to gather data and to function with industries to meet the many problems that the nation's industries will be called upon to solve with the end of the war.

#### Automotive Dealers May Have Lights

WASHINGTON, Nov. 11—Garages, gasoline stations and all automotive dealers are again allowed to illuminate their store or shop windows in New England, New York, Pennsylvania, New Jersey, Delaware, Maryland, District of Columbia, Michigan and Ohio, according to a new ruling by the Fuel Administration.

Under the new order the store or shop window lighting is only restricted when the store is closed and then only on the "lightless nights." Throughout the rest of the country lighting restrictions have relaxed to the extent that they are left to the discretion of the State Fuel Administrators.

The new order prohibits the use of light for illuminating advertisements, announcements or signs or for the external lighting of any building and for displaying a shop window when the shop is not opened for business on Monday, Tuesday, Wednesday and Thursday of each week in New England, Maryland and the District of Columbia.

The order also provides for the entire discontinuance of such use of light Monday and Tuesday of each week in Michigan and Ohio, and in any other State where the Fuel Administration may so order.

#### Driggs-Seabury to Redeem Bonds

NEW YORK, Nov. 12—All first mortgage 6 per cent gold bonds issued by the Driggs-Seabury Ordnance Co. (now the Savage Arms Corp.) other than those maturing Dec. 31, 1918, are called for redemption on Dec. 31 next at 101 per cent of the principal, together with interest.

## Buda Engineers Test New Fuel

### Dasey Says an Inexpensive Re-worked Gasoline Will Be Soon Available

CHICAGO, Nov. 9—Passenger cars could be run 50,000 miles without the need for taking up a bearing, and truck engines would require much less repairing and would last much longer if they were all equipped with good air cleaners. This statement was one of two features of the discussion of a paper on "Lubrication and Fuel Tests on the Buda Tractor-Type Engine" presented by P. J. Dasey, sales and research engineer of the Buda company, to the season's first monthly meeting of the Mid-West Section of the Society of Automotive Engineers last night.

Another feature that made the engineers and dealers at the meeting sit up and take notice was Mr. Dasey's suggestion that there probably would be commercially available in a short time a new fuel—a re-worked petroleum product which would cost much less than gasoline but which, except for ease of starting and for extremely high-speed engines, has as good power and fuel economy characteristics as gasoline.

This product Mr. Dasey in his paper calls synthetic crude, and his paper was devoted chiefly to reports of careful tests in the Buda laboratories of this fuel in comparison with four other fuels, namely, gasoline, cracked benzine, cracked gasoline and kerosene. These tests were made on the new Buda tractor engine model HTU, whose normal speed is 1000 r.p.m., and using a standard Stromberg carbureter.

Summarizing the tests on these fuels and averaging the results of five runs on each fuel for power and economy at different speeds, he found the following in brake horsepower-hours per gallon:

	B.h.p.-Hr. per Gal.
Commercial Gasoline.....	7.80
Cracked Gasoline.....	7.92
Synthetic Crude.....	8.02
Cracked Benzine.....	8.23

The crying need for air cleaners, not only on tractors but on trucks as well, was emphasized. He stated that the Buda factory service men were required to send in samples of the crankcase oil every time they went out on a case of engine trouble. This oil was tested, and in practically every instance of piston scoring, bearing wear and similar troubles, the oil was found highly charged with dirt. It is his belief that the greatest immediate need of the truck field is the universal adoption of some efficient form of air cleaner.

#### Motor Trucks Important in Haulage of Food

WASHINGTON, Nov. 8—That the world will look to America for food and that the motor trucks of the nation will be exceedingly important in hauling food

supplies to shipping points, is the statement of Edward N. Hurley, chairman of the United States Shipping Board, in a letter to the Highways Transport Committee, in which he urges the committee to do its utmost to develop the haulage of food by trucks throughout this country. Following is the letter by Mr. Hurley:

Highways Transport Committee, Council of National Defense—Our merchant marine of to-day and to-morrow will carry a message of good will to the nations of the world.

Millions of cruelly starved folk face westward from every shore with mouths open to the promise of America. These must be fed—and then clothed—and also supplied with the other necessities of life. Our grand privilege is now here to restore life, strength and hope to these martyred brothers of a hundred tongues.

Food must start to flow quickly from every hill and through every valley of the great country behind our shores. Highways Transport must first carry supplies to shipping points before we can start our ships from the ports, and fulfill our promise.

Highways Transport facilities at the farmer's gate—and at every farmer's gate—must immediately suggest the initial phase of ocean transport.

With the promise of the war's end before us the Highways Transport Committee throughout this land could and should render a peace-time service by stimulating highways transport of nourishment and supplies so badly needed. Routes and channels from country to shipping points must be opened up and be efficiently maintained. Resistance in any form to the free flow must be reduced and eliminated. Power and consequently more efficient utilization of man power must be brought about wherever possible.

The United States Shipping Board urges that this message be carried through you and your Regional Chairmen to the state organizations and down through to the great body of patriotic men whose vision can well embrace the crying need of their brothers in other lands for help.—United States Shipping Board, by Edward N. Hurley, Chairman.

#### Joint Highway Meeting in Chicago

WASHINGTON, Nov. 11—A joint meeting will be held in Chicago Dec. 4 of the American Association of State Highway Officials and the Highway Industries Association. Highway and transportation experts will tell of the needs of road construction and of the value of the use of motor trucks for handling freight.

The feasibility of the bill introduced in the Senate by Senator Chamberlain and referred to the Committee on Military Affairs which provides the appropriating of \$100,000,000 for the construction and maintenance of a system of national and State highways, designated to facilitate the movement of troops, equipment, munitions and supplies, will also be discussed at this meeting and plans made to assist in the enactment of it into a law.

This is the first concerted effort of these two bodies, and as there will be present from each State the highway commissioners, the men who really have great weight when it comes to enacting State highway regulations, the meeting should be fraught with much good.

## Buda Develops New Tractor Engine

Similar to Truck Type but Has Detachable Head with Plugs Directly in Cylinders

HARVEY, ILL., Nov. 11—Just how the design of an engine for tractor service must differ from a truck engine is brought out in the new Buda tractor engine, known as the Model HTU. This is the engine used in the Parrett tractor.

The engine is fundamentally identical with the standard Buda HU truck engine, such as is being installed in the Nash Quad for government service. The only differences between the new HTU and the HU are those differences occasioned by the different needs of tractor service as compared with truck service.

The tractor engine, however, differs in that it is made with a removable cylinder head to permit greater accessibility for carbon removal and valve grinding, and more important, the spark plugs are inserted directly into the cylinder head castings, instead of passing through port plugs. This permits the cooling water to be brought up very closely to the spark plug, and also puts the plugs in a better location with reference to the combustion space. The water circulation can therefore be made more ample, with the removable cylinder head, a feature which is necessary under the continued full load conditions of tractor service.

Provision is also made for mounting the fan-driving pulley in front of the gearcase cover, accommodating a flat belt 2 in. in width, and a pad is cast integral with the gearcase cover, on which to mount a fan bracket. This extra large fan belt is provided for to give greater assurance of cooling necessitated by the fact that the tractor engine works at very nearly full load most of the time, and its "road speed" is so low that little assistance can be expected from that source. Lubrication through all bearings is made more certain, under field conditions, by having the oil pan divided, a feature which is not necessary in a regular truck installation. It is worth while, also, to call attention to the S. A. E. flange which is provided for mounting a starting motor, and the generator.

### To Build Fordsons in Mexico

TAMPICO, MEXICO, Nov. 11—It is stated here that the manufacture of Fordson tractors in Mexico will be done by a company which will be organized for that purpose under the laws of Mexico. The commission sent to Mexico by Henry Ford has made its investigations and returned to make its report, which it is understood is entirely favorable to the project.

It is expected that the engineers of the Ford Motor company will arrive in Mexico in about a month and that Monclova, Coahuila, will be the point at which the factory will be built, as it is the most



*The championship banner that was presented last week to the Nordyke & Marmon Co., Indianapolis, for exceeding its October quota of Liberty engines by 246 per cent*

favorable point at which coal and iron can be had for making the steel parts of the tractors.

Mexican products will be used in the manufacture of the tractors and Mr. Ford has declared that none of the money made in the business will be taken out of the country but will be used in increasing the output and increasing the wages and bettering the condition of the employees.

### Illinois to Mark its Highways

CHICAGO, Nov. 9—Now that the direct reason for its formation has been brought to a successful conclusion, and the good roads bond issue has been approved by the voters of the state, the Illinois Highways Improvement Association will not cease its existence, but already has turned its attention to the matter of regulating the marking of the highways and replacing the present conglomerate, unsystematic method of signboarding the roads with some sort of systematic plan providing for standardized signboards giving definite information and on logical routes.

It is possible that a comprehensive plan similar to that the Wisconsin Highways commission has been putting into effect, will be adopted. William G. Edens, president of the Illinois Highways Association has this plan under consideration. In Wisconsin, all the main thoroughfares are officially designated by number, and signs bearing these figures inclosed in a triangle are to be found at frequent intervals along the roads thus far marked. Thus, a motorist driving from one town in Wisconsin to another, follows a route which bears the same number all the way.

## Casting Metal Under Pressure

New Process Similar to Die Casting Developed—Greater Tensile Strength Obtained

NEW YORK, Nov. 12—A metal casting process similar to die casting, but employing much higher pressures and improving the physical qualities of the alloy has been developed by the Morris Engineering Co., 39 Cortlandt Street, New York. As compared with sand castings of the same alloys, castings made by the Morris process are said to possess greater tensile strength and increased density, and to be free from blow holes. The crystalline structure is said to be finer and the machinery qualities are improved.

By the Morris process the molten alloy is poured into metal molds and subjected to high pressure while congealing. Fuse bodies for shrapnel have been made by this process in large numbers, the alloy used containing 80 per cent aluminum and 20 per cent zinc.

### Operations Automatic

The castings are made in an automatic machine which has a capacity of several hundred per hour. Various alloys have been used, including one containing 60 per cent of copper, 40 per cent of zinc and a trace of lead, which when cast by this process shows a tensile strength of 49,500 lbs. per sq. in., an elastic limit of 29,750 lb., and an elongation of 45.5 per cent in 2 in. Another alloy, containing 86.5 per cent of aluminum, 12 per cent of zinc and 1.5 per cent of copper, has a tensile strength of 42,700 lb. per sq. in., an elastic limit of 29,400 lb. and an elongation of 12.5 per cent in 2 in. In the case of the British fuse bodies referred to above, the specifications call for a composition of 80 per cent aluminum and 20 per cent zinc, which must show an elongation of 7 per cent in 2 in. It is stated that the average of 16 tests made on samples of this alloy produced by the Morris process showed an elongation of 14.47 per cent in 2 in., with a tensile strength of 41,440 lb. and an elastic limit of 30,400 lb. The quality of the castings obtained by this process may be judged from the statement made that in filling this order the loss due to rejections amounted to only 5 per cent.

The 90-10 aluminum-copper alloy used for the fuse bodies has been subjected to tests by the U. S. Bureau of Standards and the results compared with tests made on sand castings of the same alloy. Following is an extract from the report made by the Bureau:

"The 10 per cent copper-aluminum alloy as sand cast showed a normal tensile strength of approximately 20,000 lb. per sq. in., with an elongation of approximately 1 per cent (forged) as compared with tensile strengths of from 35,000 to 40,000 lb. per sq. in. and elongation of from 8 to 10 per cent of the same alloy when in the drop forged condition. The strength of the drop forging is almost



double, the ductility from 5 to 10 times as great, the toughness, therefore, from 10 to 20 times as great as that of the sand casting.

"Hard castings can be produced in sand or in dies but they are without exception brittle, having very little ductility."

#### Castings Under Pressure

Alloys of aluminum, copper and iron have been cast by this process which have desirable property of a low coefficient of heat expansion. Such an alloy is said to be well suited for use in internal combustion engine pistons, overcoming some of the difficulties due to the high heat expansion of the ordinary aluminum alloys. Tests of fragments from the frame-work of a Zeppelin show a composition similar to that employed by the Morris company, namely, 91.2 per cent aluminum, 4.13 per cent copper and 3.27 per cent iron. It is believed that the iron was introduced in this alloy intentionally and that it is largely responsible for the high tensile strength, about 40,000 lb. per sq. in. This Zeppelin alloy is similar to one recommended for engine piston cast by the Morris process, the composition being covered by U. S. patent No. 1,227,174.

It is believed that there will be a wide field for the new process in the manufacture of parts for aircraft and automobile engines which have to combine strength with lightness. It is claimed for the process that the physical properties and machining qualities are absolutely under control and that alloys can be handled by it which formerly were impossible. The process is covered by patents in the United States and all important foreign countries.

#### Bituminous Coal Production

WASHINGTON, Nov. 12—Bituminous coal production for the week ended Nov. 2 was 10,965,000 tons, a decrease of 3 per cent, as compared with the preceding week, and practically equivalent to the production of the similar period of 1917. The decrease was caused by the influenza epidemic. Production of bituminous coal from April 1, 1918, to date was 368,858,000 tons, as compared with 326,421,000 tons in the same period last year, an increase of 42,437,000 tons.

Anthracyte production for the week ended Nov. 2 was 1,500,000 tons, as compared with 1,714,000 tons during the preceding week, a decrease of 12.5 per cent.

Production during the week ended Oct. 26 was decreased from 100 per cent by labor shortage, 9 per cent; car shortage, 8.4 per cent; mine disability, 2.6 per cent; all other causes, 1.6 per cent; total, 21.6 per cent.

#### Detroit Office for Lakewood

DETROIT, Nov. 9—The Lakewood Engineering Co., Cleveland, has opened an office in the David Whitney Building, Detroit. R. C. Kimball has been appointed district manager, and will co-operate with manufacturers in the solution of factory transportation problems.

## Rubber Imports Gain in October

### Tonnage for Month Well Ahead of September—Total for Year is Slowly Gaining

NEW YORK, Nov. 13—Imports of crude rubber took a considerable spurt during the month of October, the total tonnage coming in being 4358 tons greater than came in during September. October of this year shows a loss of 461 tons imported as compared with last October, though the total for the year up to date is slowly catching up to the total for the same period last year.

During the first 10 months of 1917 a total of 145,295 tons of crude was imported. During the same period this year imports totalled 140,641 tons, the difference being 4654 tons. This is substantially the amount by which the October imports this year exceeded those of September. Following are the statistics as compiled by the Rubber Association of America:

	1917 Tons	1918 Tons
January .....	12,788	16,084
February .....	10,162	13,108
March .....	18,624	17,161
April .....	13,000	12,703
May .....	18,411	16,288
June .....	15,096	24,124
July .....	17,290	16,092
August .....	17,290	10,421
September .....	13,664	5,151
October .....	8,970	9,509
Totals .....	145,295	140,641

#### Dealers Gather for Implement Convention

OMAHA, Nov. 12—Dealers are coming in early for the tenth annual convention of the Mid-West Implement Dealers' Association. Convention will open officially at 9 o'clock to-morrow morning. Owing to conditions in this territory, past and present, a record breaking attendance is anticipated. An interesting program on the line with resumption of industrial activity has been prepared.

Tractors will occupy a prominent place on the program, but will be handled through the question box rather than by direct addresses. A large and representative display of farm operative implement and tractors is being installed in the Municipal Auditorium, and will be a big feature of the convention.

Included in this exhibit are tractors of the following makes: Nison, Allis-Chalmers, International, Mohine, Wallis, Emerson-Brantingham, Avery, Appleton, Bull, Wisconsin, Cleveland, Parrett, Case, Huber, Advance-Rumley, Hart-Parr, Turner and Townsend.

The implement display covers most of the well-known makers of farm equipment on the market. The motor car interests of Omaha are well represented in the tractor display, as tractors are shown by the J. T. Stewart Motor Co.,

Noyes-Killy Motor Co., Jones-Opper Co., Nebraska White Co. and the Hanson-Tyler Auto Co.

#### New Export Representative

NEW YORK, Nov. 13—Reed, Tilley & Co. has been formed with a capitalization of \$60,000, and will operate as an exporter and foreign manufacturers' representative in South and Central America, Mexico and the West Indies. The company will deal principally in passenger cars, trucks, motorcycles, tires, accessories, tractors, farm lighting systems and electrical supplies. H. A. Reed is the moving spirit behind the new company, which includes Hector J. Tilley, of Tilley, Ramos & Co., and Rufus S. Cole, of the Robertson-Cole Co. The new company has acquired a controlling interest in Tilley, Ramos & Co., thereby acquiring an active branch at Santiago, Chile, in charge of Julian Ramos. The company will also handle the Latin-American business of the Robertson-Cole Co., including Roamer and Harroun automobiles, Reading-Standard motorcycles and Smith motor wheels. The company is also negotiating with other concerns for South American representation. It is planned to establish branch offices in Buenos Aires, Argentina and St. Paulo.

#### Detroit S. A. E. to Hear Wardrop

DETROIT, Nov. 9—The Detroit Section, Society of Automotive Engineers, will hold its regular meeting at the Hotel Pontchartrain convention hall Nov. 29. A government film, "Process of Manufacture of the Liberty Engine," will be shown, after which G. Douglas Wardrop, managing editor of Aerial Age Weekly, who has just returned from France, will deliver a lecture on "The War in the Air."

#### 4800 Miles of Road for Illinois

CHICAGO, Nov. 8—Illinois will begin the construction of 4800 miles of improved roads immediately after the declaration of peace. This is the largest single road project ever proposed, and is made possible by the popular voting of a \$60,000,000 bond issue by the people of the State at the election Tuesday.

#### New Home for Highway Trailer

EDGERTON, WIS., Nov. 11—The Highway Trailer Co., Edgerton, Wis., expects to take occupancy of a large manufacturing addition made necessary by its extensive Government contracts before Dec. 1. The addition gives the company a building 500 ft. long and averaging 75 ft. in width. A new steam heating plant is being installed throughout the factory.

#### American Road Builders to Meet in New York

NEW YORK, Nov. 14—The American Road Builders Association will hold its sixteenth annual convention in New York. The convention will open on Tuesday, Feb. 25 and close on Friday, Feb. 28. There will be technical sessions twice each day and a dinner on one evening.

## U.S. Photographers' Fine Record

100,000 Prints of Aerial Photos in Four Days on Western Front

WASHINGTON, Nov. 8.—Over 100,000 prints of aerial photographs had to be changed out in four days by the aerial photographic force of the air service during the recent offensive west of Verdun and in the Argonne region, according to an overseas report just received here. The aerial negatives had originally been made by French squadrons operating over the sector, but the production of prints on the large scale necessary had been left to the American service. As the offensive was in the nature of a surprise, all the preparatory work, especially the bringing up of American air squadrons, had to be concealed up to the last minute.

The American photographic force was brought together and travelled all night to headquarters, arriving at 9 a. m. By 10 a. m. a laboratory had been improvised in the shed of a brewery and the printing was actually in progress. During the first night, with most limited facilities, 3000 prints were made, and later a record of 9000 prints in 16 hours for a single photographic section established, the latter made possible only by carrying all the water in buckets from a considerable distance.

During the offensive the advance of the troops was so rapid that nearly all the planes and observers were occupied in making visual observations and regulating artillery fire. Aerial photographs, however, were made by the American forces of the results of heavy artillery fire, and proved very valuable. A photographic mission also was sent out along the Meuse to ascertain if reports were correct that all the bridges were down. The results were so good that the exact number of troops, trucks and even machine gun companies in movement at that hour was ascertained.

Valuable lessons were learned in this largest operation of the photographic section yet carried out overseas.

"All of this work," the report says, "was done under the crudest possible conditions, and the results speak very highly for the quality of our men, their ability, resourcefulness and endurance, for there was very little sleep for anyone during those 4 days, but the men all realized the importance of their work and took particular pride in it."

"Photographic sections will from now on be subjected to work under extremely difficult conditions. The area over which the advances are made is usually entirely torn up by the artillery and no shelter of any kind is available, transportation facilities are limited, barracks extremely scarce, and photographic sections often left to shift for themselves. The ingenuity and push of the photographic officer is taxed to the limit."

This report from overseas has given many suggestions for speeding up the training work in this country, particularly the constant references throughout as to the necessity of a highly skilled personnel. As a result the selection of men to train will be somewhat more in-

tensive and an effort will be made to reach the very limited number of men already skilled in photography.

At present there is a shortage of properly skilled photographers. Several hundred men having a thorough knowledge of the manipulation of all kinds of cameras, both speed and view, laboratory work, photographic chemistry, lenses and the working of panchromatic plates are needed at once. Such men may be inducted through the Air Service Test Boards at the following places:

104 Broad St.	.....New York
Second and Market Streets	.....San Francisco
230 East Ohio Street	.....Chicago
739 Boylston Street	.....Boston
610 Locust Street	.....St. Louis
Eleventh and Main Streets	.....Kansas City
Old Army Bldg.	.....Cleveland
Care of Postmaster	.....Los Angeles
159 West Water Street	.....Milwaukee
Chamber of Commerce	.....Cincinnati
Kelly Field	.....San Antonio
Air Service Mechanics School	.....Overland
Building	.....St. Paul

### United Motors Formally Dissolves

NEW YORK, Nov. 12.—The United Motors Corp. has ratified the plan under which this company is to be absorbed by the General Motors Corp. Under the terms General Motors will assume all liabilities and acquire the property of the United company in exchange for 110,164 shares of its common and 330,492 shares of its preferred stock. United Motors stockholders will receive for each 10 shares of stock 3 shares of General Motors preferred and 1 share of common. Cash is to be paid in lieu of fractional shares on the basis of 80 per cent per share for General Motors preferred and \$125 for common.

### Postpone Metropolitan S. A. E. Trip

NEW YORK, Nov. 9.—The trip of the Metropolitan Section of the S. A. E. to the Wright-Martin plant in New Brunswick, N. J., has been abandoned. The Long Island City plant of the company will be visited instead on November 30.

### Economic Aid to Russia

WASHINGTON, Nov. 8.—The War Trade Board of the United States Russian Bureau, Incorporated, has been organized as a corporation of the United States to render unselfish economic aid to Russia. The capital of the corporation is placed at \$5,000,000, the amount of the revolving fund which has been placed at the disposal of the War Trade Board for financing the plans and policies of economic assistance to the Russian people.

### Enlarge Camp Holabird Barracks

WASHINGTON, Nov. 9.—To provide accommodations for 3000 additional men who will be stationed at the motor truck repair depot, officially known as the Mechanical Repair Shop Unit at Camp Holabird, Md., the Construction Division of the Army has been authorized to proceed with work which will cost approximately \$798,000. Barracks will be erected and the water supply will be increased. Additional roads will be built in and around the camp.

## Germany's Gasoline Cut Off

Armistice With Austria Stops All Supplies of Gasoline and Fuel Oil

WASHINGTON, Nov. 7.—The armistice with Austria and the consequent stoppage of all traffic between that country and Germany will cut off all of Germany's supplies of fuel oil and gasoline, according to present information in the hands of the United States Fuel Administration.

Germany has been obtaining fuel oil and gasoline from Galatia and Roumania and was planning to import extensively from the oil fields of the Caucasus. She has no supplies of fuel oil within her own borders and has been using for lubricating oil a derivative of coal tar—benzol. This latter source, however, does not supply her wants.

Italy, which is entirely dependent upon outside source for its coal supply, will not be able to get coal from Austria which has hardly enough for its own use. Germany has in the past occasionally supplied Austria with coal. The Austrian coal mines when worked to full capacity furnish sufficient coal for that country's needs. During recent months, however, because of enfeebled conditions of the Austrian miners—due to lack of food—the coal mines have yielded only from 50 to 60 per cent of their full capacity. The miners have been forced to spend about 3 days of the week gathering such meager supplies of food as they could lay their hands on.

The demobilization of the army will permit the return to the mines of miners in good physical trim and there may be no great suffering in Austria because of lack of coal this winter.

The armistice also, it was pointed out, will relieve the food situation in Austria. In the army the soldiers have been getting much better food than they were accustomed to in civil life. Austrian coal miners, for instance, before the war ate meat only a few times a year, whereas they have been obtaining it daily in the army.

### Pierce Net Surplus \$886,759 for 3 Months

BUFFALO, Nov. 11.—For the 3 months ending Sept. 30, 1918, the Pierce-Arrow Motor Car Co. reports a net surplus of \$886,759 after charges and war taxes are deducted. This is equivalent to \$2.74 per share on the 250,000 shares of common stock after allowing for dividend requirements on the preferred. A year ago the earnings on the common stock during the corresponding quarter were \$5.94 per share, but this figure was arrived at without deducting war taxes. Net operating profits for the 3 months amounted to \$1,338,129, as against \$1,809,729 for the corresponding quarter of 1917, a decrease of \$471,600.

## Contract Adjustment Board Created

Will Hear and Judge Claims Arising Under War Department Contracts

WASHINGTON, Nov. 7—A Board of Contract Adjustment has been created by the Secretary of War to hear and judge all claims arising under contracts made by the War Department. The board is clothed with all necessary powers.

Through the operation of the Board of Contract Adjustment contractors supplying the army will be able to submit any differences that may arise between them and the contracting officers of the various supply bureaus to this board, which will act without any of the technicalities of court procedure, thus insuring a speedy and equitable adjustment. The services of lawyers will not be necessary, as the contractor or his representative may appear before the board and state his case freely and fully with the assurance that he will be given an impartial hearing and a prompt decision. The decisions of the board will be final and conclusive on all matters submitted to it for determination, but appeals may be made to the Secretary of War.

The members appointed on the Board of Contract Adjustment by the Secretary of War are Lt. Col. Christopher B. Garnett (chairman), Lt. Col. H. H. Lehman and Lt. Col. Edward S. Malone. Lt. Col. Garnett was formerly chairman of the Corporation Commission of Virginia, Lt. Col. Lehman is chief of the Methods Section, Purchase Branch, Purchase, Storage and Traffic Division, and Lt. Col. Malone was Assistant Corporation Counsel of New York City for the Borough of Queens. The legal adviser of the Board will be a Judge Advocate appointed by the examiners, who will be commissioned officers of the United States Army and appointed by the Director of the Purchase, Storage and Traffic Division. The office of the Board of Contract Adjustment will be in Washington, but hearings may be held in such other places as may be expedient and necessary for the proper performance of its duties.

### Army Charting Air Lanes

WASHINGTON, Nov. 11—The Air Service of the Army has commenced charting the air lanes over the United States. This work, started for a training of map makers for the A. E. F., it is expected, will be invaluable for the development of the Air Service for the future. The charts are mosaics made by stereopticon cameras showing all the landmarks such as waterways, railroads, cities and mountains for pilots to follow in their cross country flights. These courses are laid out according to the season of the year and depend considerably on the atmospheric conditions reported by the Government Weather Bureau.

At Kelly Field the instructors and the members of their classes work with the aid of the planes carrying the cameras; photographic lorries and motor trucks carrying the photographic material and supplies, and also a portable dark room for developing and printing the plates and films exposed. Such an outfit is usually set up in the district to be photographed in some town which has a landing field adjacent to it. The men employed in the work are rationed from this camp and the developing and printing of the films and plates delivered by the planes are all down here. As fast as one district or zone is finished the outfit moves on to the next.

### Aviators Receive Hospitality

WASHINGTON, Nov. 11—Cities and towns of the Southwest under the air lanes used by Army flyers are rivaling each other in their hospitality to aviators. They are building landing fields, organizing the inhabitants into reception committees and raising money for entertainment. One town, which calls itself "The Dynamo of Central Texas," is sending out invitations by cards to flyers. The cards read:

"Upon presentation of this card all courtesies will be offered you, including shower and pool baths at the Y. M. C. A.'s \$87,000 plant, Country Club's \$75,000 plant, Elks Club's \$47,000 plant. Coffee and sandwiches will be handed out by the Red Cross cantines; hair cut, shave and shine given free at any barber shop; cold drinks at the soda water fountains, also local carfare."

### Liberty Engine Builders Form Association

INDIANAPOLIS, Nov. 11—The men and women building Liberty airplane engines have formed an association in which they pledge themselves to use every effort to keep production at its topmost point. Following the unveiling of a 10,000th motor at Detroit three weeks ago, the United States Liberty Motor League was formed. It now has a membership of over 25,000 workers, in some 600 plants, making Liberty engines and Liberty engine parts, and every day finds thousands more applications. It has been by means such as this League and other methods of keeping the airplane builders' energies at high pitch that the great increase in production for the last month was accomplished.

### Return Loads Bureaus in Canada

MONTREAL, Nov. 11—Arrangements are going ahead whereby the return load system is being got into tangible shape here; already arrangements are being made for a service between Montreal and Schenectady, taking in the entire route between these two points; it is also being arranged to put on a regular service between Montreal, Three Rivers and Quebec, in addition to a constant daily service around the entire Island of Montreal.

## Army Motor Vehicle Control Unified

Motor Transport Corps to Operate All Passenger Cars and Trucks

WASHINGTON, Nov. 11—The pooling of the motor vehicle equipment of the Army under the control of the Motor Transport Corps has proved so successful in the District of Columbia, where it was first tried, as recently announced in AUTOMOTIVE INDUSTRIES, that the system will be extended throughout the United States.

All passenger and cargo-carrying vehicles are included in the order, the effect of which will be to give a more efficient motor transportation service for the Army with a greatly reduced equipment. Heretofore motor vehicles have been assigned to the various departments for their exclusive use. Under the new plan they will be operated under one control and for the benefit of all departments.

In Washington, where the need for passenger cars for official business is great, an elaborate taxi system has been established, consisting of 13 stations connected with an adequate system of telephones. Officers above the rank of captain are provided with cards entitling them to call Government cars when needed, for official business only. Junior officers and civil service employees must have trip tickets to gain the use of the special motor car service. A bus service, operated on schedule between the principal buildings occupied by Army organizations, provides transport over regular routes for officers and employees on official business.

These arrangements have made it possible to reduce the large number of motor cars formerly assigned to officers for their individual use to 23. Only the heads of departments, corps and bureaus are entitled to have cars assigned to them individually. The new system will reduce the motor equipment necessary for the Army's use by about 33 per cent. The vehicles released from domestic service will be available for overseas duty.

Joy riding, the evasion of State license fees by privately owned vehicles masquerading as Government cars and other abuses will be prevented by the rule requiring all army trucks, cars and motorcycles to be painted olive drab and stenciled on the sides and rear in block letters 4 in. high "U. S. A.," followed by the registration number assigned to the car in the office of the Chief of the Motor Transport Corps, and by the words "For official use only."

All chauffeurs will be limited service enlisted men, and will be under military discipline. A complete manual of their duties has been prepared. All persons making use of the motor car service are required to sign for each trip. This makes the use of the service for private



# M.T.C. Organization Completed

**Drake Now Head and Furlow  
Deputy Chief; Seaman in  
Executive Charge**

WASHINGTON, Nov. 9.—The Motor Transport Corps under Brig.-Gen. C. B. Drake, which has charge of engineering, operation and maintenance of the motor vehicles of the Army excepting tanks and tractors, has completed its organization. General Drake is at the head with Col. James W. Furlow as Deputy Chief, supervising the executive maintenance, engineering and liaison divisions. Lt.-Col. B. F. Miller is the assisting deputy supervising property and operating divisions. Lt.-Col. Edward Orton, Jr., is in charge of the service division.

Col. A. O. Seaman of the General Staff is in charge of the executive division, controlling administration, personnel, training, distribution of vehicles, and requisitions and orders to purchase. Col. W. H. Noble heads the property division, John Younger the engineering division and Lt.-Col. W. D. Uhler the operating division. George E. Randles, who was formerly with the Foote-Burte Co. of Cleveland and who had charge of maintenance under Christian Girl, is in charge of the maintenance division controlling the advisory and planning, base and field shops, spare parts and accessories, machinery and tools, crating, motor transport depots and the salvage and engineering.

General Drake, Col. Furlow, Lt.-Col. Orton, Lt.-Col. Uhler, Younger and Randles were all associated with the original Motor Section under Gen. C. B. Baker and Christian Girl.

## Employment For All Says Frankfurter

WASHINGTON, Nov. 13.—That there will be employment for all in this country and that there need be no unemployment, is the opinion of Chairman Felix Frankfurter of the War Labor Policies Board who has given AUTOMOTIVE INDUSTRIES the following statement on this subject:

There is no occasion whatever for any unemployment or misery in this country. There are enough jobs if we carefully make the adjustment that has to be from an energetic war production basis over to the eventual peace basis. With that end in view the Secretary of War, the Secretary of the Navy and Chairman Hurley of the Fleet Corporation, who are the the big production chiefs, met yesterday and at once began the gradual process of adjustment by agreeing to cut out Sunday work and all overtime on Government contracts.

Secretary Baker has also given orders that there should be not curtailment of war work in the War Department, which is of course the biggest war producing agency, except after consultation with representatives of the War Industries Board and the Department of Labor. The point is that before you cut down that

releases raw material, the War Industries Board should know where the material is and the Department of Labor, through the Employment Service should be able to take up any labor released so that there should be a minimum of dislocation involved in turning the country over to a peace basis.

Chairman Hurley indicated that the ship industry would go on in this country and would need as many men as they have now. The whole process is to guide the thing with the necessary intelligence and foresight. As to the wage scales there should be no quick changes because that would be an unhealthy process. I think we want to make a gradual healthy adjustment. I think if the interests of labor are adequately represented in working out these things, labor with the rest of the interests of the country will accept what changes that are necessary in going over over to a peace basis.

What labor should have is what the country is entitled to have. That is the change should not be one-sided, but fairly representative of the Government, labor and industry.

I think there will be a gradual shifting of labor over to peace jobs. We are trying through the Community War Labor Boards to find out what the local community needs are. Some labor will be shifting of course, but a great deal of the movement of labor has been in the shipyards and Mr. Hurley's anticipation is that the ship industry will continue at its present activity.

Overtime and Sunday work will be cut

out. These were merely necessities of the war emergency abnormal methods. We must fasten our minds on this. The needs of this country and the needs of the world call for great productivity by the United States of all kinds of goods. If we keep our heads and if we work these things out in a co-operative way, there ought to be very little dislocation.

I cannot speak in detail of the definite plans of the Department of Labor. Its problem arises from the demobilization both of men actually under arms and men in industries whose activity will be terminated by the war.

## Highway Traffic Association Now Has National Scope

NEW YORK, Nov. 12.—Yesterday's conference of the Highway Traffic Association of the State of New York, at which the subject of snow removal from trunk highways was discussed at length by representative from the North Atlantic and North Central States and from Canada, was followed by the annual meeting.

At this meeting the necessary steps were taken to widen the field of operation and accordingly the association is now one of National scope, with representatives delegated by the various States. The officers were re-elected, as follows:

Honorary president, William P. ~~Steele~~; president, Arthur H. Blanchard; vice-president, David Beecroft; secretary, Elmer Thompson, and treasurer, George H. Pride.

## LABOR SHORTAGE REPORT FOR WAR DEPT. NOV. 15, 1918.

Your labor needs will be given prompt attention if they are filed at the nearest office of the U.S. Employment Service and if this card is mailed on or before Nov. 15th to Capt. O. Finney, Chief, Industrial Relations Section, Bureau of Aircraft Production, New York District, 380 Madison Ave., N.Y.C. THIS REPORT SHOULD COVER ONLY LABOR SHORTAGE ON AIRCRAFT WORK.

Name of Plant \_\_\_\_\_ Address \_\_\_\_\_

Telephone No. \_\_\_\_\_ At plant ask for \_\_\_\_\_

### OUR IMMEDIATE LABOR NEEDS ARE:

No. Men (White)	Kind of Work	Hours	Rate	Hours Overtime	Rate Overtime

No. Men (Colored) \_\_\_\_\_

No. Women \_\_\_\_\_

No. Boys \_\_\_\_\_

Housing Conditions \_\_\_\_\_

Cost of Board \_\_\_\_\_

Remarks \_\_\_\_\_

If labor is sent to you from other parts of the State, will you  
(1) Pay transportation; (2) Advance transportation?

Signature \_\_\_\_\_

## Organization of the Motor Transport Corps

# AUTOMOTIVE MATERIALS MARKETS

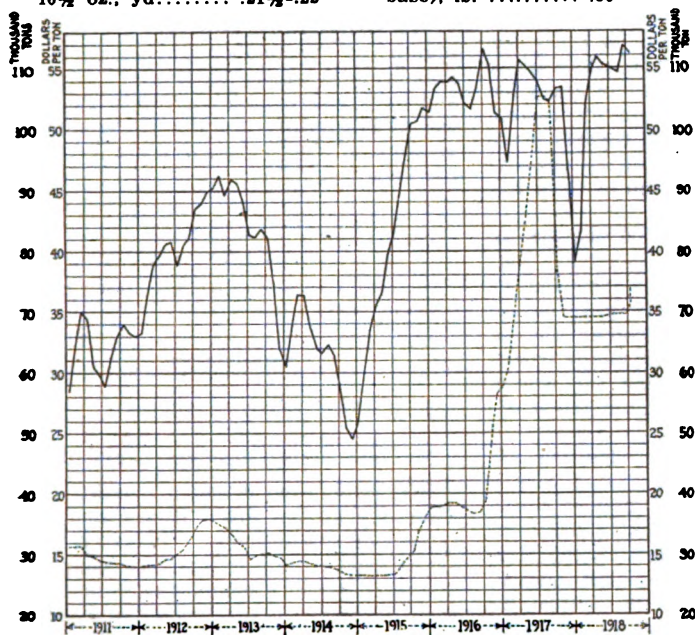
## Materials Market Prices

**Acids:**  
 Muriatic, lb. .... .02-.03  
 Phosphoric (85%).. .35-.39  
 Sulphuric (60), lb.. .006  
**Aluminum:**  
 Ingot, lb. .... .33  
 Sheets (18 gage or more), lb. .... .40  
 Antimony, lb. .... .13%-13%  
**Burlap:**  
 8 oz., yd. .... .17%-17%  
 10 1/2 oz., yd. .... .21%-22

**Copper:**  
 Elec., lb. .... .26  
 Lake, lb. .... .26  
**Fabric, Tire (17 1/2 oz.):**  
 Sea Is., combed, lb.1.65-1.70  
 Egypt, combed, lb.1.25-1.35  
 Egypt, carded, lb.1.20-1.30  
 Peilers, combed, lb.1.05-1.20  
 Peilers, carded, lb. .95-1.05  
**Fibre (1/4 in. sheet base), lb. .... .50**

**Graphite:**  
 Ceylon, lb. .... .07 1/2-.25  
 Madagascar, lb. .... .10 -.15  
 Mexico, lb. .... .03%  
**Lead, lb. .... .08 -.09**  
**Leather:**  
 Hides, lb. .... .18 -.25 1/2  
 Nickel, lb. .... .40  
**Oil:**  
 Gasoline:  
 Auto., gal. .... .24 1/2  
 68 to 70 gal. .... .30 1/2  
**Lard:**  
 Prime City, gal. .2.50  
 Ex. No. 1, gal. .... 1.70  
 Linseed, gal. .... 1.88-1.90  
 Menhaden (Brown) gal. .... 1.30-1.31  
 Petroleum (crude),  
 Kansas, bbl. .... 2.25  
 Pennsylvania, bbl. 4.00

**Rubber:**  
 Ceylon:  
 First latex pale crepe, lb. .... .62  
 Brown, crepe, thin, clear, lb. .... .54  
 Smoked, ribbed sheets, lb. .... .60  
**Para:**  
 Up River, fine, lb. .66  
 Up River, coarse, lb. .... .36 1/2  
 Island, fine, lb. .... .55  
 Shellac (orange), lb. .74 -.76  
 Spelter (orange) .... .08%  
**Steel:**  
 Angle beams and channels, lb. .... .03  
 Automobile sheet (see sp. table).  
 Cold rolled, lb. .... .06 1/2  
 Hot rolled, lb. .... .03 1/2  
 Tin .... .80  
 Tungsten, lb. .... 2.45-2.50  
 Waste (cotton), lb. .... 12%-17

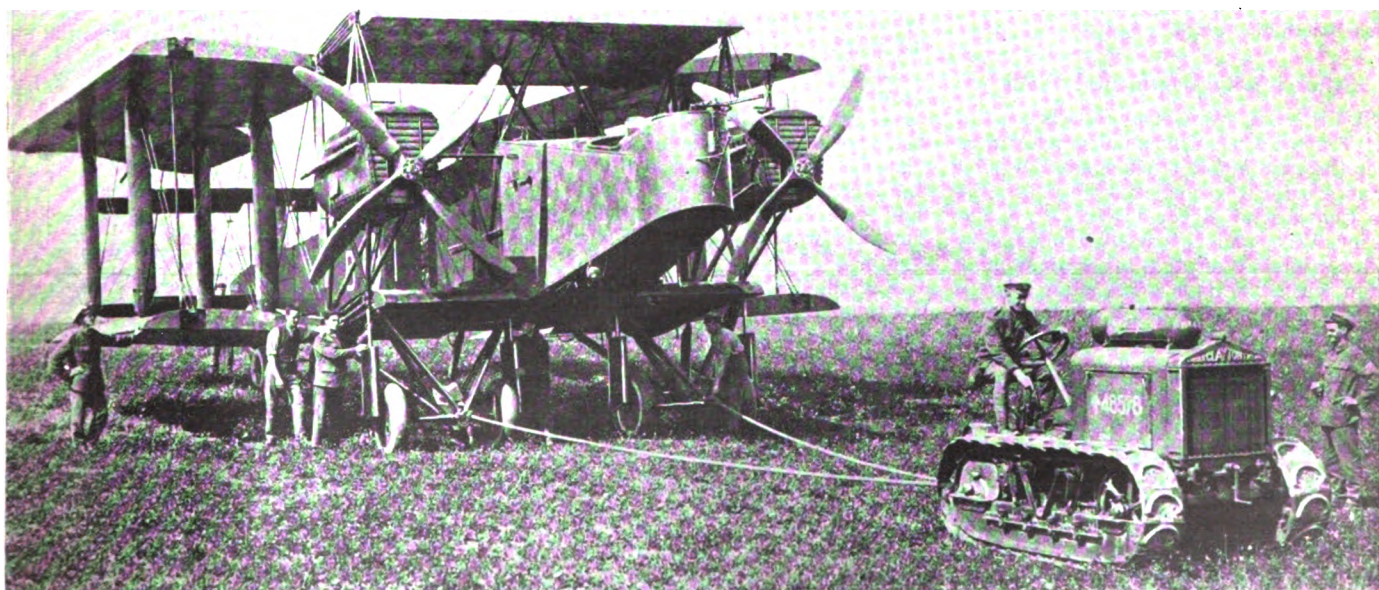


The full line represents the daily production of pig iron, and the dotted line is the average price per ton of No. 2 Southern at Cincinnati, local No. 2 at Chicago and No. 2X iron at Philadelphia. Reproduced from IRON AGE, Nov. 7

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping .....	6.45	6.35
Hood, flat fender, door and apron, or splash guard, stock.....	6.05	5.95
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
<b>Automobile Sheet, Extras for Extreme Widths:</b>		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
<b>Black Sheet Extras to Apply to Narrow Widths:</b>		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		



One of the huge British R. A. F. bombing planes with folding wings being towed into position on the flying field by a creeper type tractor

purposes quite impossible, while the painting and numbering will definitely identify every War Department vehicle.

#### Propose Air Mail Route to Texas

WASHINGTON, Nov. 6—A bill has been introduced into the Senate by Senator Sheppard to investigate the cost and practicability of an aerial mail route to Texas and the Southwest. It was referred to the Committee on Post Offices and Post Roads.

#### S. A. T. C. Graduates 89,824

WASHINGTON, Nov. 6—The Students' Army Training Corps which has charge of the vocational training of enlisted men and officers for the Army between Oct. 1 and Oct. 28, has graduated 89,824 trained soldiers. Of this number 6341 went into the Motor Transport Corps, 2221 into the Tank Corps and 5729 into the Air Service.

#### Urge Saving of Kerosene

WASHINGTON, Nov. 11—A campaign for the conservation of kerosene and coal oil has been started by the Fuel Administration and directed particularly to farmers, who are asked not to use oil heaters and stoves unless necessary, and who are given instructions in the use of kerosene and oil in lamps, to achieve the highest conservation.

#### More Room For F-W-D

CLINTONVILLE, Wis., Nov. 4—The F-W-D Automobile Co. has virtually taken over the entire plant capacity of the Silent Washer Co. of that city for the period of the war in order to meet the new requirements of Government contracts that until further notice all trucks be shipped in boxes. The Silent Washer Co. manufactures domestic washing machines and is prevented from maintaining production of this product by scarcity of materials and necessary curtailment ordered by the War Industries Board.

#### Stinson Gets Continental Plant

SUPERIOR, Wis., Nov. 4—The Stinson Tractor Co., Minneapolis, has taken over the new motor truck manufacturing plant erected for, but never occupied by the Continental Motor Truck Co., in Superior, Wis., and is installing machinery and equipment so that operations may begin within 30 days. The plant will be devoted exclusively to the production of the Stinson tractor.

#### Hamilton Making Aircraft Parts

TWO RIVERS, WIS., Nov. 11—The Hamilton Mfg. Co., Two Rivers, Wis., has received additional contracts for aircraft materials and parts for the Government which will keep the plant fully occupied well into next year. The Hamilton company is supplying material for 4000 airplanes to the Dayton Wright Airplane Co., and will complete this contract by Dec. 24.

## Trucks Show Saving on Wagon Costs

### Official Figures Indicate Enormous Reduction in Operation Cost When Trucks Are Used

WASHINGTON, Nov. 6—Motor truck hauls in 1918 from farm to shipping point averaged 11.3 miles, while wagon hauls averaged 9 miles; and motor trucks made 3.4 round trips daily over the 11.3 mile route while wagons made 1.2 round trips over the 9 mile distance.

The cost of hauling in wagons from farm to shipping point averaged 30 cents per ton a mile for wheat, 33 cents for corn and 48 cents for cotton, while truck or tractor haulage averaged 15 cents for wheat or corn and 18 cents for cotton. These figures are based on reports made by correspondents to the U. S. Department of Agriculture, Bureau of Crop Estimates.

A similar inquiry in 1906 showed an average for wagons of 19 cents per ton-mile for hauling corn or wheat and 27 cents for cotton. This last year naturally found wagon costs higher due to general price increases, but motor trucks show costs lower even than the wagon costs of 1906 due to greater truck efficiency.

The cost of motor truck hauling for wheat varied in different States with 9 cents per-ton-mile in 1918 in East North Central, 10 cents in the East South Central, 14 cents in New England, the Middle Atlantic and the West North Central, 15 cents in the West South Central, 17 cents in the Pacific, 18 cents in the South Atlantic and 29 cents in the Rocky Mountain States.

Wagon hauling by States amounted to 22 cents in the Pacific States, 26 cents in the North Central States east of the Mississippi River, 29 cents in the West North Central, 32 cents in the West South Central, 36 cents in the East South Central, 39 cents in the South Atlantic, and 42 cents in the Rocky Mountain States.

Most farmers use smaller sizes of motor trucks, usually the 1 to 2 ton sizes, and in a number of counties these are trucks converted over passenger chassis. In some cases trailers are used for farm produce. In North Dakota and California tractors, each drawing several wagons, are used for hauling grain.

For the United States as a whole the average wagon load of wheat was 55 bushels in 1906 and 56 bushels in 1918 as against the motor truck loads which averaged 84 bushels. For corn the wagon loads of 1906 and 1918 were 38 bushels and the motor truck loads for 1918 amounted to 58 bushels. The cotton load for 1906 and 1918 by wagon was 3.4 and 3.6 bales respectively as against 6.6 bales hauled by motor trucks in 1918.

#### Hercules Plant Gets Big War Order

CANTON, Ohio, Nov. 4—A \$2,000,000 order for engines to be used in the stand-

ard army trucks has been received by the Hercules Motor Co. from the War Department. The company is now engaged solely on government work and has taken over an additional plant to meet its increased space needs.

#### New Hangars To Be Built

WASHINGTON, Nov. 7—Eleven new hangars will be constructed at the Aerial Gunnery School, Miami, Florida, at a cost of \$660,000. Three new hangars will be built at North Camp Jackson, to cost \$270,110.

#### Allies Get 72 Per Cent of Petroleum Products Exports

WASHINGTON, Nov. 12—During the month of September the exports of petroleum products to England, France and Italy aggregated 45,509,122 gal. valued at \$7,639,191. Details of the exports to each of these countries are given in the following table:

	England	France	Italy
Fuel oil, gal..	12,882,558	537,749	474,686
Illuminating oil, gal.....	7,674,320	4,805,761	.....
Lubricating oil, gal.....	6,221,046	1,468,490	1,366,990
Gasoline, gal..	4,357,588	2,079,863	.....
Other naphthas, gal. ....	2,619,458	.....	1,010,613
	33,764,970	8,891,863	2,852,289
Total value.	\$5,393,820	\$1,418,547	\$336,814

#### Massachusetts Considers Legislation

BOSTON, Nov. 9—At a meeting here Thursday at the State House representatives of the automobile industry, owners of trucks and cars, and accessory men discussed with a committee comprising the Highway Commission, and other State officers the problems of motor legislation. The last legislature passed a resolve calling for an investigation by the Highway Commission, and Secretary of State A. P. Langtry and Thomas W. White of the Administration Board. The subject of increased fees on trucks was the first matter taken up, but that had no sponsors, but a number of objectors who pointed out that with five and six taxes next year increased fees by Massachusetts would not be fair. The weight of loads was thoroughly talked over, whether it would be possible to limit vehicles to a total of 10 tons including the weight of the vehicle; or the use of two smaller vehicles instead of one large machine, etc. The opinion seemed to be that the 14-ton limit now was pretty nearly right for here. The length and width of body were other topics, as were headlights, the controlling of jitneys, the probability of trailers and tractors coming into general use, etc. A committee was appointed to consider a suggestion made by John H. Johnson of the N. A. D. A. that the dealers be divided into three classes, Class A the men who handle cars and trucks as factory representatives and their sub-dealers; Class B those handling used cars solely, and Class C the men who junk cars. It was brought out that many people have dealer licenses who are not entitled to them, and so they will be curtailed next year.



# 150,955 Tractors in 2½ Years

During the First Six Months  
of 1918, 58,543 Were  
Manufactured

WASHINGTON, Nov. 11—Eleven thousand three hundred and eighty-eight tractors were in the hands of manufacturers, in transit or in the hands of dealers in August, 1918, according to a report just filed by the office of farm equipment, United States Department of Agriculture, following an investigation of the tractor situation in this country.

Investigation was for the purpose of securing accurate information to facilitate adequate and equitable distribution of farm tractors throughout the country. In connection with the inquiry a report was received from every tractor maker in the country concerning tractors manufactured and their distribution between Jan. 1, 1916, and July 1, 1918. Following is the summary of the compilation of the replies:

## NUMBER OF TRACTORS MANUFACTURED

1916 .....	29,670
1917 .....	62,742
January 1 to June 30, 1918.....	58,543

Total for 1916, 1917 and first half of 1918 .....

150,955

## NUMBER OF TRACTORS SOLD

### To Users

1916 .....	27,819
1917 .....	49,504

### To Exporters

1917 .....	14,854
1918, first 6 months.....	15,610
Number of tractors on hand, in transit or in hands of dealers at time of report (August, 1918) .....	11,388

## Restrain Milwaukee Tank

WASHINGTON, Nov. 7—The Federal Trade Commission to-day ordered the Milwaukee Tank Co., Milwaukee, makers of automatic measuring oil pumps, tanks and devices for the storage and handling of gasoline and other volatile liquids, to discontinue "divers means and methods of inducing and procuring a large number of its customers and prospective customers and the customers and prospective customers of its competitors to cancel and rescind orders and contracts for the purchase of pumps, tanks and outfits placed with said competitors." The concern agreed to issuance of the Commission's order waiving right to introduce testimony in support of its practices.

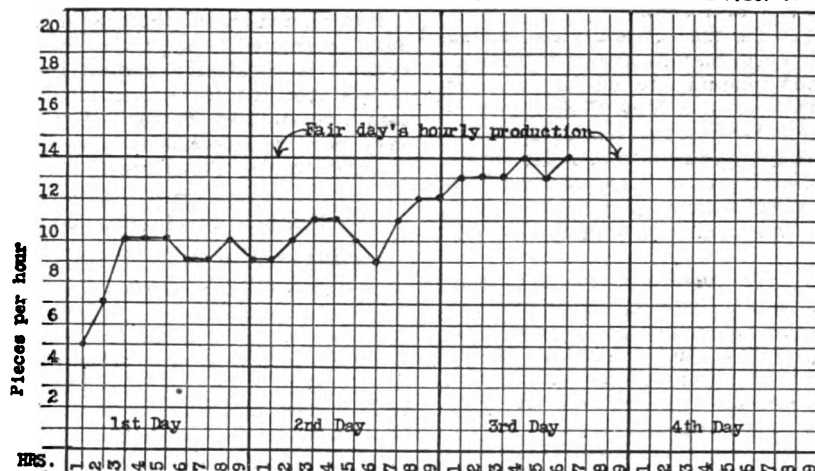
## Westinghouse to Close Indianapolis Office

INDIANAPOLIS, Nov. 4—The Westinghouse Electric & Mfg. Co. will close its local office on Dec. 1 for the period of the war. The business of the territory hitherto handled from Indianapolis will be dealt with at the Chicago office, Conway Building. Prescott C. Ritchie, now in charge at Indianapolis, will manage the Chicago office.

## OPERATOR'S PROGRESS CHART

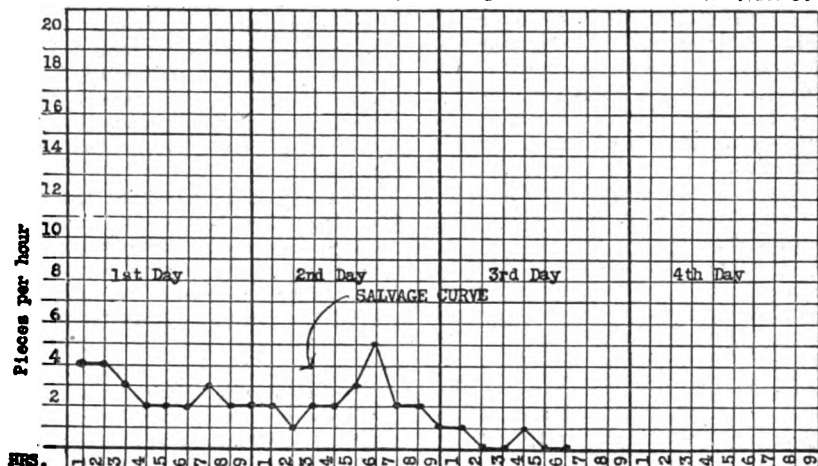
Instruction department record  
PRODUCTION SCALE CHART.

Instructor's Name & No. **RICHARD ROWE 10-076** Part Name & No. **226041**  
Operation No. **2711** Date **8-14-18** Operator's Name & No. **PAUL WEST 69-148**



## SALVAGE SCALE CHART

Instructor's Name & No. **RICHARD ROWE 10-076** Part Name & No. **226041**  
Operation No. **2711** Date **8-14-18** Operator's Name & No. **PAUL WEST 69-148**



THE chief instructor of the training department of a large manufacturing concern engaged upon aircraft production has forwarded to the Training and Dilution Service Department of Labor actual sample copies of their "operator's progress charts." These charts are of unusual interest because they visualize so clearly the value of training unskilled workers. They are reproduced herewith for the benefit of other manufacturers.

A glance at the Production Scale Chart will readily show that in the first hour this unskilled worker was able to turn out 5 pieces of repetition work. But the Salvage Scale Chart registers 4 spoiled parts against him, hence his net production for the first hour was but one part. At the end of his second hour's work his production had increased to seven parts, yet his salvage remained at the same rate as that of the first hour's work. Had he been allowed to continue in the old method of "breaking in," having to work out his own salvation in a sink-or-swim fashion, his salvage would no doubt have remained at the same rate for many days or even weeks to come.

But under the careful guidance of a trained instructor who was there to point out his errors as each part progressed, he was able in the third hour to increase his production to 10 parts and at the same time decrease his salvage to 3. The record of the third hour was maintained during the fourth and fifth, yet his salvage decreased to 2 parts.

The beginning of the second day found him turning out 7 times greater net production than at the start of his first day. And though his salvage fluctuated with his production during this day, his last hour's work showed a greater net production than at any previous time. On the third day his first hour's production was 12 parts with a minimum salvage of 1, the end of the second hour he had raised his production to 13 and entirely eliminated his salvage. By night of the third day's work he had reached a high level of production, viz., 14, with no salvages against him.

The cold facts disclosed in these outline charts show conclusively what can be accomplished by training unskilled and inexperienced workers. The Training and Dilution Service offers the assistance of its experts who will be glad to consult with manufacturers regarding standardized training methods.

## Reconstruction Body Under Consideration

(Continued from page 848)

uted where they will do the most good. It is stated that war orders will not be cancelled in a wholesale way until some such plan is developed.

So much for the national phase of the matter. Local manufacturers in various population centers are on the anxious seat. This week in New York a conference of employers, representing 2,000,000 war workers, was held to consider means of transferring labor from war work to peace work without any considerable break in the earning time of the individual.

Plans were considered for switching labor from war work to peace work as rapidly as war industries reduce their working forces. In consequence of the meeting a committee was appointed, with a representative for each industry. This committee will present to the United States Employment Service, from time to time, the actual needs of employers of labor. In this way this government bureau will operate in the most effective manner as a clearing house. The bureau is sending out a questionnaire to manufacturers with the idea of obtaining accurate data on labor requirements and with the idea that such requirements may be filled by releasing war workers for industries connected with more peaceable purposes.

The National Association of Manufacturers has taken a step which should go far to relieve worry on the part of returning soldiers. President Stephen C. Mason has announced that all returned soldiers will have their jobs restored to them in all factories of members of the association. The announcement is to be cabled to General Pershing. It is the plan to have an open door for a return to duty and prosperity for every American soldier and sailor.

The policy of the Government with regard to the release of labor is made plain by its action in gradually closing down the gas defense plant of the United States Government in Long Island City. Here there are 12,000 men and women employed. Following a conference yesterday, notices were posted of a gradual reduction of the working force instead of a wholesale discharge, and government agencies are actively engaged in finding positions for workers as rapidly as they are released.

The question of wages is one of paramount importance. It is suggested that with the cessation of hostilities the needs of war will no longer supply work nor determine the labor relationship. In view of these facts it is thought impossible that the present 8-hour day will survive, or that the era of high wages will continue very much longer.

The sentiment is that the gains obtained by organized labor must be gradually relinquished and that a return to pre-war conditions, both insofar as concerns the hours of work and the wage scale, will follow as a matter of course. It is the opinion of William H. Barr,

President of the National Founders Association, that "the present determination on the part of certain forces among the workers to cling to all that organized labor has gained on an unsound basis during an abnormal and artificial period will doubtless occasion considerable trouble and friction."

But, regardless of whatever machinery may be created to supervise the transition, it is considered certain in official circles that the Government will maintain a centralized control and exercise a very positive supervision over business interests during the change.

### Consider Steel Situation

WASHINGTON, Nov. 13—Conferences are being held here between the War Industries Board and the American Iron and Steel Institute Committee, headed by E. H. Gary to determine what steel can be allocated to non-war industries. No definite decisions were arrived at other than that the War Industries Board will continue to control the allocation of steel for the time being. Data are being gathered and further meetings will then be held to determine how soon Government control of steel can be abolished.

Arrangements have been made to provide the additional steel required by these non-war industries following the modification of the curtailments but no announcement of how this will be accomplished has been made or will be given out at this time.

Arrangements have been made by the War Department to care for those contractors whose contracts have no termination clauses and whose war-work will probably be cancelled. In each instance the contractor will be asked to sell the raw materials on hand and their cost plus handling charges plus overhead directly applicable; the partly finished products on hand and their cost of raw material and labor plus overhead directly applicable, finished products on hand and the contract price less freight charges if contract specifies delivery at point other than factory; special facilities including their cost as paid for and their cost as estimated in the contractors original estimate.

The fair value at the time the contract is terminated will be deducted from the original cost and the contractor is asked to thus determine the ratio of the uncompleted portion of the whole contract; the contractor will also determine the costs of commitments to suppliers and subcontractors in the same manner as in the above rules.

If the contractor claims additional compensation he is to include it with the original claim with detailed facts. If a contract is cancelled the Government official loses his power to enter into a supplemental contract with the contractor.

No allowances will be made for prospective profits but an allowance may be had of 10 per cent of the cost on partly finished products. All materials partly finished products and finished products become the property of the Government if an agreement is reached.

## Washington S. A. E. Section Formed

(Continued from page 848)

Rear Admiral G. W. Taylor, Chief of Construction, U. S. Navy, told of airplane development in the Navy, praising the Liberty engine highly, and said that if it had been a failure the entire Navy program would have failed. The Navy now patrols more than 100,000 miles of coast by airplane weekly and is using single, twin and triple-engine planes and lighter than air dirigibles equipped with single and double engines. The dirigibles make 60 m.p.h. The Curtiss Engineering Co., said the Admiral, has lately developed a seaplane engine that has developed 160 m.p.h. The seaplanes using triple engines are as large as the Handley-Page airplanes.

The Admiral was very enthusiastic over the development of a Washington section and certain it would accomplish much good. Lt.-Col. Edward Orton Junior spoke for the Motor Transport Corps, praising the standardized truck developed by the Society of Automotive Engineers and designed, produced, assembled and operated within 75 days, and which he said was the best truck ever built. He said the Government had already had great benefits from the S. A. E. and would certainly receive additional valuable aid if a section were established. Rear Admiral C. W. Dicer, Chief of the Bureau of Steam Engineering, in charge of engines, told that the Navy uses the Curtiss Liberty, and Hispano-Suiza engines in its program, and that in 2 years the engines have improved from 90 m.p.h. to 160 m.p.h. He stated that the Eagle boats have been made noiseless by use of new drives that eliminate vibration, noisy gears, and at 18 knots keep the engine room silent, which is necessary, as these boats were designed to listen while running and to attack submerged submarines.

Lt.-Col. W. G. Wall, Ordnance Department, formerly National chief engineer, displayed photographs and motion pictures to illustrate the work of the Ordnance Department and showed trench mortar hauling trucks, reconnaissance cars, field gun trailers, caterpillar trailers for carrying ammunition, 10-ton tractors to haul large guns with drawbar pull of 10,000 lb. and speed of 6 m.p.h.; 5-ton tractor with drawbar pull of 6000 lb. and speed of 10 m.p.h.; 3-ton tank equipped with two Ford engines, of which many have been made; 6-ton tank similar to the French Renault tested on 100 per cent grade, stopped halfway and started again, and capable of going most anywhere.

He told how the American Army learned to use tractors not only to haul guns but to carry them and shoot them while on tractors. This, he said, made it difficult for the enemy to get the range as the guns could be moved easily and quickly, and further this eliminated the need for digging the gun into the ground, the usual camouflage and the carrying away of dirt to prevent enemy airplanes finding the guns.

Ward M. Canaday, advertising manager of the Willys-Overland Co., Toledo, Ohio, is giving part of his time at Washington directing the public information work of the Non-War Construction Division of the War Industries Board, headed by D. R. McLennan of Chicago.

Earl L. Woods, sales manager of the tractor department of the J. I. Case Plow Co., Racine, Wis., has accepted a commission as a captain in the Motor Transport Corps and will go overseas shortly with Unit 304, to which he reported for duty at Ft. Sam Houston, Tex., on Nov. 10.

Albert Gough is now in charge of the service department of the Liberty Motor Car Co., Detroit. He was formerly connected with the Shaw Electric Crane Co., Muskegon, where he was engaged in production work, and more recently with the service organization of the Chalmers company.

James W. Graham, member of the C. A. S. Engineering Co., Columbus, Ohio, the steering gear manufacturing company of the parent organization in Detroit, died at Columbus of influenza. He was purchasing agent of the old Krit company.

Howard West, purchasing agent for factory supplies at Dodge Brothers, Detroit, died of Spanish influenza at his home in Royal Oak, Nov. 2.

Walter E. Parker, president of the Commerce Motor Car Co., Detroit, has entered the service in the capacity of captain in the Quartermaster's Corps, and is chief of the motor transport division in Indiana and Michigan.

#### Mott Completes Organization

DETROIT, Nov. 8—Major C. S. Mott, head of the Weston-Mott Co., Flint, and in charge of the inspection and production branch, Motors and Vehicle Division, Quartermaster Corps, this district, has completed his staff organization. Among the members of his staff are Lieutenant Harold Whitmore, former production superintendent of the Dort Motor Car Co., Flint, in charge of Class AA truck production; Charles H. Quirk, production manager for the Buick Motor Co. and later with the Cadillac company on Liberty engines, who will have charge of the quad and four-wheel drive section.

Earnest Kollmorgan, former superintendent of the W. A. Paterson Co., Flint, will have charge of the production of Ford, Dodge, Cadillac and Packard cars for the Army; Harold Comlossy, of Mac-Crone & Co., accessory dealer in Chicago, to have charge of spare parts; Lieutenant Neil J. Bersten, formerly with the Weston-Mott Co., Flint, to have charge of the Continental Motors and Hinkley Motors Co. production of engines; Lieutenant Lloyd Kenworthy, formerly with the Weston-Mott Co., to have charge of production of Timken axles; Lieutenant Vance Day, formerly with the General

## Men of the Industry

### *Changes in Personnel and Position*

#### James W. Graham

COLUMBUS, OHIO, Nov. 11—James W. Graham, president of the C. A. S. Products Co., manufacturer of auto gears and other parts and accessories, died at his late residence last week from an attack of influenza. He was 29 years of age and reorganized the present company from the old Foster Gear Co. about three years ago. His former home was at Carthage, Canada.

Motors Truck Co., to have charge of production of trailers.

Harvey J. Mallery, formerly with the Weston-Mott Co., will have charge of accounting; A. P. Brush, Brush Engineering Association, Detroit, production engineer of the motors branch; Herbert White, formerly with the Hyatt Roller Bearing Co., Detroit office, appointed assistant to Major C. S. Mott; Captain W. B. Deyo, former Ford dealer, member of the production department of the motors division; Benjamin Rosenszweig, former purchasing agent of the Buick Motor Co., Flint, to have charge of priorities; F. H. Mutchler, accountant, to have charge of statistics.

Lieutenant E. C. Welch, Port Huron, will have charge of production of Class B trucks; R. E. Winans, assistant in charge of production of Class B trucks; Bernard McKay and Henry Hellman, both with the Ford Motor Co., assistants to E. C. Welch; F. P. McDevitt, also assistant to E. C. Welch; Arthur Hayes, formerly with the Ford Motor Co., gray iron specialist; Lieutenant W. O. Lamke, assistant in charge of priorities; Lieutenant R. P. Kenney, assistant to E. C. Welch; H. Coen, formerly of the Ford Motor Co., assistant in charge of the production of quad and four-wheel trucks.

J. F. Gilmore will be assistant in charge of spare parts; C. A. Bundy, assistant in charge of spare parts and located at the plant of the Packard company; H. P. Glazier, assistant, same duties, assigned to the plants of the Ford and Cadillac companies; W. W. Carpenter, assistant, in like capacity, assigned to the Dodge plant; L. F. Mullen, Detroit, assistant, same duties, and John F. Thompson, Federal motor truck distributor, Detroit, in charge of body division.

Major George D. Wilcox, former sales manager of the Commerce Motor Car Co., Detroit, is Detroit district manager of the motors branch, and Norval A. Hawkins, sales manager of the Ford Motor Co., his assistant. Captain W. E. Parker, president of the Commerce Motor Car Co., Detroit, is traffic chief of the division, covering Michigan and Indiana.

Guy Nonemacher, formerly secretary to President Walter P. Chrysler, of the Buick Motor Co., Flint, who has been color sergeant with the 125th Infantry in France, has been promoted to second lieutenant.

L. E. Trent has been appointed secretary and general manager of the Common Sense Gas Tractor Co., Minneapolis. He succeeds H. W. Adams.

E. L. Evans has been appointed superintendent of Plant 1 of the Bound Brook Oil-Leas Bearing Co., Bound Brook, N. J. He was formerly chief inspector of the plant.

#### Western Trailer Adds to Personnel

KANSAS CITY, Nov. 11—The Western Trailer Co., organized in April, 1918, has for the third time increased its factory, the latest addition being 50 x 175, two stories. The body factory, paint shop and other enterprises will occupy the older portions of the building, about twice the size of the new. The company has recently engaged H. M. Gillespie, formerly district sales manager of the Republic Motor Truck Co., with headquarters in New York, as assistant to the president and director of sales. Mr. Gillespie was also formerly connected with the White Co., and was assistant manager of the Racine Saddlery Co. H. G. Fluority, for several years chief engineer of steel mills in the Pittsburgh and Birmingham districts, has been engaged as chief engineer of the Western Trailer Co., and is now completing designs for trailers which the company manufactures, from one-half to twelve tons capacity. Peter Nelson, formerly in charge of body building departments for passenger car and truck manufacturers, including Packard, Nash, Mack and General Motors, has been employed as superintendent of the body building department; he will specialize in bodies of intricate design with which the trailers will be equipped. C. J. Welch is president and general manager of the Western Trailer Co.

#### Government to Retain Control of Steel Prices

WASHINGTON, Nov. 13—In accordance with the expressed wishes of steel producers at the first Reconstruction Conference of the War Industries Board held to-day, the Government will continue for the time being the regulation of the sale and distribution of steel.

It was felt that this course was desirable in order to insure against the possibility of disturbance to the steel industry or to other industries in which steel plays an important part. An informal statement was issued jointly after the meeting of the chairmen of the War Industries Board and of the American Iron and Steel Institute. This was to the effect that the general discussion had the main purpose of preserving industrial stability, and that it was characterized by a spirit of co-operation and that further data and information would be collected for the use of further conferences.



## New Quartermaster Contracts

WASHINGTON, Nov. 11—The following contracts were placed by the Quartermaster Board of Review:

United States Rubber Co., Dallas, raincoats, \$6,761.63.  
United States Rubber Co., Boston, raincoats, \$5,826.09.  
Firestone Tire & Rubber Co., Akron, tubes and casings, \$14,028.14.  
Firestone Tire & Rubber Co., Akron, tubes and casings, \$6,970.40.  
B. F. Goodrich Co., Akron, tubes, \$6,112.75.  
B. F. Goodrich Co., Akron, tubes and casings, \$11,327.04.  
United Equipment Corp., New York, tool bags, \$5,900.  
White Co., Cleveland, wheels, etc., \$35,781.60.  
Berg Auto Truck & Specialty Co., New York, shoeing boxes, \$12,035.  
U. S. Rubber Co., Baltimore, raincoats, \$7,084.75.  
B. F. Goodrich Rubber Co., Akron, tires, \$6,203.75.  
H. S. Tire & Rubber Co., New York, casings, \$13,041.50.  
B. F. Goodrich Co., Akron, casings, \$14,483.  
Dort Motor Car Co., Flint, cargo bodies and troop seats, \$182,500.  
Field Mfg. Co., Owosso, Mich., cargo bodies and troop seats, \$71,500.  
International Harvester Co., Chicago, cargo bodies and troop seats, \$286,000.  
Auto Body Co., Lansing, cargo bodies and troop seats, \$341,250.  
Belber Trunk Co., Philadelphia, tool bags, \$46,104.96.

## Indian Service Wants Cars

WASHINGTON, Nov. 7—Bids are asked for three 5-passenger touring cars to be delivered by December 1, by the United States Indian Service, Department of the Interior, Yakima Agency, Fort Simcoe, Washington. Bids are to be filed by November 20 and the bidder should state the make of the automobile he proposes to furnish and also quote the price f.o.b. White Swan, Washington on the Northern Pacific Railroad.

## Ordnance Department Contracts

WASHINGTON, Nov. 4—The following contracts and purchases were made by the Ordnance Department:

Vim Motor Co., Sandusky, lifting plugs.  
Maxwell Motor Co., Detroit, tools and accessories.  
Cleveland Tractor Co., Cleveland, tractors.  
Four-Wheel Drive Auto Co., Clintonville, parts.  
Detroit Auto Specialty Co., Detroit, fuse socket holders.  
Edw. G. Rudd Mfg. Co., Philadelphia, airplane release mechanism, bomb release mechanism, crates.  
Nash Motors Co., Kenosha, truck repair parts.  
B. F. Goodrich Rubber Co., Akron, rubber hose.  
Allen Motor Co., Fostoria, safety bolts and gun spare parts.  
Billings & Spencer Co., Hartford, wrenches.  
Pan Motor Co., St. Cloud, drop forgings.  
Keystone Forging Co., Northumberland, Pa., drop forgings.  
Nash Motors Co., Kenosha, automobiles.  
Willard Storage Battery Co., Cleveland, batteries.  
Panson Lumber & Mfg. Co., Bridgewater, Nova Scotia, spruce.  
Charles T. White & Son, Sussex, New Brunswick, spruce.  
Fellows & Co., Boston, spruce.  
Lake Niegantic Pulp Co., Lake Niegantic, Quebec, Canada; spruce.  
American Commercial Car Co., Detroit, motor trucks.  
Cadillac Motor Car Co., Detroit, ambulances.  
Ford Motor Co., Detroit, ambulances.  
Wright-Martin Corp., New Brunswick, services.  
Wright-Martin Corp., New Brunswick, labor.  
Ward Motor Vehicle Co., Philadelphia, trench searchlights.

## Contracts

## General Engineer Contracts

WASHINGTON, Nov. 4—The following contracts were made by the General Engineer Depot:  
Ford Motor Co., Detroit, wheels.

## Marine Corps Contracts

WASHINGTON, Nov. 4—The following contracts have been placed by the Marine Corps:  
Nash Motors Co., Kenosha, spare parts for trucks.

## Aircraft Production Purchases

WASHINGTON, Nov. 4—Following is a list of purchases made by the Aircraft Production Board:

2250-2. Wright-Martin Aircraft Corp., New Brunswick, engine spares.  
International Stamping Co., Detroit, spares for planes.  
The Bristol Co., Waterbury, Venturi Pitot tubes.  
Curtiss Aeroplane & Motor Co., Buffalo, spares for planes.  
Willys-Overland Co., Toledo, motors and spares.  
Curtiss Aeroplane & Motor Corp., Buffalo, engine spares.  
Curtiss Aeroplane & Motor Corp., Buffalo, spares for planes.  
Capital Electric Co., Washington, D. C., material for mobile electric plants.  
Standard Seamless Tube Co., Ambridge, Pa., tubing.  
Tillotson Mfg. Co., Toledo, O., carbureters.  
Curtiss Aeroplane & Motor Corp., Buffalo, planes.  
Curtiss Aeroplane & Motor Corp., Buffalo, engine spares.  
Wright-Martin Aircraft Corp., New Brunswick, tools for engines.  
Wright-Martin Aircraft Corp., New Brunswick, engine spares.  
Standard Parts Co., Cleveland, Ohio, tubing.  
Standard Varnish Works, 90 West Street, New York, for mixing of dope.  
Standard Aero Corp. of New York, Elizabeth, N. J., planes.  
The Steel Products Co., Cleveland, Ohio, engine spares.  
Curtiss Aeroplane & Motor Corp., Buffalo, engine spares.

## New Milwaukee Ford Home

MILWAUKEE, Nov. 11—The Milwaukee branch of the Ford Motor Co., which turned over its big assembling plant to the Government for hospital purposes on Nov. 1, has taken over the three-story building of the Hughes Motor Car Co. for the period of the war and one year thereafter.

## Calendar

## ENGINEERING

Nov. 14-15—New York, Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

## SHOWS

Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.  
Nov. 11-16—Pittsburgh, Pa. Fall Automobile Show, Motor Square Garden. Automobile Association of Pittsburgh.  
Jan. 13-19—Des Moines, Ia. First Tractor Show, Des Moines Thresher & Tractor Club. H. J. Clark, Mgr.

## Aircraft Production Contracts

WASHINGTON, Nov. 8—Following is a list of contracts placed by the Bureau of Aircraft Production:

General Motors Corp., Detroit, motors.  
Dartmouth Mfg. Co., New Bedford, Mass., airplane fabric.  
William Whitman & Co., New Bedford, Mass., airplane fabric.  
American Bleached Goods Co., Taftville, Conn., airplane fabric.  
Harding, Tilton & Co., New Bedford, Mass., airplane fabric.  
Harding, Tilton & Co., New Bedford, Mass., airplane fabric.  
Unit Construction Co., Philadelphia, Pa., propellers.  
Marlin-Rockwell Corp., New York, spares for planes.  
Hardman, Peck & Co., New York, propellers.  
The Holbrook Co., New York, propellers.  
Packard Piano Co., Fort Wayne, Ind., propellers.  
The Unit Construction Co., Philadelphia, Pa., generator propellers.  
Intertype Corp., Brooklyn, N. Y., interrupter gears.  
Wolverine Brass Works, Grand Rapids, Mich., interrupter gears.  
Wright-Martin Aircraft Corp., New Brunswick, engine spares.  
Holt Mfg. Co., Peoria, Ill., adapter sets.  
Thomas-Morse Aircraft Corp., Ithaca, spares for planes.  
Thomas-Morse Aircraft Corp., Ithaca, spares for planes.  
Hardman, Peck & Co., New York, lamination sets.  
Curtiss Aeroplane & Motor Corp., Buffalo, spares for planes.  
Curtiss Aeroplane & Motor Corp., Buffalo, airplanes.  
Thomas-Morse Aircraft Corp., Ithaca, spares for planes.  
Olds Motor Co., Lansing, Mich., engine spares.  
Spitdorf Electrical Co., Newark, engine spares.

## Beaver Kerosene Tractor Engines

(Continued from page 839)

the crankpin bearings. Each of the connecting-rod heads is provided with a splash scoop which dips into an oil trough beneath the crank, and splashes oil all over the interior surface of the crankcase and on to the cylinder wall. Oil holes are provided on top of all bearings through which oil from the splash can find its way to the bearing surfaces.

For circulating the cooling water there is provided a centrifugal pump with 5 in. impeller. This pump runs at crankshaft speed and tests have shown that at 900 r.p.m., at which speed the engine is governed, it delivers about 190 lb. of water per minute against a head of 1½ ft. A 20-in. fan is usually employed with these engines and is driven by a 1½ in. flat belt from the accessories shaft.

The weight of either size of engine is in the neighborhood of 1000 lb. A governor is always fitted. In the past various makes of governors have been used by different customers, but the company is now developing one of its own design.

## Kansas City Wants Fire Trucks

KANSAS CITY, Nov. 11—As the result of the adoption of prefects for issuing bonds in Kansas City, Mo., at the election Nov. 5, the city will shortly be in the market for more than \$100,000 worth of fire department motor equipment, and may within a year be buying motor equipment for the delivery of ice from a municipal plant. One bond issue is for \$200,000 to buy fire department equipment, the purpose being to replace nearly all the present vehicles.



# AUTOMOTIVE INDUSTRIES

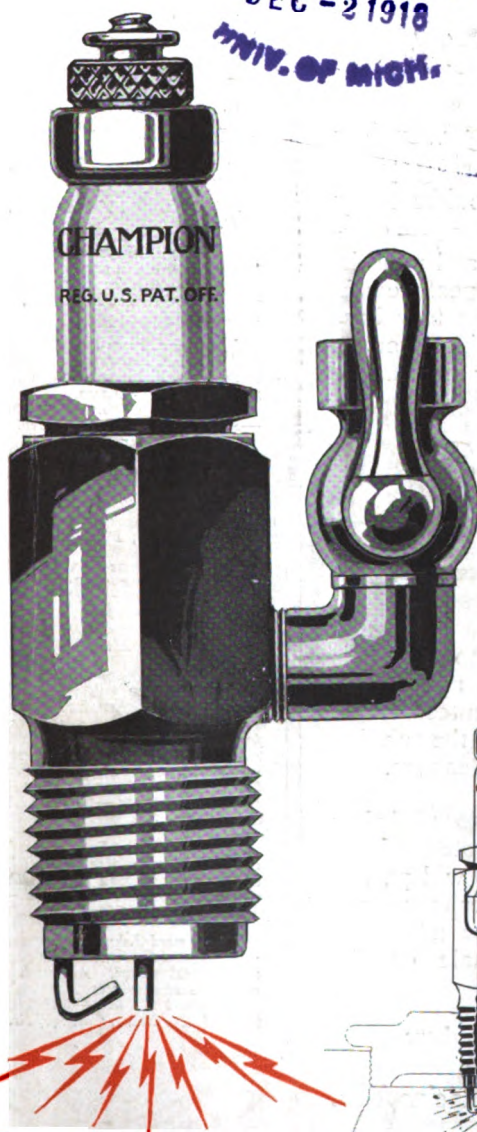
## The AUTOMOBILE

Vol. XXXIX  
Number 21

PUBLISHED WEEKLY AT 239 WEST 39th STREET  
NEW YORK, NOVEMBER 21, 1918

Fifteen cents a copy  
Three dollars a year

## Order **Now** For Big Winter Trade



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Dealers are looking to their jobbers to take care of the big winter demand for Champion Priming Plugs.

They sure-fire cold motors because you have gas right at the sparking points of the spark plugs.

The gasoline trickles right down the core and drips from the electrode—right where the spark jumps.

Don't take out your plugs—don't run down your battery or

wear yourself out with useless cranking.

Champion Priming Plugs are imperative in cold weather for the hundreds of thousands of cars that do *not* have priming cups, and are infinitely better for those that do, because priming cups let the gas in *too far* from the spark plug.

Because of the public demand for the Sure-Fire of Champion Priming Plugs, *get your order in early* so you will not miss a single sale.

**Champion**  
Dependable  
**Priming Plugs**

\$1.50 Each

Champion Spark Plug Company, Toledo, Ohio  
Champion Spark Plug Co. of Canada, Limited, Windsor, Ontario

Sure-Fire

Chance-Fire





## Don't Wait!

Don't wait until the freezing weather comes to think about protecting your car for the coming winter. Decide early to use Johnson's Freeze-Proof—purchase your supply from your dealer and read the directions carefully. A little time spent now in cleaning the radiator and putting on new hose connections will save you unlimited time, trouble, worry and expense during the winter months.

## JOHNSON'S FREEZE-PROOF

is the logical anti-freeze preparation to use. It is inexpensive—does not evaporate—is non-inflammable—is easy to use—and is guaranteed. One application will last all winter unless the solution is lost through the overflow pipe or leakage.

One package will protect a Ford to 5° below zero, one and a half packages will protect a Ford to 30° below zero and two packages will protect a Ford to 50° below zero. For larger cars, or to protect to a lower temperature, use additional Freeze-proof according to the scale on the package.

For Sale by all Dealers and Jobbers

S. C. JOHNSON & SON, Dept. A, Racine, Wis.

We used your Freeze-Proof for the last two winters in all of our cars, meaning seven passenger cars and one truck. We found same to be a very good anti-freeze solution, and also a very inexpensive, effective substitute for alcohol. We can recommend it very highly for the purpose it is intended for.—F. M. OPITZ, Pres. Perflex Radiator Co., Racine, Wis.

We wish to say at this writing, we want to compliment your company for the wonderful co-operation that we have had towards the sale of Freeze-Proof this past season. We haven't a package of Freeze-Proof left in stock and sold same to owners of cars where the prices of these cars carried from \$1,000.00 to \$15,000.00 and not in one instance did we have a complaint for this product.—JOHN J. MAHONEY, Treas. Motor Accessories, Inc., Boston, Mass.

Our confidence in Freeze-Proof is such that we have just placed an order for an additional carload for the coming season, and quite naturally we could not have the nerve to handle this quantity if we did not have the most profound confidence in the product.—THE SALT LAKE HDWE. CO., Salt Lake City, Utah.

We have used Johnson's Freeze-Proof this winter in Peenless Eight, Chandler Six, Ford, Wilson and Republic Trucks. This has been the coldest winter we have had for years, zero and lower right along. But notwithstanding the extremely cold weather all of the above cars and trucks have worked every day and not one of them froze up. We consider your preparation the best we ever used.—JOHN T. BYERS Supt. Labor Brewing Co., Uniontown, Pa.

We wish to say that the Freeze-Proof is satisfactory in every respect. We have recently had temperature of 20 below zero and it did not freeze in my car at that time.—W. J. DYSART, Woods-Everts Store Co., Springfield, Mo.

We used several cases of your Freeze-Proof last winter and the very best of results were obtained from its use. It was satisfactory enough that we are stocking it again this coming season.—CITY GARAGE OF TYLER, Tyler, Texas.

In regard to your Freeze-Proof, beg to say that when it has been used according to directions I have had the very best success. When the proper amount is used even in the most severe weather I have not had a single complaint of cars freezing.—W. S. DOUGHTY GARAGE, Parker, S. D.

We have used your Freeze-Proof for the past year and it gave entire satisfaction and placed our order for the coming season.—MADISON MOTOR CO., Madison, Maine.

I put your Freeze-Proof in my radiator and have had satisfactory results. I had it in the radiator while the thermometer registered 22 below zero. No injury was done. I shall be your patron henceforth.—REV. F. ADI X, Rush Center, Kans.

I have used Johnson's Freeze-Proof during the winter 1917-18 and can recommend it to all car owners. It was tested in my car by 20 below zero. For that reason I dare to recommend it.—REV. H. NIELSEN, Poysippi, Wis.

Johnson's Freeze-Proof has done good work for me this winter. My car has been out all night several times in a howling gale at from 10 to 16 below zero and my radiator did not freeze.—DR. MALCOLM DEAN MILLER, Akron, Ohio.

I used your Freeze-Proof this past winter, and as you will recall, it was the worst weather we have had in many years. It protected my seven passenger car to as far as 20 degrees below zero and did not show the least particles of crystals in the radiator. Johnson's Freeze-Proof is the best insurance one can have on the cooling system of any car.—C. W. MALLORY, Georgetown, Ky.

Have used your Freeze-Proof and find it all that you advise it. Will probably always use it unless I find something better which I doubt I ever will.—H. H. PECK, New Milford, Conn.

I have used Johnson's Freeze-Proof in my Overland Six which is a regular type Continental motor. Although this was a very severe winter Johnson's Freeze-Proof stood the test.—H. E. GNADT, General Hardware, Chicago, Ill.



# AUTOMOTIVE INDUSTRIES

## *The* AUTOMOBILE

VOL. XXXIX

NEW YORK, THURSDAY, NOVEMBER 21, 1918—CHICAGO

No. 21

## Co-operation in Conversion Assured

**Resumption of Peace Basis in Automotive Industry to Be Facilitated—Makers  
and Government Representatives Confer on Transition Problems—  
Cancellation of Contracts to Be Gradual—Disposition  
of Army Trucks Considered**

**W**ASHINGTON, Nov. 19.—Conditions affecting the automotive industry here gradually are taking definite shape, and, following the meeting of the National Automobile Chamber of Commerce members yesterday, assurances are coming to light of a gradual resumption of peace-time occupations without that jolt which some expected and which might have proven disastrous. Further evidences are everywhere apparent that the Government contemplates full and complete co-operation with industry with a view to fostering and furthering a quick return to commercial practice.

### **Great Care is Urged**

The urgency for great care by the Government in its policy with regard to the cancellation of contracts, the serious possibilities of labor troubles, and the fact that commencing to-day all Government priorities except for Army and Navy work are void, thus permitting manufacturers to purchase what supplies they need in the open market are all questions which are in the air; and already answers partly satisfactory and almost wholly reassuring have been forthcoming.

The reconstruction of industry, or rather its transition, from a war to a peace basis is the topic of paramount importance at present. Just how this policy is to be shaped with a view to the fullest possible co-operation, is indicated by the formation of a committee of members of the N. A. C. C. chosen at

the invitation of Chairman Bernard M. Baruch of the War Industries Board, to meet with him and give him aid in such work.

The committee includes Hugh Chalmers, Alvan MacCauley, of the Packard Motor Car Co.; H. B. Jewett of the Paige-Detroit Motor Car Co.; Roy D. Chapin of the Hudson Motor Car Co.; and Charles Clifton of the Pierce-Arrow Motor Car Co., representing passenger car makers; and George Graham of the Pierce-Arrow Motor Car Co.; Windsor White of the White Co.; L. H. Boylston of the Service Motor Truck Co.; S. M. Williams of the Garford Motor Truck Co., and A. C. Burch of the Clydesdale Truck Co. for the truck makers.

### **Delay in Conversion Unavoidable**

Following a preliminary meeting, this committee drew up a formal statement which was presented to Mr. Baruch but not made public. The statement pointed out present conditions and emphasized the fact that following the advice of the War Industries Board, a great many of the members of the N. A. C. C., had arranged their businesses so that they were practically 100 per cent on war work and that months of delay must be faced in converting their activities to a peace basis.

It was also pointed out that unless great care is taken in the cancellation of contracts, large numbers of workers will have to be laid off summarily; on the other hand, if such cancellations are con-

servatively arranged, and the elimination of war business fitted into the gradual resumption of peace business, coupled with a removal of all curtailment restrictions, manufacturers believe they can get back to normal production safely and without serious disturbance.

That the Government will welcome the assistance of the automobile makers and will tender every aid to bring a safe return of peace time activities is made certain by the statements already made by Mr. Baruch and other officials.

### Government Anxious to Co-operate

The Government is exceedingly anxious to cancel contracts and demobilize the Army to effect savings in expenditures but it appears to realize that moderation in action is necessary. The prompt action taken last week by the War Industries Board modifying curtailments was the first step in acknowledgment that industry must be guarded and that room must be made for the workers before they are discharged from the Army.

Contracts are being canceled or suspended according to a definite plan by which only those orders not yet in production are cut or terminated. Airplane contracts have in the main been suspended instead of canceled where they were not in production pending decision by Secretary Baker and General Pershing as to the needs abroad and the possible future of military planes.

The contracts suspended were those not yet in production. For example the Fisher Body Co., which is in production on De Haviland planes and has just completed the drawings for the Caproni, continue producing De Havilands at a somewhat reduced rate but has entirely suspended the Caproni program. Likewise the Curtiss Aeroplane & Mfg. Co. has suspended its work on the Liberty engine program but continues its output of Liberty engine parts for other makers, and its other contracts. Liberty engine production has not been terminated in any factory as yet where the plant is actually engaged in turning them out.

### Truck Contracts Cancelled

Although the cancellations of motor trucks and other vehicles seem large—81,000 to date—these comprise entirely trucks that have not yet been in production and in some instances merely the truck orders planned soon and not yet even placed.

The cancellations include: The recent contracts placed for 25,000 "B" 3-ton standardized trucks together with the eleven major units which were also ordered, the axles, motors, wheels, steering gears, transmission, clutches, universal joints, tires, radiators, frames and springs.

Fifty per cent of all the commercial trucks on order and not yet delivered were canceled including:

Name of company	Original Order	Type	Reduced to
Federal Motor Truck Co. ....	500	3½-ton	250
Federal Motor Truck Co. ....	300	5-ton	150
Gramm-Bernstein Co. ....	100	3½-ton	50
Hurlburt Motor Truck Co. ....	200	5-ton	100
International Harvester Co. ....	200	2-ton	100

Name of company	Original Order	Type	Reduced to
International Harvester Co. ....	800	2-ton	400
Kelly-Springfield Truck Co. ....	920	3-ton	460
Moreland Motor Truck Co. ....	40	2½-ton	21
Moreland Motor Truck Co. ....	60	4-ton	30
Packard Motor Co. ....	3000	3-ton	1500
Peerless Motor Car Co. ....	500	3-ton	250
Republic Motor Truck Co. ....	250	5-ton	125
Standard Motor Truck Co. ....	800	3½-ton	150
Vellie Motor Vehicle Co. ....	125	3-ton	63

Other cancellations included the Kelly-Springfield Motor Truck Co. order for 340 1½-ton "A" trucks which has been reduced to 170, the Pierce-Arrow Motor Car Co. order for 1100 2-ton "A" trucks reduced to 700, and the J. C. Wilson Co. contract for 200 2-ton "A" trucks cut to 100. The Peerless Motor Co. order for 3000 "A" trucks and the Garford Motor Truck Co. order for 4000 "A" trucks have been suspended. Orders for Nash and F-W-D trucks have been reduced by 15,000.

### Urge Gradual Cancellation

In discussion of these cancellations the various manufacturers pointed out the disaster that would follow too prompt termination. That 6000 trucks out of the order for 8000 "A" trucks placed with the White Co. had been cancelled while 1000 had been delivered and the other 1000 is in production was the statement by Windsor White. He told that it will require three months before the company can get back to a normal peace basis which means that Government work must be maintained in the plant for that length of time or the organization must be reduced.

The Peerless Motor Truck Co., which suffered the termination of its contract for "A" trucks has an order for 500 Peerless trucks for the British Government which will suffice to keep the company going while it undergoes conversion to a peace basis, if it is not cancelled. The Mitchell and Kissell companies reported serious labor troubles in Wisconsin due to the socialistic trend there.

Mitchell has 2000 trucks completed for the Government and 2000 in production. The Kissell order for 2400 was cut to 900 which will be sufficient if no further cuts are made. The U. S. Motor Truck Co., which held an order for 2000 trucks has been reduced to 500 trucks and unless the Government continues its business with the company until it can convert to a peace basis it too will have to lay off men. In fact, every manufacturer told of the same experiences, of need by the Government to maintain some of its war contracts and to be conservative in their termination.

That the Government may possibly allow truck makers to retain materials purchased for war contracts for use in making commercial trucks is possible.

The possibilities of further need for Army trucks was also discussed at the N. A. C. C. meeting and it was said that the policing of Europe will make a demand for trucks for many months to come. To prove the need for them it was cited that 10,000

German trucks had been placed at the disposal of the American Expeditionary Forces because our Army abroad suffered from a truck shortage.

A possible continuation of the past differences between the adherents and opponents of the Class B standardized Army trucks, also known as the Liberty truck, was forecast by the announcement that the Class B assemblers following a meeting in Ohio this week asked the co-operation of N. A. C. C. members and were told to appear before General Drake and the War Industries Board as a separate body. The formation of a motor truck committee by the N. A. C. C. with three members in favor of the elimination of the B truck and two in favor of its retention also gives promise of interesting activities between the majority and minority sections.

Other important developments included the statement that all manufacturers' pledges made to the War Industries Board will stand until January 1, 1919, which means that truck manufacturers can make trucks only to the number allotted them by the War Industries Board, despite the statement made last week by the Automotive Products Section of the Board to the effect that truck makers could consider themselves on a 100 per cent production basis.

It was also told that makers need fear no competition from re-sale of trucks now in the Army because those in France would be sold abroad while those in this country will be useless from wear and those that can be used will be taken over by the Post Office.

A committee was appointed to wait upon General Drake, Motor Transport Corps, to impress the dangers of reselling the trucks to the public and to learn definitely from him if the plans stated above are the Government's program.

That the Government will take the necessary steps with regard to labor seems assured by the arrangement made to-day between the War Department,

War Industries Board and U. S. Employment Service. The Service will place all workers released by cancellation of contracts. It will make surveys and if employment is not available will recommend to the War Board that the contracts in question and which would release workers should be continued and not terminated. Its recommendations will be followed.

That the Service can effect good work it has already shown by its disposition of the labor problems during the war and it has already placed large bodies released from war work since the signing of the armistice. Seventeen hundred workers discharged from a Dayton airplane factory last week not only found new employment through the Service but were distributed from the gates of the old employer to the new jobs.

Further evidence of the Government's policy and plans are indicated in the statement by Assistant Secretary of War Benedict Crowell who said:

"Instructions have been issued to all bureaus of the War Department governing the methods of slowing down production so that there will be a tapering off of war work giving time for industrial readjustment. So that manufacturers might as rapidly as possible get into work of civilian needs the War Industries Board has at our request withdrawn all priority ratings on Army work. Over-time, holiday and Sunday work has stopped and as rapidly as the labor can be used in normal day shifts, night shifts will be discontinued."

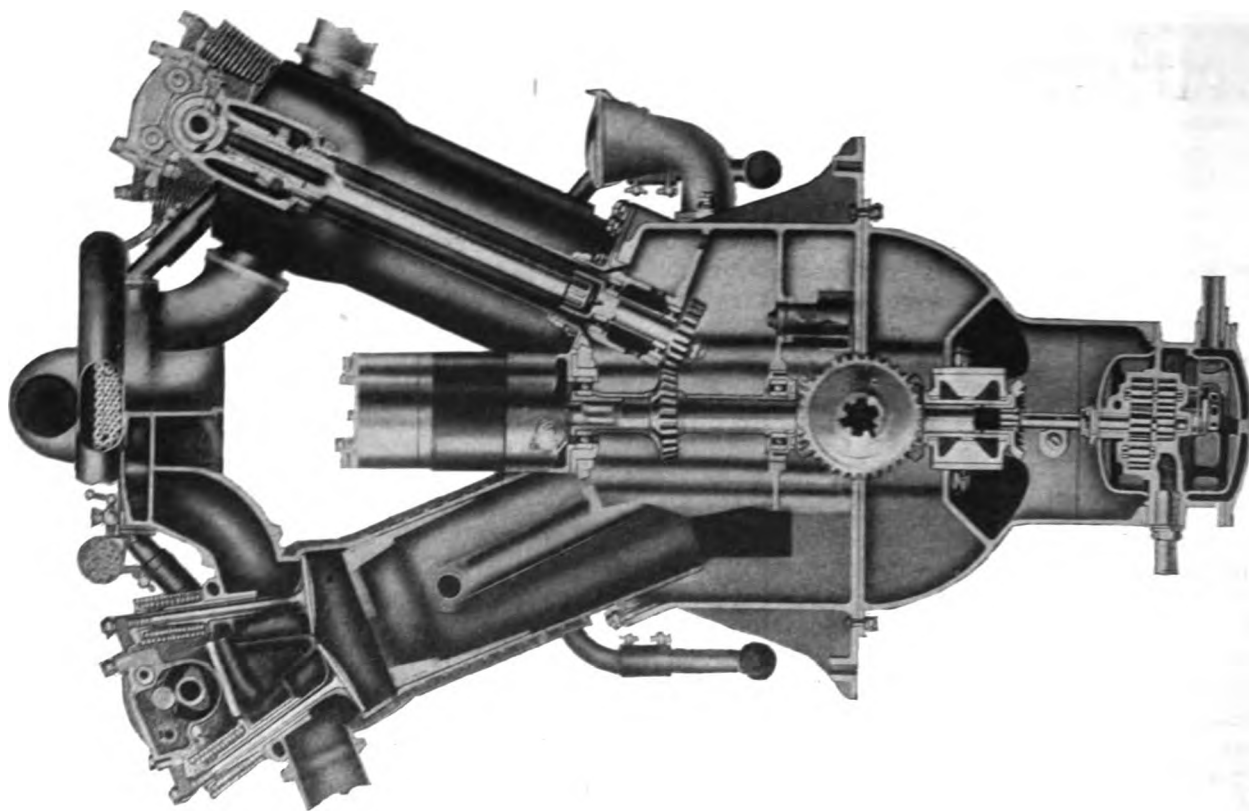
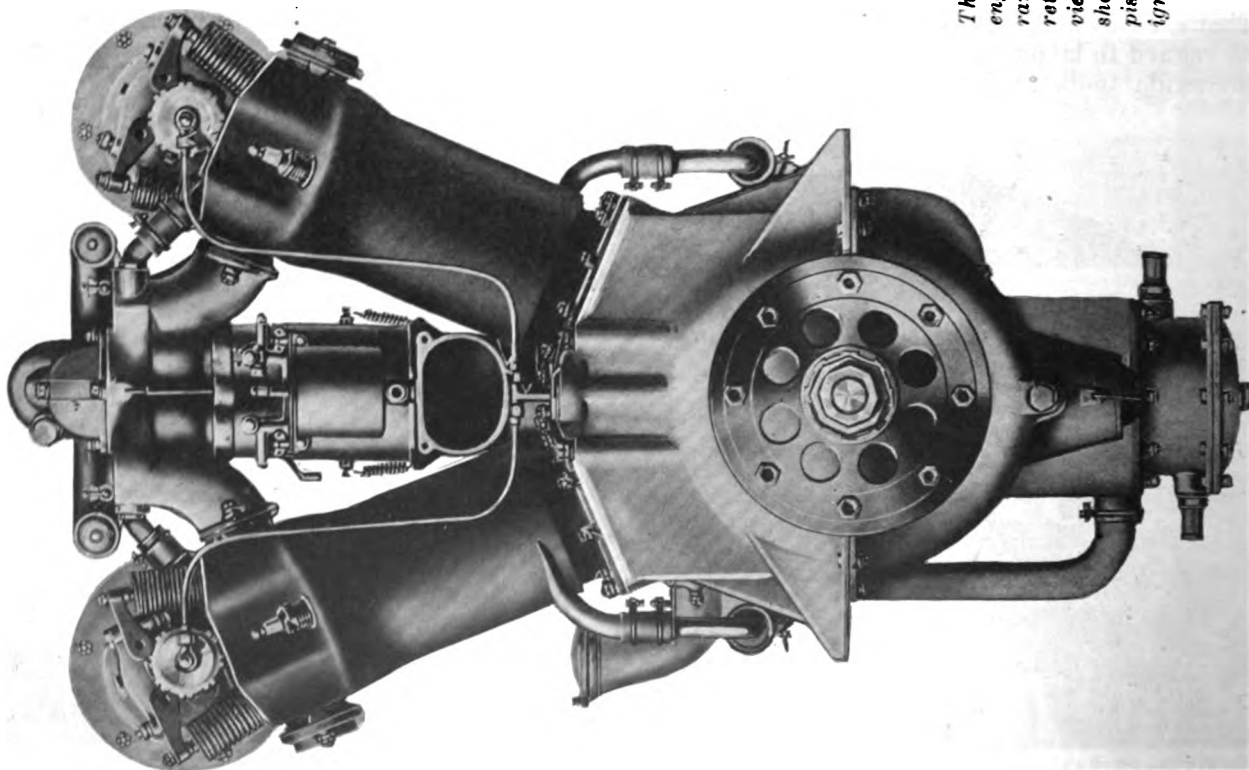
Resolutions were adopted at the meeting, giving thanks to Hugh Chalmers who has represented the industry in Washington and to C. C. Hanch, vice-president of the Studebaker Corp. and chairman of the Automotive Products Section of the War Industries Board, for their work both for the Government and the industry. A further tender of the services of the National Automobile Chamber of Commerce members to the War Industries Board was also voted.



*Nieuport biplane. An interesting feature of this machine is the arrangement of the struts*



# First Photographs of the Liberty Aircraft Engine



*The propeller end of the engine, showing the arrangement of the carburetor and manifold. The view of the opposite end shows in part section the piston, valve mechanism, ignition distributor and oil pump*

# Cultivating Japanese Automotive Field

## PART I

### Passenger Car Imports Increasing—Financial Position Excellent—Missionary Work Needed to Overcome Prejudice Against American Products

By Tom O. Jones\*

JAPAN as a whole is prosperous. Individually the Japanese are better off financially than ever before in their history. Some tremendous profits have been made from war business. While applying to many industries, this is especially true in the shipping business and shipbuilding, lines of activity that have been of particular advantage to Yokohama and Kobe, and has resulted in large profits for manufacturers in the Osaka and Tokyo districts. The men who have profited from this business are commonly known as *narikin*, a term almost synonymous with our designation war millionaires. These make up a class of buyers who are willing to spend liberally for pleasures that were heretofore beyond their reach. These men want automobiles and want them badly.

#### 25 Per Cent of Imports Exported

Of the 218 cars imported in 1916 it is safe to say that fully 25 per cent were re-exported, but this fact only emphasizes the increase of business during 1917, for during the first six months of the latter year 216 cars were brought in, equaling the entire previous year's business, with practically no re-shipment to other countries. In the last six months of 1917 three times as many cars were imported as during the first six months, and the total number for the entire year was practically four times that of 1916. Comparative figures for the two years, by months, are given below:

Months	1916		1917	
	Number	Value	Number	Value
January	11	\$5,205	15	\$12,526
February	13	12,685	41	39,565
March	33	21,018	14	12,453
April	10	6,473	54	40,423
May	14	11,570	34	36,690
June	19	19,413	58	49,687
July	13	12,176	128	107,272
August	14	14,943	129	116,684
September	29	32,240	99	95,094
October	18	21,894	50	45,310
November	23	17,244	111	94,987
December	21	17,712	127	130,490
Total	218	\$192,573	860	\$781,181

The late summer months were the periods of greatest import, but this was due more to shipping conditions than to seasonal trade. The figures for 1917, proportionately large as they are, might well have been increased, for a great number of dealers who had ordered cars in America were unable to obtain deliveries.

From the foregoing it might appear that Japan is a country to which the American manufacturer might look for huge business. But the first statements are optimistic only

in comparison with previous conditions in Japan. When it is realized that at the present time there are hardly more than 2700 automobiles in Japan, it is evident that an amount of business which would be considered small in many other countries, or even in one of the states of our country, would be large for the entire Empire of Japan. While the Japanese business is growing steadily, it will not for a long time merit a large outlay, either in advertising or in travelers' expenses. The chief task of the American manufacturer is to see that he gets his fair share of the business.

European manufacturers had nearly half the business in 1912 and more than half in 1913. Since the war, of course, the American manufacturers have had practically all the trade. Most of the European cars imported in 1915 and 1916 were brought in by private owners, although one American company shipped a few direct from the factory. The trend of business under normal conditions shows a decided preference for the European car, and there is hardly a dealer in Japan to-day who does not look forward to the time when he can again secure some of the standard European makes to meet the demands of the trade in high-priced cars.

#### Position of the American Car

There is a prejudice against American cars which should be overcome while the Americans have the market to themselves, but there is a noticeable lack of any great effort along this line. The lower-priced cars are getting the trade and will continue to hold it on a basis of price, unless Europe comes forward with small cars after the war. At any rate, as soon as the war is over the European manufacturers will have a practical monopoly in furnishing the higher-priced vehicles. With increasing shipping difficulties the task of the manufacturer to-day is harder than in the previous two years.

Japanese dealers, of course, are influenced in favor of European cars, as against the higher-priced American machines, by the attitude of their buyers. There is a deep-seated feeling that European workmanship is superior. This may be due in part to the fact that older members of many of the wealthier Japanese families have been educated in Europe. Also, from the standpoint of the dealer, the European contracts are more favorable in their terms. Some of the features in American contracts which do not meet with favor in Japan will be discussed later in this report.

It is evident that there must be some propaganda in favor of American cars, preferably conducted by the manufacturers direct, through the National Automobile Chamber of Commerce. There is no doubt that some of the English papers in Japan would use publicity matter and a part of it might find its way into some Japanese papers.

#### Lack of Good Highways

If favorable influences in Japan at the present time can be put down as an abundance of money among the buying class and the desire to own cars, the unfavorable conditions may be ascribed almost entirely to road conditions in the Em-

\*EDITOR'S NOTE—Mr. Jones was formerly with the J. B. Crockett Co., New York, and was given a special appointment by the Bureau of Foreign and Domestic Commerce to investigate automotive conditions in Japan, China, the Philippines and Hawaii. This story is taken from the advance proof sheets of Mr. Jones' report to his departments. Part II will deal with the making of selling connections, the type of car Japan wants, Japanese repair facilities and shipping regulations, duties, etc.

pire. There has been very little change in the highways of Japan in years, except for certain short stretches built for military purposes. Generally the roads through the country are narrow and winding, hardly wide enough to permit two vehicles as wide as standard motor cars to pass. Moreover, there are usually deep ditches on each side, or the road is considerably raised above the level of the rice fields, so that in passing it is almost necessary for one of the vehicles to stop or risk going into the ditch. That this matter has the attention of the Government is evidenced by the following item in the *Japan Advertiser* of Sept. 27, 1917:

The Government authorities announced yesterday that a bill extending the national road from Tokyo to Yokohama for 20 miles has been approved by the Minister of Finance and placed in the budget which will be submitted at the forthcoming session of the Diet. The bill asks for 3,000,000 yen (1 yen=\$0.498) for the construction of the road and the other half will be borne by the prefectures of Kanagawa and Tokyo. The road, according to the plan, is to be 48 feet wide and will make an ideal one for military motor cars. The authorities said that the road will be completed within three years. On the completion of the road means for motor traffic between the two cities will be greatly improved, and the present possible time for motor cars, about one hour, will be shortened. Both the Tokyo and Kanagawa prefectures have decided to defray a sum of 705,000 yen for the coming fiscal year for the improvement.

How the expense of reconstructing this road will reach such high figures can be judged from the fact that of the 20-mile length probably not more than 5 miles is now of the standard width. Of the remaining distance only 3 or 4 miles is through open country. The rest of the way the desired width can only be obtained by tearing down solid rows of houses and shops that now line either side of the road. Even the widening of this highway will hardly result in clear traveling between the two cities because of the tendency of Japanese vehicles and pedestrians to wander zigzag aimlessly over the road.

Because of the fact that Tokyo is extremely hot during most of the summer, many of the business men live in Yokohama or at some point between the two cities. The building of this

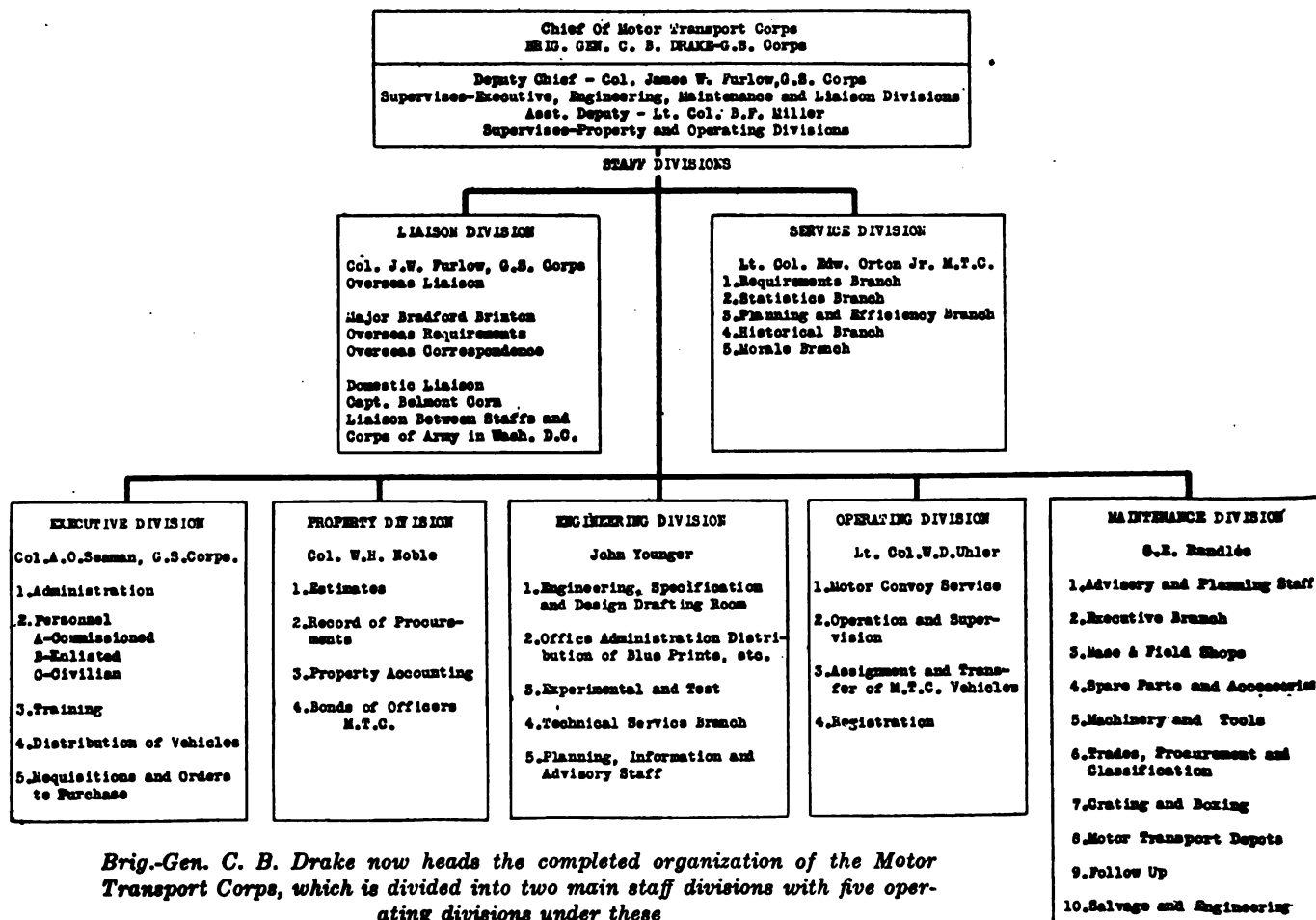
road and the adoption of rules making it available for pleasure travel would mean a greater use of motor cars between the two cities.

There is also a movement on foot to construct a similar road between Osaka, the greatest manufacturing center of Japan, and Kobe, which is fast becoming the largest shipping port. This has been discussed for several years, but only last fall was there evidence that the plans had attained tangible form.

Throughout the country there are numerous bridges far too lightly constructed to carry a motor car. It is no extraordinary experience, in endeavoring to reach a certain point even within short distance of the largest cities, to have to stop at a bridge and complete the trip by jinricksha or by walking a mile or more. The army has had some of its loaded trucks fall through bridges, and these experiences have resulted in the reconstruction of many bridges upon orders from the War Office.

Driving in cities is a task that requires concentration on the part of the driver. While in the large municipalities there is a fair mileage of wide streets, a majority of the streets are too narrow for the operation of a motor car. One of the traffic regulations provides that passenger cars shall not be driven through roads of a width less than two and a half times the width of the car, and transport vehicles shall not traverse roads which are not more than 4 ken (24 feet) in width, unless special permission is given by a police official having jurisdiction over the district. The only deviation from this regulation permitted is when there is no wider road leading to the residence of the owner of the house or person which one wishes to visit or when the distance to be traveled is a short one. In these narrow streets and even in streets through which travel is permitted there is such a mass of slow-moving vehicles and pedestrians that progress is necessarily slow. The pedestrian has the right of way and is almost unmoved by the warning of a motor horn. (To be continued)

## Present Organization of the Motor Transport Corps



*Brig-Gen. C. B. Drake now heads the completed organization of the Motor Transport Corps, which is divided into two main staff divisions with five operating divisions under these*



# Tractor Activities in Illinois

## Three Centers of Tractor Manufacture in the State—Types Manufactured by and Scale of Production of Different Concerns—New Manufacturing Equipment

By P. M. Heldt

**T**AKING volume of production as the basis, Illinois is probably the greatest tractor manufacturing state in the Union. The state has three great tractor centers—one at Peoria, another in the Illinois portion of what is commonly referred to as the Tri-Cities (Rock Island and Moline) and the third at Chicago. The latter city is a center for tractor activities in general and boasts of a good many tractor parts factories and branches or depots of parts factories located in other sections of the country. Not all of the State's tractor interests are centered at the points mentioned, however, as there are more or less important plants also at Bloomington, Quincy, Joliet, etc.

In Peoria the lists show no less than five tractor factories. It is of interest in this connection to point out that Peoria is also a great distributing center for tractors and most of the large manufacturers in other parts of the country and especially those associated with the implement industry, have distributing branches here from which the central Illinois territory is supplied. Most of these branches are located close together, and Peoria may be said to have what amounts to a tractor row, the same as other cities throughout the country have their automobile row. This tractor row is, however, not located in the high rent district and the buildings on it are impressive more on account of their substantial construction than for any gaudiness of their decorations.

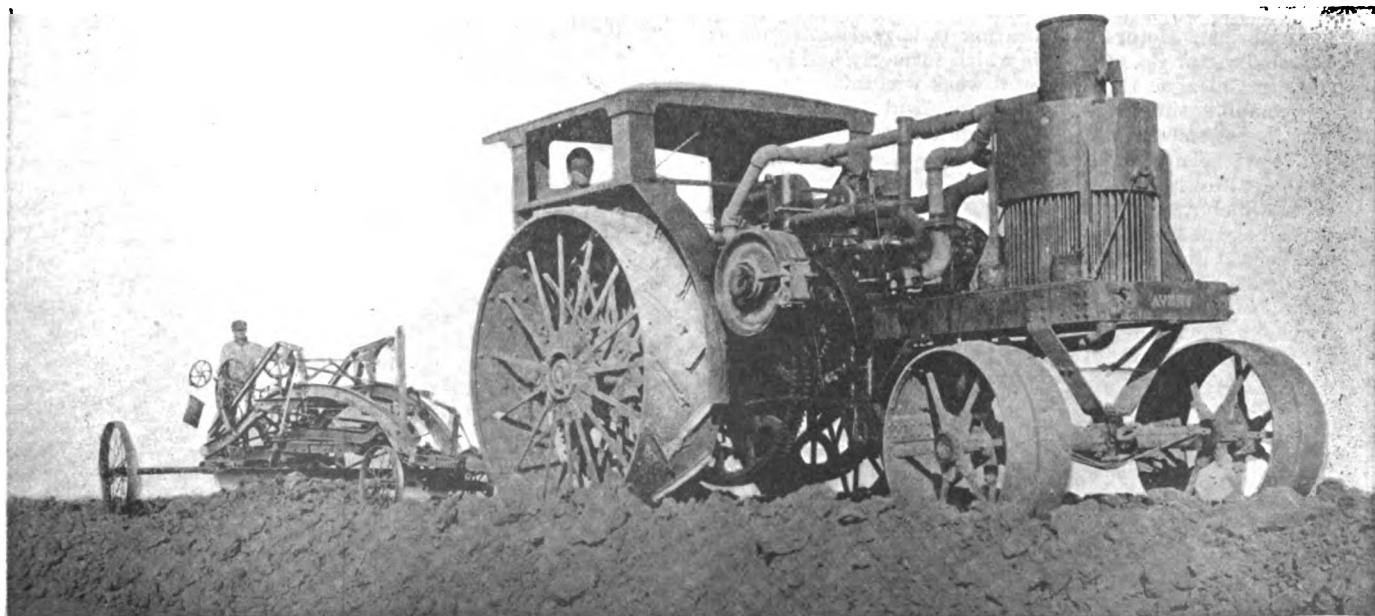
### Holt on War Work

Of the five tractor plants in Peoria that of the Holt Mfg. Co. is at present engaged on Government work exclusively and may be passed over here. The Holt plant is the home of the battle tank and was largely devoted to war work even before the U. S. entered the arena as a belligerent.

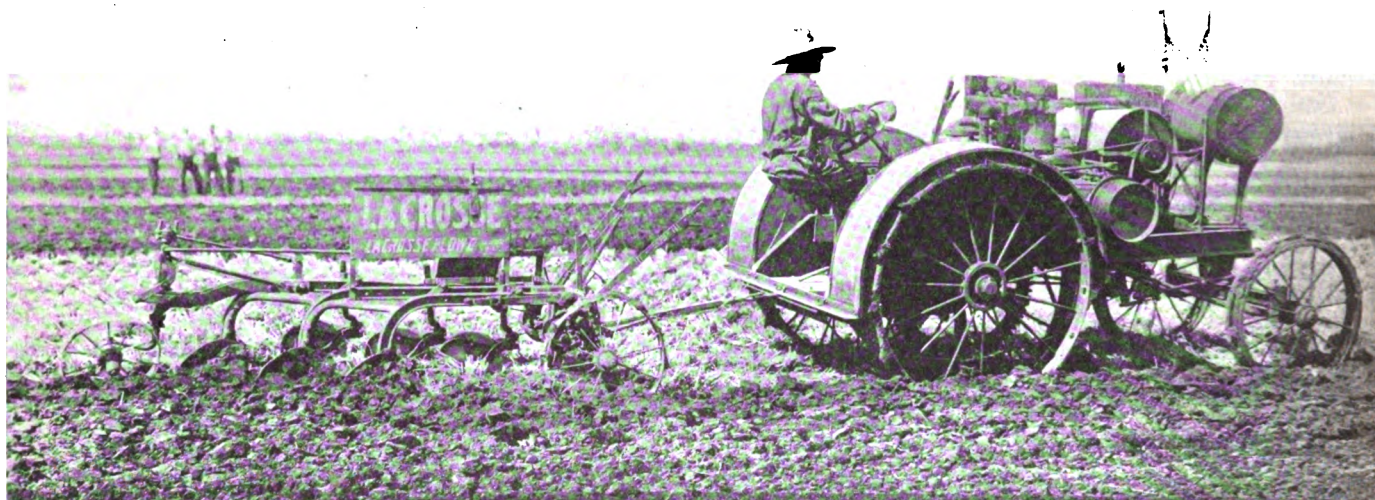
The other big tractor plant in the city is that of the Avery company which turns out between 10,000 and 12,000 machines

a year. Considerable export business was done last year, between 400 and 500 tractors having been sent to Italy, a few less to France and some also to England. The concern manufactures seven different models of which the smallest, the 5-10 hp. model recently fully described in *AUTOMOTIVE INDUSTRIES*, sells at the low price of \$550. This model has a four cylinder upright engine, while all the others have horizontal opposed engines and are designed all on the same lines. All these horizontal engines have removable cylinder walls, water-tight joints being obtained at the crank end by means of rubber packings and at the head end by means of the usual gaskets. Among the outstanding features of the Avery line are the following: Valves in removable heads; very substantial crankshafts (not a single shaft having broken to the company's knowledge though some 25,000 tractors have been turned out since the concern engaged upon this line of work in 1908); fuel gasifiers permitting of the use of kerosene; adjustable main bearings on crankshaft; exhaust induced air circulation through cooler; transmission through a train of spur gears giving a double reduction, the simplest type of transmission that could be used on a tractor; a sliding frame carrying the driving pinions whereby the same large diameter gear is used for all speeds. In addition to the seven tractor models the Avery company also manufactures a motor cultivator which plows two rows at a time.

The Acme Harvesting Machine Co., whose plant is located some distance out of Peoria on the interurban line to Pekin, manufactures a 3-plow tractor which can be furnished either as a wheeled or creeper type or both wheels and creeper outfits can be furnished for the same machine. This concern has turned out about 50 tractors to date, having started in the business a year and a half ago. The machine is a 3-plow tractor of 12-24 hp. and is fitted with a 4½ x 6 in. Beaver engine, Climax radiator, Donaldson air cleanser. Practically



Avery 40-80 tractor used in road grading



*Acme 3-plow wheeled tractor. This machine is also made in a creeper type*

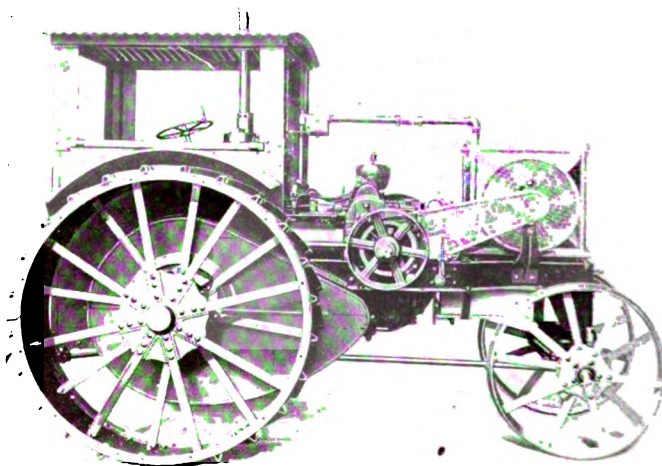
all of the other parts, including the clutch and transmission, are of the company's own design and manufacture. The tractors manufactured so far have been sent to different parts of the country to test them out under different soil conditions and it is likely that the business will be greatly expanded in the near future, as the demand the past year was away beyond the capacity of the plant to supply. The machine as a wheeled tractor sells at \$1,800, as a creeper at \$2,250 and as a convertible wheeled tractor and creeper at \$2,450.

#### Peoria Has New Four-Wheeled Model

The Peoria Tractor Co. at the time of the writer's visit was about ready to start upon the manufacture of a new four-wheel tractor assembled from standard parts. This firm is a reorganization of another one which began the manufacture of tractors in 1914 and up to the end of 1917 had turned out between 700 and 800 three-wheel machines having a rating of 8-16 hp. and selling at \$650 to \$725. This three-wheel tractor was equipped with a  $3\frac{1}{4} \times 5$  in. four-cylinder engine and was rated as a 2-plow machine. The reorganization referred to took place at the beginning of this year and previous to that time the old company had already been working on the new model, of which a full description appeared in AUTOMOTIVE INDUSTRIES some months ago. Since the reorganization some additional three-wheel machines and about 20 of the new model had been turned out.

The American Motors Corporation is a reorganization of the Huron Tractor Co. of Illinois which formerly had its headquarters at Chicago. Experimental work was taken up by the Huron company in 1915 and the removal to Peoria was effected in December last. Up to date between 50 and 60 tractors have been completed. This is an assembled machine, the main feature being in the transmission and rear axle construction which are of the company's own design. The trade name Yankee has recently been adopted for the product of the concern. A special feature is the one lever control. Every function of the tractor is controlled by a single lever, including three forward speeds and reverse and the engagement of the belt pulley. The engine is a four-cylinder Erd having  $4 \times 6$  in. cylinders and turning at 925 r.p.m. A Borg & Beck disk clutch is used and the transmission, which, as already stated, is original with the company, affords three forward speeds and one reverse, the speed range obtainable being from  $1\frac{1}{2}$  to  $4\frac{1}{4}$  m.p.h. The belt pulley is 11 in. in diameter and runs at 925 r.p.m. Considerable attention has been paid to items of design which affect the comfort and convenience of the operator. The tractor may be mounted from either side. To fill the radiator the operator stands on the front axle. The kerosene tank, which forms the hood of the machine, is filled from the platform. The operator's seat is cushioned and has a lazy back. There are foot rests on the operator's platform and there is ample leg room. The final drive is by internal spur gears.

In Rock Island and Moline there are three big plow companies which have entered the tractor industry and are destined to play an important part in it. The largest producer among these at the present time is the Moline Plow Co., which manufactures the two-wheel Moline Universal. This was originally a two-cylinder machine, but a new model with a four-cylinder engine was announced in June last and a full description of it appeared in AUTOMOTIVE INDUSTRIES at that time. The Moline Plow Co. erected special works for its tractor department which are very spacious, and all of the parts, including the engine, are manufactured in these works. The company turned out 12,000 tractors during the past business year, and this scale of production will undoubtedly be exceeded during the coming year. Various innovations were shown the writer at the time of his visit to the plant. Thus, it has recently placed in service a bearing die casting machine by which the babbitt metal is cast into the big ends of the connecting-rods. This machine has a capacity for 300 to 350 rods a day. The molten babbitt is forced into the die under an air pressure of 50 lb. per sq. in., which makes a very nicely finished job. Another innovation contemplated was the installation of pyrometers on all core ovens. Heretofore foundries have lost many cores on account of irregular heating, which loss can be obviated by the use of pyrometers. The Leeds-Northrop pyrometer equipment will be used. The company designed a special milling machine for straddle milling the lugs on the steering yoke, by means of which six surfaces are milled at the same time. Another interesting device used in the manufacture of this tractor is a fixture for



*15-30 hp. International kerosene tractor, which handles 4 plows*



marking the timing on the flywheel. The latter is located by means of two pins passing through bolt holes in the flywheel web and the marks on the flywheel rim are then made by dealing a hammer blow to dies which can move radially inward toward the axis of the flywheel. At the time of the writer's call the plant employed about 1000 men.

#### Velie Production Held Down by War Work

The Velie Motor Vehicle Co., which has been heavily engaged on war work during the past year, has not pushed its tractor operations. At the time of the writer's call it was putting through a lot of 100 tractors which it was intended to complete and then stop tractor work for the duration of the war. These tractors were to be sent to different parts of the country so as to bring out any possible hidden defects and gain further experience for use in the development of the tractor model which the company expects to place on the market after the war on a large scale.

The Rock Island Plow Co., Rock Island, Ill., is the manufacturer of the Heider tractor, which was formerly manufactured by the Heider Manufacturing Co., Carroll, Iowa. Work was carried on at Carroll from 1908 to 1915 and on Jan. 1 of the latter year operations began at Rock Island. The company is at present turning out two four-cylinder jobs the leading characteristics of both of which is the friction drive. These tractors were described in a recent issue of AUTOMOTIVE INDUSTRIES and it is not necessary to go into details here.

#### International Harvester Has Several Models

In Chicago are located the main headquarters of the International Harvester Co. which figures very prominently in the tractor field. The company turns out a complete line including the International 8-16 hp., the Mogul 10-20 hp., the Titan 10-20 hp. and the International 15-30 hp. All of this company's models burn kerosene. The engines have from one to four cylinders, and, curiously enough, the smallest and the largest models are the four cylinder ones. The 15-30 hp. International, which is typical of the company's machines, has a four-cylinder horizontal engine of 5¼ in. bore and 8 in. stroke. This engine is set with its crank extending across the frame, the cylinders lying back of the crankcase. The cylinders are cast in pairs which are placed some distance apart so as to provide space for a liberal-sized central bearing on the crankshaft. The valves are located in the removable heads and the kerosene vaporizers are directly above the cylinder heads so the combustible mixture is drawn in to the cylinders partly by gravity and there is no possibility of "loading". The air is first drawn through a dust separator and then through an air heater surrounding the vertical exhaust pipe. Transmission is by sliding pinions, and two forward speeds and one reverse are obtainable. The final drive to the rear axle is by inclosed chain. The two speeds are 1.8 and 2.4 m.p.h. Cooling is by radiator and fan, the cooling system having a capacity of 40 gal. Rear wheels are 66 x 14 in., front wheels 40 x 7 in. The engine is of the low speed type (575 r.p.m.) and the weight of the tractor is relatively high, being 8700 lb. dry. The fuel capacity is 24 gal. and fuel and water add about 500 lb. to the weight. The front axle is spring mounted, short coiled springs surrounding the knuckle pins above the knuckles.

#### Improvements in the Parrett

Several improvements have been introduced in the new model of the Parrett Tractor Co. of Chicago. The Parrett Co. has always used the Buda engine and the new model has the Buda Model HTU special tractor engine. One of the particular advantages of this engine is that it has a detachable head. Cylinder dimensions are 4¼ x 5½ in. and the tractor is rated at 12-25 hp. A change has been made in the transmission which now gives three forward speeds, viz.: 1¼, 2½ and 4 m.p.h., besides the reverse of 1.8 m.p.h. The final drive, which, as formerly, is by internal gears, is now inclosed. A novel attachment original with the Parrett concern is the air washer of which a sectional view is shown herewith. The air enters on top and passes down through the central tube to the bottom where it bubbles through the water. On passing up again through the washer the air is compelled to pass through

a series of perforated baffle plates which breaks the bubbles up very finely, thus causing all dust held in suspension to come in contact with the water and to be moistened and precipitated.

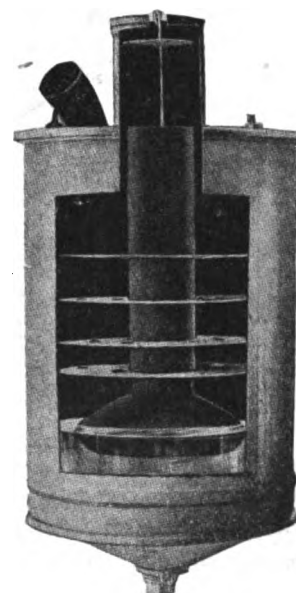
The Parrett company, which was reorganized nearly a year ago, at which time additional capital was put in, manufactured 600 tractors last year and plans to double this output the coming year.

The Square Turn Tractor Co., which was organized in Chicago and for a considerable period occupied extensive offices in the Lytton Building, has removed to Fremont, Neb. Similarly, the Stutes-Mar Farm Tractor Co., which formerly had offices in Chicago, has moved to Frankford, Ind., where it is developing a tractor of the creeper type, a machine of rather large size.

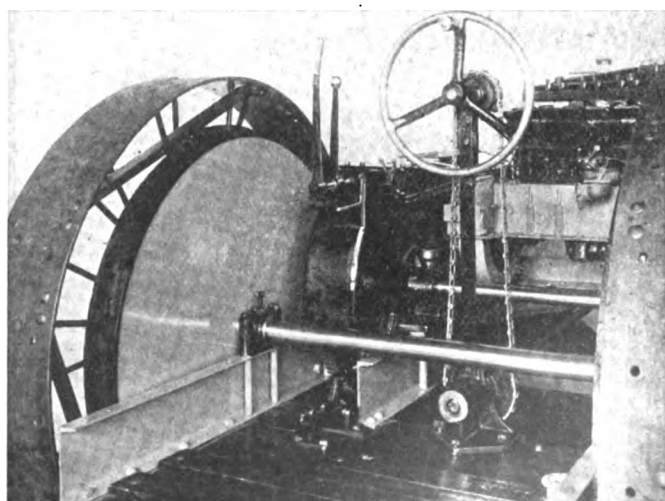
At Joliet the Joliet Oil Tractor Co. is manufacturing on a moderate scale the new model of the Bates Steel Mule. This is a machine of the combined wheel and creeper type, having two steering wheels in front and two chain tracks at the rear. It has a four-cylinder 4 x 6 in. engine and is rated at 12-20 hp., or as in the 3-plow class. A centrifugal air cleaner is fitted and the engine is designed to burn kerosene, of which a supply of 10 gal. can be carried.

It might be supposed that the use of wheels would annul the advantage of the crawler of exerting a very light pressure per square foot of ground contact surface, but this is not so, as of the total weight of 4300 lb. only 240 lb. is supported by each front wheel. Two speeds are available, of 2.4 and 3.5 m.p.h. respectively. The two crawlers are pivoted on the rear axle and their forward part is pressed against the ground by springs located midway between the front and central wheels of the crawler. A plow type seat is mounted on the transmission box and the tractor is steered and controlled much the same as an automobile. The tread over the front wheels is a good deal wider than that over the crawlers and when plowing one front wheel runs in the furrow, rendering the tractor self-steering, while both crawlers run on unplowed ground.

Although the center of gravity is quite low the ground clearance at the lowest point is 14 in. The belt pulley is 12 in. in diameter by 8½ in. face and runs at 725 r.p.m. All transmission shafts and main drive shafts run on Timken roller bearings. All gears and gear shafts are of alloy steel and

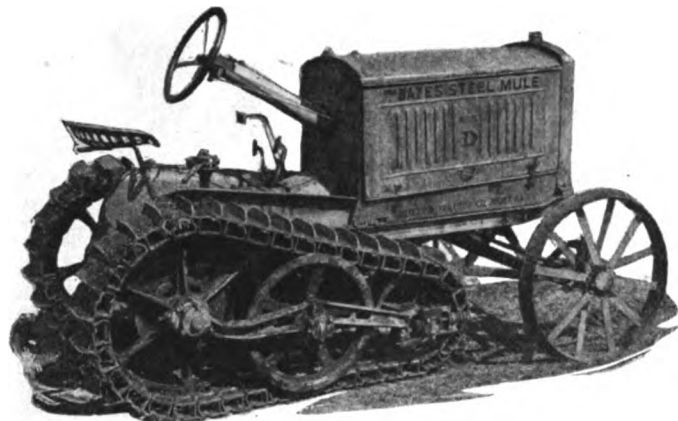


Parrett air washer



Rear view of the new Parrett showing enclosed drive





*The Bates Steel Mule model D*

the gears are hardened and ground. The whole transmission and drive is inclosed and runs in oil.

#### Dayton-Dick Co. Manufactures the Leader

At Quincy, Ill., the Dayton-Dick Co. manufactures the two-cylinder Leader tractor. The two cylinders are arranged opposite each other and have 6¼ in. bore by 6 in. stroke, the horsepower rating being 18 on the belt and 12 on the drawbar. From the crankshaft the power is transmitted by chain to a countershaft carrying the sliding pinions for the two forward speeds. These speeds are 2 1/3 and 3 1/3 m.p.h. The change speed gearing and differential are enclosed, but the chain transmission from the engine shaft and the final drive by bull gears are exposed. The front axle is of the automobile type, with pivoted steering knuckles and the forward end of the frame has a spring support on it. Rear wheels are 48 in. in diameter by 12 in. face and are provided with cone lugs or cleats. The front wheels are 30 x 5 in. The tractor complete weighs 4800 lb. and has a wheelbase of 81 in. Kerosene is used as fuel and is fed to the carburetor by the Stewart vacuum system.

The Bullock Tractor Co. of Chicago manufactures a line of crawler tractors comprising four models. The machine was originally developed in Iowa and was produced for a couple of years by the Western Implement Co. of Davenport. In November, 1913, the Bullock company was formed and took over the business. This firm turns out about 350 machines a year.

The Bullock tractor is of the type having no wheels at all, steering being effected by locking one of the creeper driving shafts.

## Official Bulletin on Diesel Engines

The lesson in economy in power production and use which America was forced to learn under war conditions is inclining a large number of people to consider carefully the claims of the more efficient engines, according to the Bureau of Mines, Department of the Interior. The limits of the peculiar field in which each engine is pre-eminent constantly change with the fluctuating costs of fuel, labor and investment. The Diesel engine is so far the most efficient mechanical device produced for changing the heat of fuels into power, says the bureau. That the fuel must be in liquid form and, therefore, relatively expensive has been one of the elements that has so far limited its use in competition with power plants starting with solid fuel, but the rise in price of coal and the increasing production of burnable fluids from coal distillation may at any time produce a profound change in these relations.

The Bureau of Mines has just issued Bulletin 156, "The Diesel Engine, Its Fuels and Its Uses," by Herbert Haas, which is both informative and readable and contains the facts which the interested reader, both non-technical and technical, most desires to know. The characteristics of the type, theoretical, mechanical and practical, concerning the engines built in this country are given. The chapter on fuels desirable for these engines is especially valuable and timely.

Copies of this bulletin may be obtained free of charge by addressing the Director of the Bureau of Mines, Washington, D. C.

### Cutting Lubricants

THE Department of Scientific and Industrial Research has recently published a memorandum on cutting lubricants and cooling liquids, in which it states that the mineral oils, which are best suited to be used as cutting lubricants, either alone or mixed with animal or vegetable oil, are mineral oils, preferably of pale color, of low viscosity, ranging from 100 sec. to 200 sec. Redwood at 100 deg. F. The lower viscosity oils may be used for high-speed conditions and oils with higher viscosity may be used for slow-speed conditions. Of the animal oils used either alone or in admixture, tinged lard oil containing as much as 10 to 15 per cent of free fatty acid is most frequently employed. Prime lard oil is almost free from acid; it is much more expensive than tinged lard oil, but is less inclined to gum under severe conditions—heavy cut and high speed. Lard oil congeals in cold weather, so that, wherever possible, a mixture of lard oil and low cold test mineral oil is to be preferred on account of greater fluidity in the cold.



*Leader 12-18 hp. tractor doing belt work*

# Labor the Next Great Problem

## Recriminations Between Industrial and Labor Leaders Forecast Another Struggle—Bethlehem Steel Co.'s Plan for Dealing with Labor—Right to Organize Cannot Be Questioned

By Harry Tipper

**T**HE abrupt termination of hostilities and the consequent speculation upon future conditions have brought the labor problem squarely to the front as an uncertain and difficult factor in the readjustment.

The public discussion between William H. Barr, president of the National Founders' Association, and Samuel Gompers, president of the American Federation of Labor, indicates the lack of common ground for action which governs the consideration of these industrial groups. This is particularly emphasized by the somewhat belligerent tone of the utterances.

It is unfortunate that a public discussion of these matters should have been started and emphasized in this particular way before the character and extent of the problem have been measured. If these are to be considered as typical of the positions which will be taken by groups of manufacturers and groups of labor organizations, it is evident that the war has not particularly increased the desire for common action in or materially lessened the hostility of these large organizations.

This sudden transition from the requirements of war to the problems of reconstruction imposes upon the individual the necessity for action if he is to avoid the turmoil which follows the economic changes. The necessity of taking advantage of the present position is measured by the imminence of the period of readjustment and the certainty of industrial conflict unless measures are taken to meet them. That there is an increasing appreciation of this necessity is indicated by the constant announcement of new plans dealing with the matter from the individual organization standpoint. It is significant that announcement has been made of such a new plan by the Bethlehem Steel Corporation, and the details of this plan indicate its far-reaching character.

It is interesting to note that this plan specifically admits the right of the man to join a labor organization and states that the proposed plan does not abridge or conflict with this right.

In the consideration of plans for the development of machinery, within the corporation, to take up and handle the problems of employer relations, there are certain fundamental requirements which must govern each plan. These requirements must be based upon recognition of the place and value of labor organizations, the necessities of the workers, the responsibilities accompanying government of an

industrial establishment, in order that any plan will be of service and not a mere shell.

The right of the worker to organize must be recognized. This right is just as clear as the right of any other body of men to organize for their own interests. The recognition must be definite and whole-hearted. Without it there can be no common ground for peaceful solution of the problems. The value of any particular type of organization may be questioned, and the manufacturer should recognize that labor organizations, as constituted at present, do not solve his individual problem, but rather intensify some portions of it—the uncertainty of agreement, the difficulty of decision, the tendency of movement from plant to plant, the lack of organizational incentive.

### The Responsibility of Industry

Plans must be based upon a recognition of the fact that absolutism or autocratic control of industry is no more justified than absolutism or autocratic control in political government. It must be recognized that the worker who has been fighting or working for a democratic ideal—one in which each man has some share in his own destinies politically—will not be content for long to continue under an industrial control which does not permit or recognize the same principles. Control must be given up voluntarily in some slight degree, in order to secure efficiency, co-operative responsibility and stability of industrial operation.

The idea that the worker is not intelligent enough to exercise some share in the decision of industrial matters relating to his working conditions is as false as the idea that he is not sufficiently intelligent to share in the government of his country. Intelligence is increased by responsibility, the necessity for decision and action. Responsibility has always developed conservatism and careful operation. Every organization endeavor in human affairs has shown that control, voluntarily shared, induces a unity under leadership which cannot be attained by any amount of arbitrary control.

Some form of elective, representative systems for governing these matters is desirable. It is old and usual; every form of co-operative organization employs some system of this type. It is, therefore, understood and readily measured by the employees of an establishment. In all the individual cases, so far observed, some organization of this type is used

for the purpose. In this connection the methods employed by the Bethlehem Steel Corporation are quoted:

#### I—REPRESENTATION

1. Representation shall be on the following basis:

Plants employing under 1500 employees: One representative for each 100 employees.

Plants employing 1500 to 10,000 employees: One representative for each 200 employees.

Plants employing over 10,000 employees: One representative for each 300 employees; provided, however, that in no case shall there be less than 10 representatives.

Such adjustments as may be necessary to meet special cases shall be made.

2. For the purpose of applying the unit of representation, the plants should be subdivided according to departments and natural subdivisions. Wherever it is necessary to group a number of small departments in order to complete a unit of representation, regard shall be had to logical groupings and location.

3. Adjustment in units of representation shall be made in accordance with the recommendations of the Committee on Rules.

#### II—TERMS OF REPRESENTATIVES

1. Representatives shall be elected for a term of one year, and shall be eligible for re-election.

2. A representative may be recalled upon the approval by the Committee on Rules of a petition signed by two-thirds of the voters in his department.

3. A representative shall be deemed to have vacated office upon severance of his relations with the company or upon his appointment to such a regular position as would bring him within the meaning of Paragraph 3, Section 3, entitled "Qualifications of Representatives and Voters."

4. Vacancies in the office of representative may be filled, in the discretion of the Committee on Rules, by special elections conducted in the same manner as the general elections.

#### III—QUALIFICATIONS OF REPRESENTATIVES AND VOTERS

1. Any employee who has been on the company's pay-

rolls for a period of six months prior to nominations, who is 21 years of age and over, and who is an American citizen or has taken out his first papers, shall be considered qualified for nomination and election as a representative.

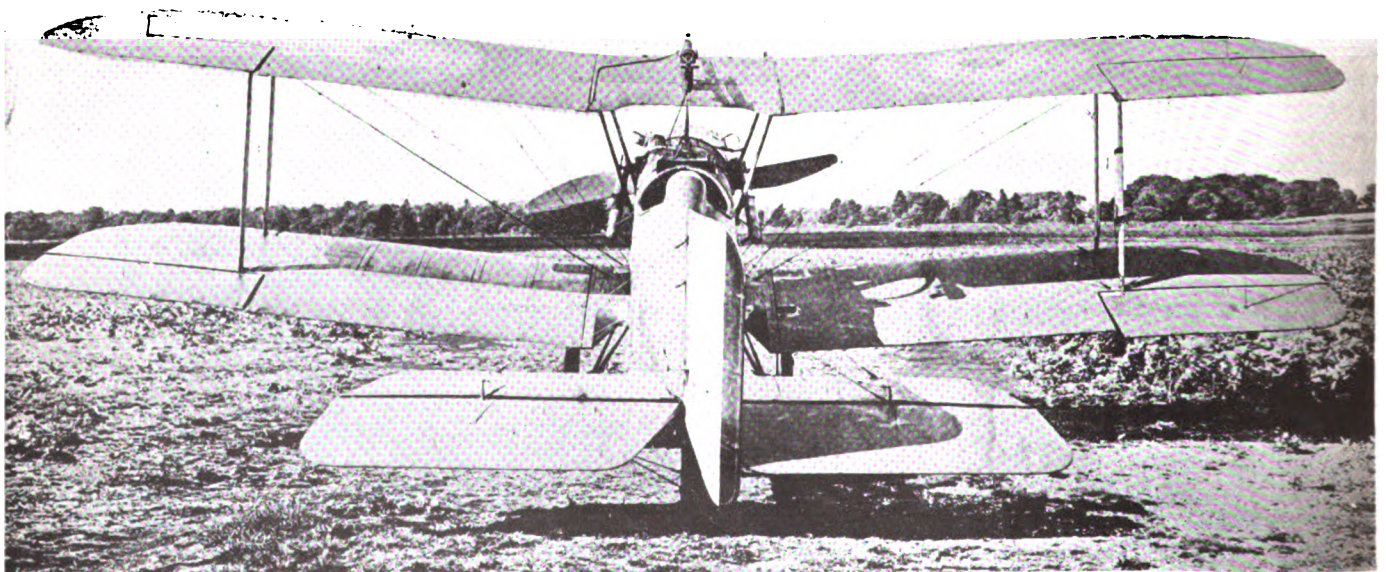
2. All employees who have been on the company's payrolls for a period of at least sixty (60) days prior to the date fixed for nominations, and who are 18 years of age or over shall be entitled to vote; provided, however, that in case of the first elections, thirty (30) days on the company's payrolls shall suffice.

3. Company officials and persons having the right to hire or discharge shall not be eligible as representatives or qualified to vote for representatives.

#### Economic Values

The manufacturer should understand thoroughly that control or precedent is not important. Labor costs are relative, time and production factors governing. Labor in Great Britain in 22 industries averaged \$750 per person in 1913. In 1918 it averaged \$2,300 per person. Wages increased about 100 per cent. Production has increased about 300 per cent.

Turnover, absence from work, strikes, fatigues, and all these items of economic waste in labor rise out of psychological causes in the man and must be cured by human developments. The justification for the owner and manager of industries does not lie in precedent, in desire for control, nor in any disbelief in the intelligence of labor. The verdict upon his management will be placed by the record upon the efficiency of his production and that very economic situation depends upon a thorough knowledge of human desires and aspirations, a decent analysis of history and a conservative courage which will thoroughly determine the cause and then act confidently on the solution of it.



**Rear View of the SE-5 Tractor Scout**

*This machine is fitted with a 140-hp. Hispano-Suiza engine and carries one Vickers and one Lewis machine gun with Constantinesco interrupter gear. The machine complete weighs 1930 lb., has an endurance at 10,000 ft. (including climb) of 2½ hr. and a ceiling of 20,000 ft. Its speed at ground level is 129 m.p.h. and at 10,000 ft. 120 m.p.h. The climb to 10,000 ft. requires 11 min. Following are the chief dimensions: Span, 27 ft. 11 in.; overall length, 20 ft. 11 in.; height, 9 ft. 6 in. This model was brought out by the British Royal Air Craft factory in December, 1916*



# Lubrication and Fuel Tests

Paper Presented to the Mid-West Section of the Society of Automotive Engineers  
Dealing with Tests Made on a Buda Tractor Type Engine

By P. J. Dasey\*

THE demand for heavy duty engines of the four-cylinder, four-cycle, vertical type, especially for use in farm tractors, has made it necessary, in order to meet the heavy service requirements, to make alterations in design with the idea of not only strengthening such parts as are under maximum load conditions during practically all of the operating period but also to allow of adjustments to shaft and connecting-rod bearings with the least loss of time and effort.

The Buda HTU model engine, which was announced some months ago, and which is now being supplied to various firms in the tractor industry, illustrates the latest development in the medium size of four-cylinder engines produced by the Buda company for use in farm tractors and heavy duty trucks.

In exterior appearance it differs from the conventional type only in the detachable head and split oil pan, two features that are highly valuable in tractor work where the excessively heavy duty it is called upon to perform makes it necessary that access to cylinders, valves and crank bearings be easy as well as rapid.

For quick reference the general dimensions of the engine are as follows:

Type.....	Four cylinder, vertical, en bloc "L" head type, four cycle	
Bore.....	4 1/4"	
Stroke.....	5 1/2"	
Weight.....	About 800 lbs. with regular equipment	
Suspension.....	3 point	
Ignition.....	Any standard type of magneto or ignition system	
Carburetor.....	1 1/4" vertical outlet	
Lubrication.....	Gear pump force feed system	
Cooling.....	Centrifugal water pump	
Fan.....	Not furnished.	
Extreme length of crank shaft.....	32 1/2"	
Height from center of crank shaft to top of water outlet pipe.....	25 1/4"	
Distance from center of crank shaft to bottom of engine.....	9 1/2"	
Distance from center of front supporting bracket to center of rear supporting arm.....	34 1/4"	
Drop of supporting arms from center of crank shaft to top of frame.....	4" to 6"	
Drop of front support bracket.....	2 1/2" or 3 1/4"	
Length of rear supporting arm.....	25 1/4"	
Length of engine over cylinders.....	24 1/2"	
Diameter of fly wheel.....	17"	
Wt. of fly wheel.....	Truck, 76 lbs. to 115 lbs. for Tractor	
Face of fly wheel.....	3 1/2"	
Fly wheel regularly furnished for multiple disc clutch.....		
Diameter and length of front bearing.....	2 1/4 x 3 1/4"	
Diameter and length of middle bearing.....	2 1/4 x 2 1/4"	
Diameter and length of rear bearing.....	2 1/4 x 4"	
Diameter and length of connecting rod bearings.....	2 1/4 x 2 1/4"	
Connecting rod length from center to center.....	12 1/2"	
Diameter and number of connecting rod bolts.....	1 1/2" - 4	
Diameter and length of piston pin bearing.....	1 1/2 x 2 1/4"	
Length of piston.....	5 1/2"	
Effective working diameter of valves.....	1 1/2"	
Use 1/8" 18 standard thread, S. A. E. spark plugs.....		
Piston displacement in cubic inches.....	312	
Internal diameter of bell housing flange.....	16 1/4"	
External diameter of bell housing flange.....	17 1/4"	
Diameter of bolt circle.....	16 1/4"	
Diameter of bolts.....	1 1/8"	

NOTE.—This engine furnished in the bell housing (unit feature) only.

The split oil pan is a feature which has proven highly valuable in practice, as it permits of the bearings being examined and adjusted without the necessity of removing the transmission from the bell housing.

The valve timing is as follows:

- Inlet opens 15 deg. past top center,
- Inlet closes 40 deg. past bottom center,
- Exhaust opens 45 deg. before bottom center,
- Exhaust closes 10 deg. past top center.

While this valve setting has worked out well in practice, it has not, by any means, been determined that it is the most efficient; hence further experimentation is being carried out which it is hoped will ultimately determine what change, if

any, is necessary in the timing to secure maximum results in the use of fuel as well as in life of valves, etc.

The intake valve areas have been designed for high velocity of the ingoing mixture—

At 600 r.p.m. the velocity is approximately 6033 lineal ft. per min.

At 800 r.p.m. the velocity is approximately 8044 lineal ft. per min.

At 1000 r.p.m. the velocity is approximately 10,055 lineal ft. per min.

At 1200 r.p.m. the velocity is approximately 12,066 lineal ft. per min.

(These figures are based on calculation only.)

The vacuum readings at the same speeds are:

At 600 r.p.m., .45 in.

At 800 r.p.m., .80 in.

At 1000 r.p.m., 1.25 in.

At 1200 r.p.m., 1.60 in.

The water pump is of the ordinary rotary vane type with a capacity of:

4 1/2 gal. at 400 r.p.m.

8 1/2 gal. at 700 r.p.m.

11 gal. at 900 r.p.m.

14 gal. at 1200 r.p.m.

The projected area of the wrist pin bearing is 2.39 in. (1.125 in. x 2.125 in.), carrying a total pressure of 2001 lb. or approximately 837 lb. per sq. in.

The projected areas of the main bearings are:

Front main bearing, 6.7 sq. in.; load approximately 720 lb. per sq. in.

Center main bearing, 6.18 sq. in.; load approximately 780 lb. per sq. in.

Rear main bearing, 9.49 sq. in.; load approximately 518 lb. per sq. in.

Total of all main bearings—22.37 sq. in. with an average pressure of 672 2-3 lb. per sq. in. Ratio to piston displacement, 13.5 to 1.

The connecting-rod bearings each have 5.31 sq. in. with a pressure per sq. in. of 908 lb.

The valves have semi-steel heads electrically welded to .20 carbon, 7-16 in. diameter stems. They lift 5-16 in. and have 1 1/8 in. diameter in the clear. The camshaft (1 in. in diameter) and cams are turned out of solid bar, cams being 3/4 in. wide. There are three bearings of ample proportions.

The crankshaft is made of .45 carbon open-hearth steel; the connecting rods of .25 carbon open-hearth steel.

A pressure lubrication system is used which forces the lubricating oil to all crankshaft, crankpin, wristpin and camshaft bearings, the pressure ranging from zero up to 30 lb. at 1000 r.p.m.

The pressure is furnished by a gear pump mounted on the bottom and at the rear end of the oil pan and driven by spiral gears mounted on the cam and pump shafts. The oil is carried in the oil pan and before reaching the pump must pass through a bronze wire screen mounted near the center of the oil pan, after which it enters a passage leading to the intake side of the pump. From there it is forced up a passageway leading to a tube which runs the length of the engine and from which passageways lead to the main bearings and camshaft bearings. From the main bearings the oil is fed to the crankpins through holes drilled through the crankshaft and from the connecting-rod bearings to the wristpin bearings through copper tubes clamped to the sides of the connecting rods. The cylinders are lubricated by the oil thrown

\*Sales and Research Engineer, the Buda Co.

off the connecting-rod bearings at the crankpins, while the cams, push rods, tappets and valve stems are lubricated by oil being thrown by the cams and cranks to the guides above.

A relief valve is provided in the main oil line at the front of the engines so that when the pressure reaches the point at which the spring is set to operate, the ball check is raised and the oil flows into the front gear case, thus furnishing a constant supply of oil to the gears. In order to hold a constant reservoir of the oil in the gear case a small dam is cast across the outlet so that the oil level is always above the bottom of the gear mounted on the engine shaft.

### Lubrication

In connection with the work already accomplished in the designing and working out of the full pressure system described considerable work has been done along the lines of determining what kinds of oils are best suited for use in this type of engine.

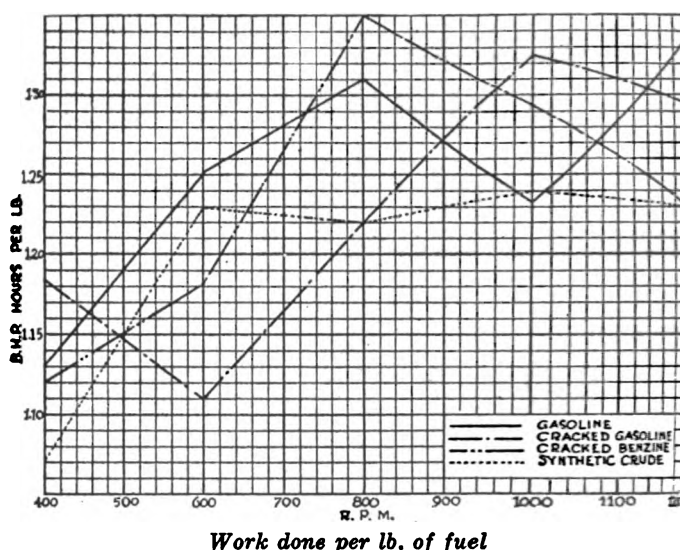
Internal combustion engines of this type have two major conditions in lubrication to be met at the same time and with the same oil, namely, cylinder lubrication under high heats and pressures, and crankshaft and connecting-rod bearings under comparatively little heat but high pressure. The lubricant must have the necessary body and viscosity at 150 deg. F. to withstand the extreme pressures in the crankpin and main bearings without permitting the metal surfaces to come in contact; also that its viscosity at 350 deg. F. be such as to provide a perfect piston seal, and to carry the pressures exerted against the piston and cylinder walls, under very high heat conditions, with the minimum of "cracking" or decomposition of the oil.

The oil must not only have these characteristics but must be fluid at reasonably low temperatures, although for pressure feed types the cold test is not so important—so far as feeding the lubricant is concerned during cold weather.

As a general rule, oils of low gravity "crack" or decompose under lower temperatures and pressures than do oils of higher gravities, the result being more rapid consumption of the oil, partly as fuel, partly in the formation of carbon deposits in the cylinders, and partly in the increase of the heavy tarry ends being washed down into the reservoir.

The more a given oil "cracks" or decomposes the less its value as a lubricant becomes, as the process of "cracking" not only allows parts of the lighter vapors so released to be used as fuel, but some of the heavier vapors condense and are washed down with the heavy tarry ends, thus raising the gravity (making the oil lighter), also lowering the flash and fire points to a considerable degree. This condition makes rapid use of the lubricant not only unavoidable but also causes considerable difficulty with carbon deposits on plugs, cylinders, pistons and rings, and if continued for any great time without being replaced with new oil, will cause the crankcase oil to eventually become a thick tarry mass, too heavy to circulate freely, hence dangerous to use further.

The lighter gravity oils are usually subject to a higher de-



gree of evaporation and to a lesser degree of cracking; hence in order to get a satisfactory lubricant that will serve both cylinder and bearing conditions with the least decomposition yet with the highest flash and fire points and viscosity from which the best average results may be expected, characteristics have been tabulated for those desiring to take advantage of the same.

Oils specified for summer use only are much heavier in body than those specified for all year round service, and while they can be used in the summer only because of their remaining in a fluid condition, they will carbonize more freely than will the lighter oils. They are more viscous, however, and will carry the loads placed upon them with less wear to the bearings, etc., than will the lighter oils. It is a matter of choice as to which oil one prefers to use, all things considered. One reason for not using heavy oils in the winter time is that the oils become very thick (viscous) in low temperatures and hold the pistons so tight that it requires considerable power to move them when starting.

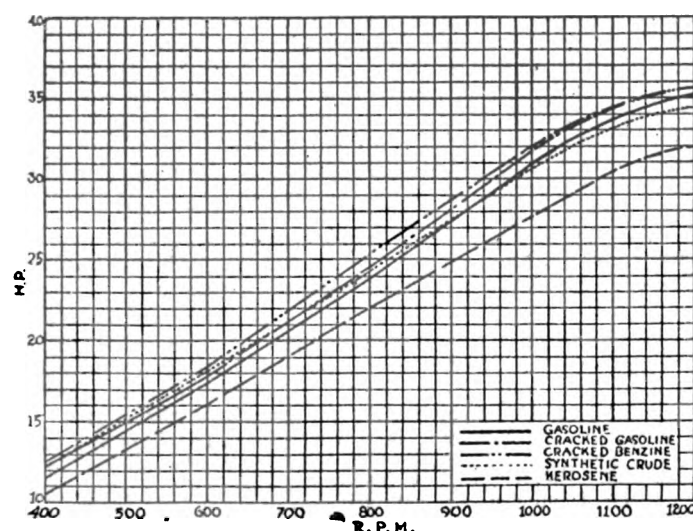
Gravities do not play an important part in the selection of an oil. The principal points to judge by are the flash and the fire points and the viscosities at 150 deg. F. and 350 deg. F. While the crankcase oil will vary in temperature under different working conditions, also in winter and summer, the point of 150 deg. F. has been taken as a basis of calculation, while the 350 deg. F. point more nearly approximates that under which the oil must work in the cylinders, hence the viscosity at that point is important.

Some oils show high viscosities at 150 deg. F. and 212 deg. F., but at 350 deg. F. are greatly reduced; others show ordinary readings at the first mentioned temperatures and drop but little at the latter point.

The best results will be obtained from an oil, all other things being equal, that shows the greatest viscosity at not only 150 deg. F. but also at 350 deg. F. In other words, an oil having the proper cold test, flash and fire points and which will show the greatest viscosity at 150 deg. F. and at 350 deg. F. will give far better service as a lubricant under heavy duty working conditions than will an oil as good in all other respects but with a relative low viscosity at 150 deg. F. even though it might be the same at 350 deg. F., which of course is not likely to happen.

There is such a difference in oils that it is impossible to tell without actual tests or a complete dependable table of characteristics, including viscosities at 350 deg. F., just which kinds will best fill the bill for any particular purpose, but I feel sure the day is coming when more attention will be given to this end of the engine business and a means found of giving the information secured to the engine owner to the end that he will be relieved of any uncertainty or guesswork regarding what he should use to derive the best results and maximum service.

It will be noted in the specifications tabulated there is considerable leeway in all characteristics except the viscosity at 350 deg. F. (Universal Saybolt viscosimeter), where the limits



Horsepower curves corresponding to different fuels

are rather close. The oils which come within these limits naturally have the desired characteristics at the lower temperature, flash and fire points, hence it is important that in addition to all other characteristics of an oil its viscosity at 350 deg. F. and cold test be obtained.

This data is based on the requirements of an engine of the type described in which the oil is used for lubricating all bearings as well as cylinders, etc., and should therefore not be confounded with specifications which might be deemed desirable in an oil which was to be used in any other type of machinery or engines. It was because of the excessively heavy duty work this type of engine was called upon to perform that investigation of the oil problem was taken up. Considerable work has already been done but much more remains to do; in fact, it is practically an endless labor.

## OIL SPECIFICATIONS FOR FULL PRESSURE ENGINES

All year round oils:

Gravity, Deg. B.	Flash, Deg. F.	Fire, Deg. F.	Saybolt Viscosity at 212 Deg. F., Seconds	Viscosity at 350 Deg. F. Seconds	
20 to 30	415 to 465	455 to 520	58 to 85	36 to 40	Cold test not to exceed 32 deg. Preferably 20 deg. to 25 deg.

Heavy oils for summer use only:

Gravity, Deg. B.	Flash, Deg. F.	Fire, Deg. F.	Saybolt Viscosity at 212 Deg. F., Seconds	Viscosity at 350 Deg. F., Seconds
22 to 29	470 to 530	530 to 600	100 to 125	40 to 45

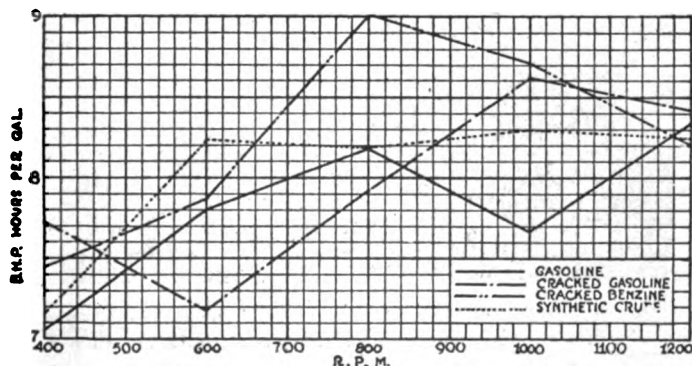
## Fuel Tests

While the engine is designed primarily for the use of gasoline, it can be provided with a low compression head so that those desiring to use kerosene may do so by applying such apparatus as they determine is best adapted to the handling of that fuel. No such device is furnished as a regular part of the equipment.

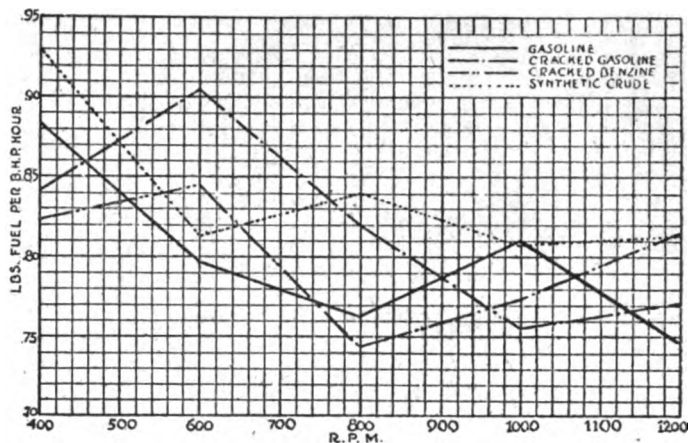
As a part of the research work carried on in connection with the HTU engine, tests have been made on "cracked" fuels of different weights in order to determine whether it was possible to use such fuels in an engine of this type designed and equipped for the use of gasoline, and the results are given in Table I (see page 887).

Please note the gravities of the fuels used:

The plotted curves will more readily illustrate the results obtained, but before going further I wish to explain that the tests were made with a regular Stromberg carbureter, 1½ in. size, attached to a gasoline manifold (unheated) and that no hot air stove nor other means of heating was provided—in fact, it was the regular gasoline equipment. A Sprague electric cradle dynamometer was used, with all the necessary equipment for weighing the fuel, counting the revolutions, timing, taking temperature of water inlet and outlet as well as oil temperature in the crankcase manifold, vacuums, etc.



Work done per gal. of fuel



Specific fuel consumption at different speeds

On page 876 at the bottom of the first column are shown horsepower curves of all five tests, including the kerosene test which was made with a low compression head and heated manifold, but without hot air being taken through the carbureter. That particular test was made only for horsepower determination and no record was kept of fuel consumption per b.-hp. per hour.

Note the horsepower readings at the different revolutions per minute points and the fuel making the best showing—

At 400 r.p.m., first in power is cracked benzine;  
second, " " gasoline;  
third, " " synthetic crude;  
fourth, " " ordinary gasoline;  
fifth, " " kerosene;

At 600 r.p.m., first, " " cracked benzine;  
second, " " synthetic crude;  
third, " " cracked gasoline;  
fourth, " " ordinary gasoline;  
fifth, " " kerosene.

At 1000 r.p.m., first, " " cracked benzine;  
second, " " gasoline;  
third, " " common gasoline;  
fourth, " " synthetic crude;  
fifth, " " ordinary kerosene.

(This is the first point at which ordinary gasoline showed better than any of the cracked products, and then it only went ahead of the crude.)

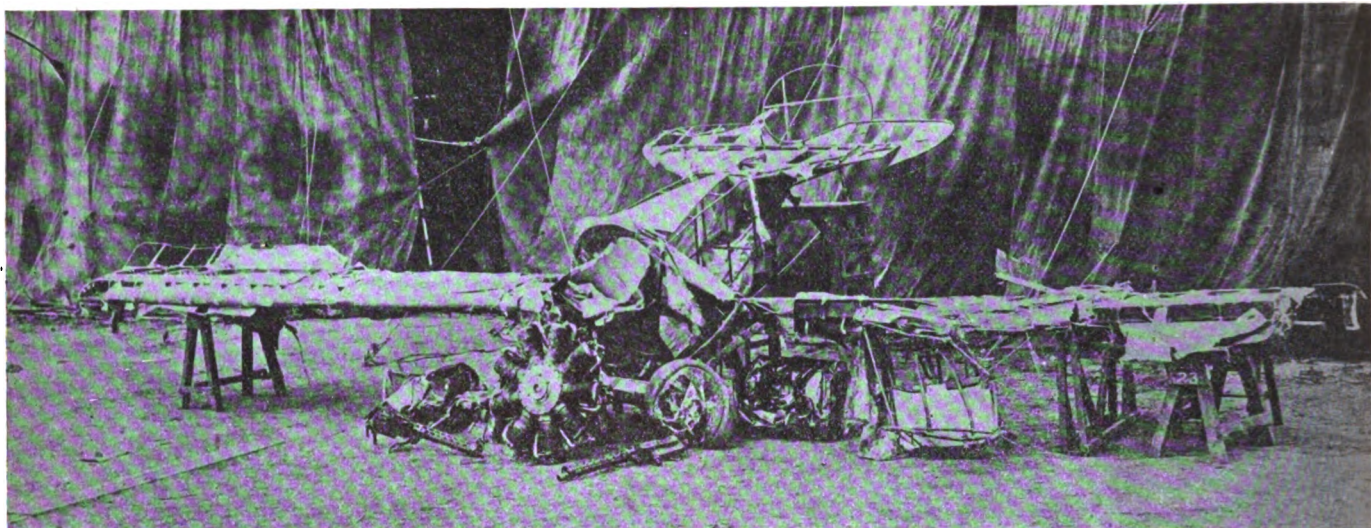
At 1200 r.p.m., first, " " is cracked benzine;  
second, " " gasoline;  
third, " " ordinary gasoline;  
fourth, " " synthetic crude;  
fifth, " " ordinary kerosene.

It will be noted that once again gasoline moved up ahead of one of the cracked fuels, the crude.

In all cases the cracked benzine and cracked gasoline show power producing qualities superior to gasoline under exactly the same operating conditions. I might add here that in each test the engine was speeded up to 1000 r.p.m. with full load, at which point the carbureter was adjusted to get the maximum power, after which the test was started at 400 r.p.m. and continued up to 1200 r.p.m. with no further adjustments.

It is only fair to say that the kerosene test being made with a low compression head (about 10 lb. lower than the other head used) does not show favorably from the point of power developed, and as no special arrangements were made in the way of special vaporizer or heating apparatus other than the heated intake manifold, and a regular Stromberg carbureter used, the same as in the other tests, it is not quite to be expected that the showing would be near what the fuel is capable of producing when properly handled. The power curve is given, however, merely to show what kerosene would do in the engine with no special treatment to assist vaporization other than the heated manifold. The two reasons for the falling off of power in the kerosene test, outside of the low compression head, is the loss in volumetric efficiency owing to the use of the heated manifold and to the slow burning of only a part of the charge owing to the lack of complete gasification.





*Wreck of von Richthofen's Fokker triplane. This photograph was taken in front of a British hangar soon after the German air-fighter was shot, down*

## Extracts from the Diary of von Richthofen

The German Flier Has an Audience with His "All-Highest-War-Lord" in  
"The Holiest of Holies"—He Also Meets Hindenburg and  
Ludendorf and Is Much Impressed

### PART II

**EDITOR'S NOTE.**—When von Richthofen received the "Ordre pour la Merite" he was given command of an air squadron, afterwards known as the von Richthofen Circus. This gave him greater opportunities although he never reached his wished-for goal of a hundred victories, being killed while on a reconnaissance, with a record of eighty-two. His diary indicates that he was not altogether of the same mind as was his Imperial Master (at a later date), for he says, "The vicinity of Holland was disagreeable."

#### The Anti-Richthofen Circus

**T**HE English had hit upon a splendid joke. They intended to catch me or to bring me down. For that purpose they had actually organized a special squadron which flew about in that part which we frequented, as a rule. We discovered its particular aim by the fact that its aggressive activity was principally directed against our red machines.

I would say that all the machines of the whole squadron had been painted red because our English friends had by and by perceived that I was sitting in a blood-red box. Suddenly there were quite a lot of red machines, and the English opened their eyes wide when one fine day they saw a dozen red barges steaming along instead of a single one. Our new trick did not prevent them from making an attempt at attacking us. I preferred their new tactics. It is better that one's customers come to one's shop than to have to look for one's customers abroad.

*We flew to the lines, hoping to find our enemy. After*



*Captain Baron von Richthofen and his mascot dog "Moritz." The captain bought him from a Belgian for about \$1.25. "Moritz" acted as observer on one occasion. On another one of his ears was cut off by the propeller*

about twenty minutes the first arrived and attacked us. That had not happened to us for a long time. The English had abandoned their celebrated offensive tactics to some extent. They had found them somewhat too expensive.

Our aggressors were three Spads, one-seater machines. Their occupants thought themselves very superior to us because of the excellence of their apparatus. Wolff, my brother and I were flying together. We were three against three. That was as it ought to be.

Immediately at the beginning of the encounter the aggressive became a defensive. Our superiority became clear. I tackled my opponent and could see how my

machine fell like a stone, burning fiercely. It dropped into a morass. It was impossible to dig it out, and I have never discovered the name of my opponent. He had disappeared. Only the end of the tail was visible and marked the place where he had dug his own grave.

Simultaneously with me, Wolff and my brother had attacked their opponents and had forced them to land not far from my victim.

We were very happy, and flew home and hoped that the anti-Richthofen Squadron would often return to the fray.

#### I See Our All-Highest-War-Lord

I had shot down fifty aeroplanes. That was a nice number, but I would have preferred fifty-two. So I went up one day and had another two, although it was against orders.

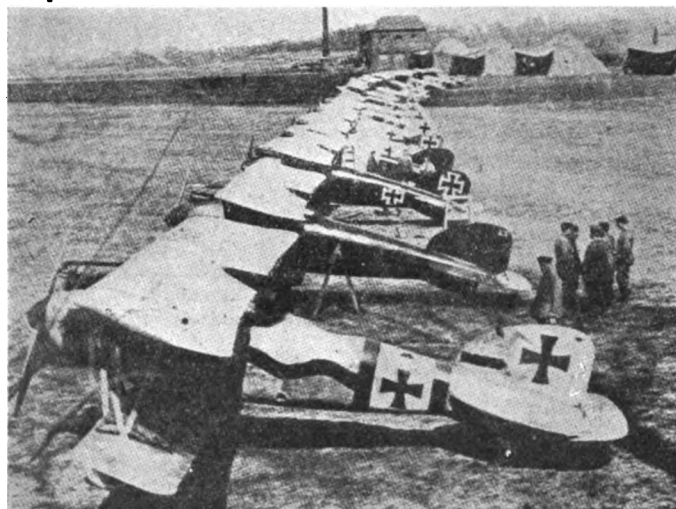
I hope that I may live to celebrate a second lot of fifty.

In the evening of that particular day the telephone bell was ringing. Headquarters wished to speak to me. It seemed to me the height of fun to be connected with the holy of holies.

They gave me over the wire the cheerful news that His Majesty had expressed the wish to make my personal acquaintance, and had fixed the date for me. I had to make an appearance on the 2nd of May. The notification reached me on the 30th of April at nine o'clock in the evening. I should not have been able to fulfill the wish of our All-Highest War-Lord by taking the train. I therefore thought I would travel by air, especially as that mode of locomotion is far pleasanter. I started the next morning, not in my single-seater "le petit rouge," but in a big fat two-seater.

I took a seat at the rear, not at the stick. The man who had to do the flying was Lieut. Krefft, one of the officers of my squadron. He was just going on leave to recover his strength. So things fitted in admirably. He also got home quicker traveling by air and he preferred the trip by aeroplane.

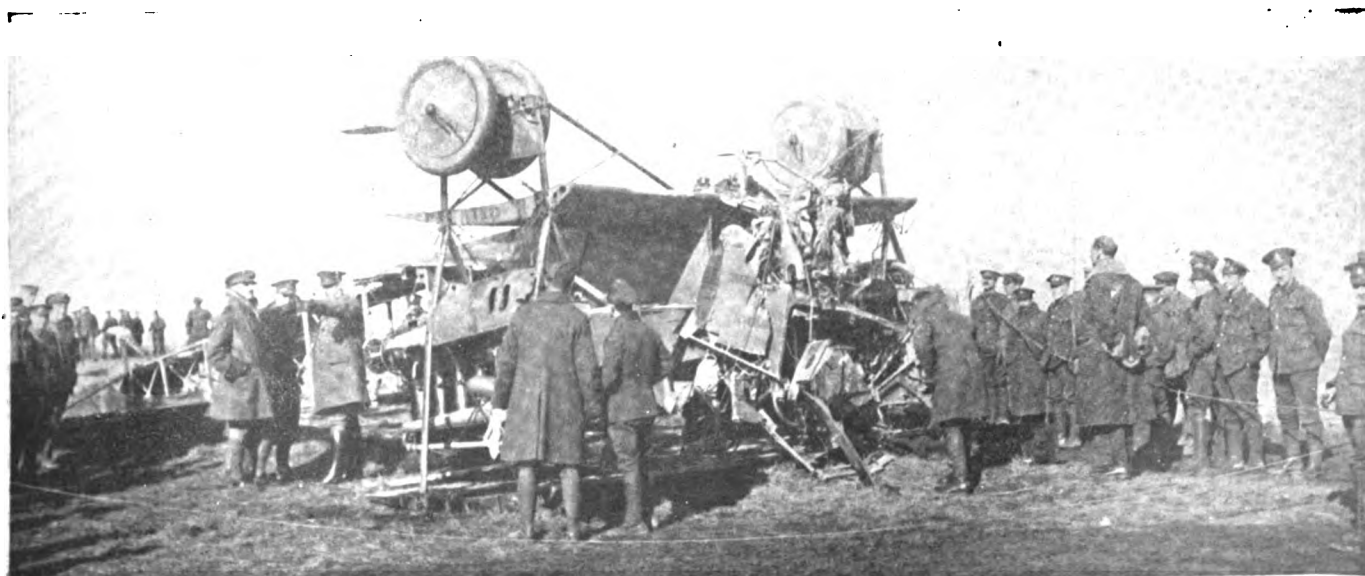
I started on the journey rather hastily. The only luggage which I took with me was my toothbrush. Therefore, I had to dress for the journey in the clothes in which I was to appear at Headquarters. Now, a soldier does not carry with him many beautiful uniforms when he goes to war, and the scarcity of nice clothes is great in the case of a poor "Front-hog" like myself.



*A German picture of the von Richthofen Circus, ready for flight*

brother and Wolff handled each their own enemy. The usual waltzing began. We were circling around one another. A favorable wind came to our aid. It drove us fighting away from the Front in the direction of Germany.

My man was the first who fell. I suppose I had smashed up his engine. At any rate, he made up his mind to land. I no longer give pardon to anyone. Therefore I attacked him a second time and the consequence was that his whole machine went to pieces. His planes dropped off like pieces of paper and the body of the

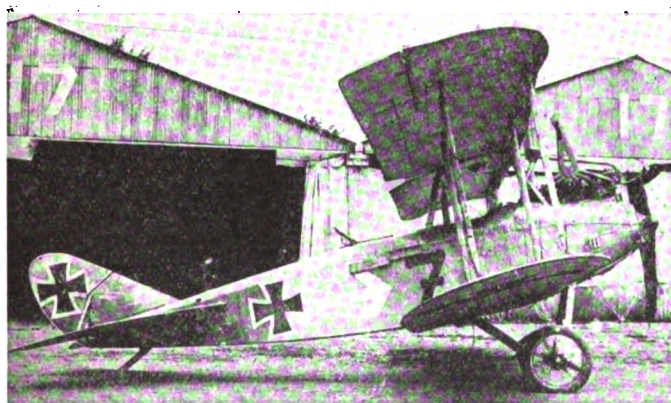


*This double-engined Gotha turned upside down just before it crashed. The pilot was killed*

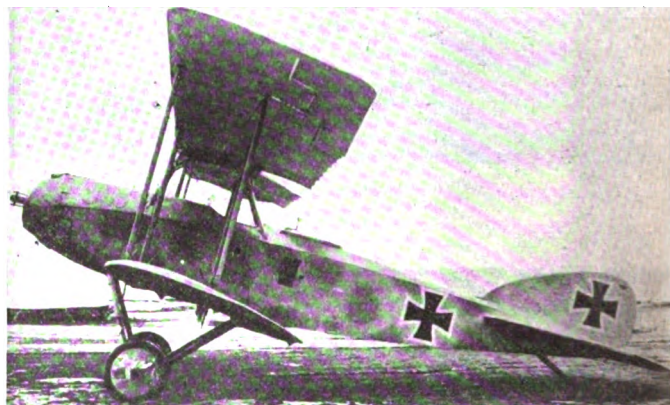




*A Friedbrichafner of the latest type, brought down in France*



*A German D. F. W. airplane, brought down by the British*



*An Albatross 2-seater machine with a 200-hp. Mercedes engine*

My brother undertook the command of the aeroplane squadron in my absence. I took leave with a few words, for I hoped soon to recommence my work among those dear fellows.

The route was via Namur, Liège, Aix la Chapelle and Cologne. It was lovely for once to sail through the air without any thoughts of war. The weather was wonderful. We had rarely had such a perfect time. Probably the men at the Front would be extremely busy.

Soon our own captive balloons were lost to sight. The thunder of the Battle of Arras was only heard in the distance. Beneath us all was peace. We saw steamers on the rivers and fast trains on the railways. We overtook easily everything below. The wind was in our favor. The earth seemed as flat as a threshing floor. The beautiful mountains of the Meuse were not recognizable as mountains. One could not even trace them by their shadows, for the sun was right above us. We only knew that they were there, and with a little imagination we could hide ourselves in the cool glades of that delightful country.

It had become late. Clouds were gathering below and hid from us the earth. We flew on, taking our directions by means of the sun and the compass. The vicinity of *Holland* was disagreeable to us. So we thought we should

go lower in order to find out where we were. We went beneath the cloud and discovered that we were above Namur.

We then went on to Aix la Chapelle. We left that town to our left and about mid-day we reached Cologne. We both were in high spirits. We had before us a long leave of absence. The weather was beautiful. We had succeeded in all our undertakings. We had reached Cologne. We could be certain to get in time to Headquarters, whatever might happen.

Our coming had been announced in Cologne by telegram. People were looking out for us. On the previous day the newspapers had reported my fifty-second aerial victory. One can imagine what kind of a reception they had prepared for us.

We flew rather low in order not to lose the sensation that we were traveling among mountains. For, after all, the most beautiful part of the Rhine are the tree-clad hills, castles, etc. Of course, we could not make out individual houses. It is a pity that one cannot fly slowly as well as quickly. If it had been possible I would have flown quite slowly.

In the afternoon we arrived at Headquarters and were cordially received by some comrades with whom I was acquainted and who worked at the Holiest of Holies. I



absolutely pity those poor ink-spillers. They get only half the fun in war.

First of all I went to the General Commanding the Flying Services.

On the next morning came the great moment when I was to meet von Hindenburg and von Ludendorff. I had to wait for quite a while.

I should find it difficult to describe my encounter with these Generals. I saw von Hindenburg first and then von Ludendorff.

It is a weird feeling to be in the room where the fate of the world is decided. So I was quite glad when I was again outside the Holiest of Holies and when I had been commanded to lunch with His Majesty. The day was the day of my birth, and somebody had apparently told His Majesty. He congratulated me in the first place on my success, and in the second on my twenty-fifth birthday. At the same time he handed me a birthday present.

Formerly I would never have believed it possible that on my twenty-fifth birthday I would be sitting at the right of General Field Marshal von Hindenburg and that I would be mentioned by him in a speech.

On the day following I was to take mid-day dinner with the Kaiserin. And so I went to Homburg. Her Majesty also gave me a birthday present, and I had the great pleasure to show her how to start an aeroplane. In the evening I was again invited by General Field Marshal von Hindenburg. The day following I flew to Freiburg to do some shooting. At Freiburg I made use of a machine which was going to Berlin by air. In

Nuremberg I replenished my tanks with petrol. A thunderstorm was coming on. I was in a great hurry to get to Berlin. Various more or less interesting things awaited me there.

### The German Flying Machines

In the course of the war the German flying machines have experienced great changes. That is probably generally known. There is a colossal difference between a giant aeroplane and a chaser aeroplane.

The chaser plane is small, fast, quick at turning. It carries nothing apart from the pilot except machine-guns and ammunition.

The giant aeroplane is a colossus. Its only duty is to carry as much weight as possible, and it is able to do this owing to the huge surface of its planes. It is worth while to look at the gigantic English aeroplane which landed smoothly on the German side of the lines.

The giant aeroplane can carry an unbelievable weight. It will easily fly when lifting from three to five tons. Its petrol tanks look as large as railway wagons. In going about in such a colossus one has no longer the sensation that one is flying. One is driving. In going about in a giant aeroplane the control depends no longer on one's instinct, but on the technical instruments which one carries.

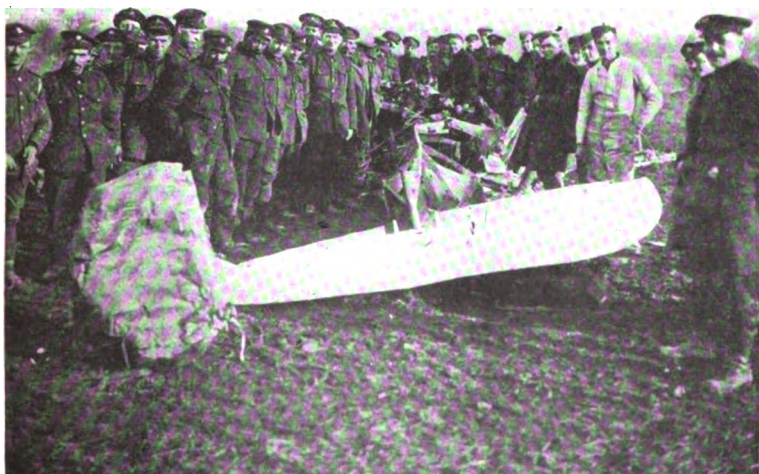
A giant aeroplane has a huge amount of horsepower. I do not know exactly how many, but they are in the thousands. The greater the horsepower the better. It  
(Continued on page 904)



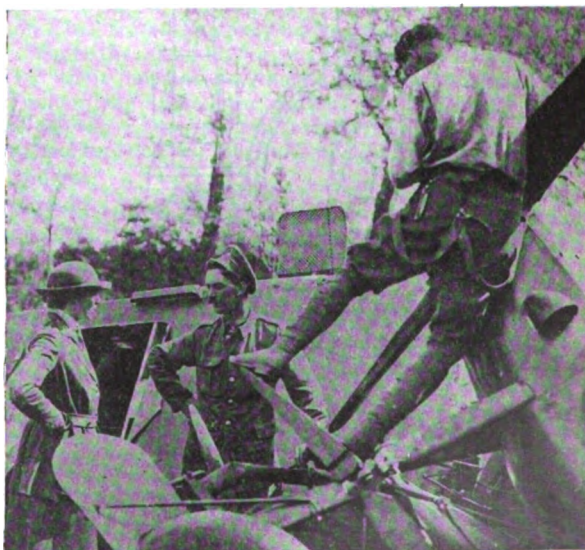
*A Rumpler fitted with a 200-hp. Benz engine*



*This German Rumpler has been re-marked with the British air sign*



*Either a Rumpler or Aviatik 2-seater. The object in the foreground is a crumpled gasoline tank*



*This Gotha was brought down in England. Note the woman transport driver*

# Maybach 300-Hp. Aircraft Engine

## PART IV

### Results of Horsepower and Fuel Consumption Tests—Table of Engine Dimensions —General Analysis of Weights—Chemical and Physical Analyses of Material in Various Parts

**T**HE design of the equalizing baffle is shown in the perspective sketch, Fig. 30, which also shows the method of joining the ends of the induction pipes by rubber connections and band clips. Details of the six small primer valves fitted into the top of the induction pipe are also shown in the sketch.

The Maybach carbureter has been tested separately at the R. A. E. The results of these tests are shown graphically in the power and throttle curves (Fig. 32), together with a throttle curve diagram in comparison with the HC-8 Claudel-Hobson carbureter (Fig. 31).

#### Characteristic Curves

(a) **Throttle Curve.**—The throttle curve appears good. There is an excess of fuel at first which should give good acceleration, and there is a fair range, down from full throttle, of weak mixture suitable for cruising. Obviously, if it is considered desirable to have fuel and air control interconnected, any required throttle curve could be obtained, but it makes an unnecessarily complicated instrument. In this particular carbureter there are four ball universal joints and two sliding blocks.

(b) **Power Curves.**—The power curves are satisfactory, the mixture being practically constant over a large air speed range.

#### Resistance Test

The resistance is very high compared with carbureters of ordinary design. For purposes of comparison, the resistance of the HC-8 Claudel-Hobson carbureter is plotted on the same curve. The two carbureters are for engines of about the same

horsepower, and it will be seen that the resistance of the Maybach is about nine times that of the Claudel-Hobson.

#### Atomization Test

	Air Temper- ature	Air cu. ft. min.	Fuel pt./hr.	Deposit c.c./min.	Deposit % of fuel flow
Maybach .....	58°F.	195	51	32	6.62%
HC-8 Claudel-Hobson	58°F.	192	50	23	4.85%

The atomization of the Maybach is rather better than the Claudel-Hobson, but this is obtained by a high depression and high loss through the carbureter.

#### Conclusion

The carbureter seems satisfactory on throttle and power curves and atomization, but the resistance is very high and the weight excessive. The throttle curve is obtained by a complicated mechanical system which would need careful first adjustment and constant adjustment for wear. The air is taken in through the moving parts, and if any dust is present the mechanism is very liable to stick or to render the control very hard to operate.

#### Fuel Supply System

Fuel is supplied to the two carbureters by a small double-acting duplex fuel pump, which is attached to the rear end of the bottom half of the oil base, and is driven at half engine speed directly off the rear end of the main oil pump spindle, the fuel pump driving shaft being coupled to the oil pump

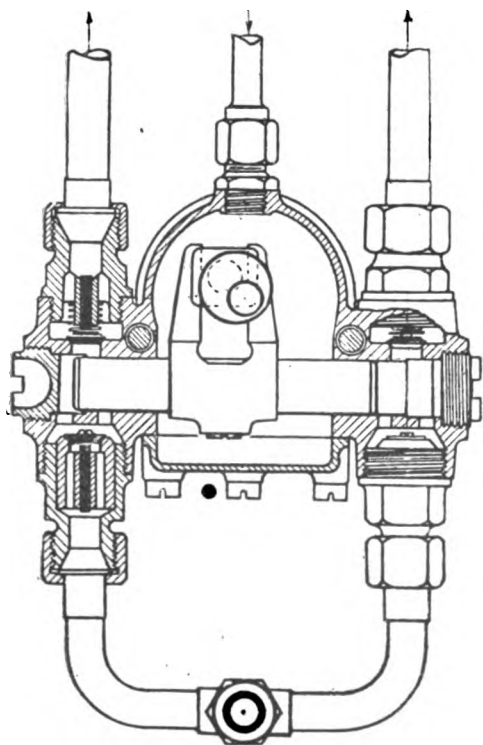
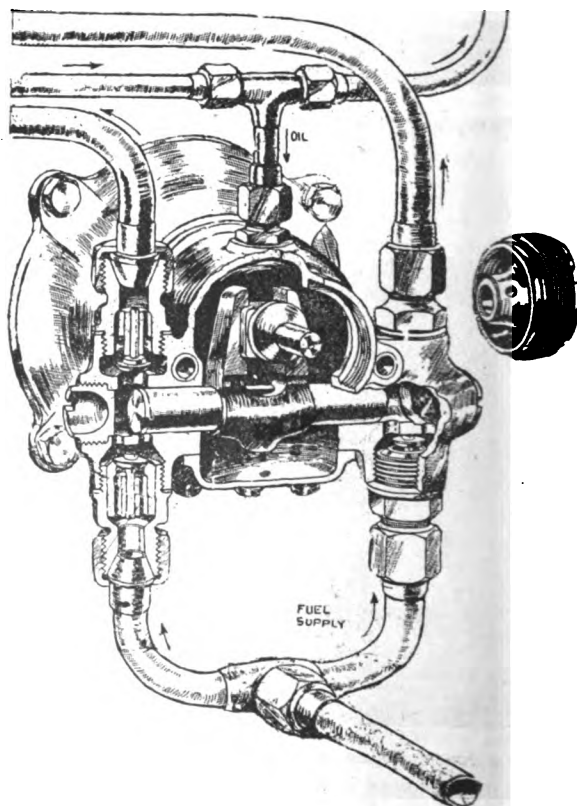


Fig. 28, left—Sectional view of fuel pump assembly. This is of the plunger type, having two opposite cylinders with a common plunger for both. Fig. 29, right—Perspective sketch of the fuel pump and its connections



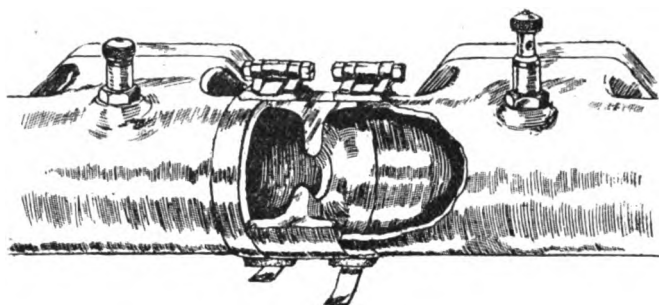


Fig. 30—Inlet pipe baffle and priming caps

spindle by a dog clutch. The installation of the fuel pump is clearly shown in the general arrangement drawing of the engine, and the details of the fuel supply system are shown in the diagrammatic drawing (Fig. 19).

Regarding the installation of the fuel supply system to the fuel pump in the machine, it is assumed that the main fuel tank is provided with the ordinary float regulator, which has always been fitted inside the fuel tanks for regulating the supply through the fuel pumps; but owing to the fact that the machines from which these new Maybach engines were taken are completely destroyed no information regarding the construction and installation of the fuel tanks is available.

In the Rumpler machines fitted with the 260-hp. Mercedes engines two fuel tanks are fitted. The main tank is in the center of the fuselage behind the pilot's seat, and the auxiliary tank is situated under the pilot's seat.

#### Fuel Pump

The design of the compound fuel pump is shown in the sectional drawing (Fig. 28) and also in the sectional perspective sketch (Fig. 29).

The fuel pump consists of two opposed cylinders, in which a reciprocating plunger works, the ends of which operate as single-acting pumps. The pump plunger carries a yoke fitted with a sliding bush, which forms the crankpin bearing of the small pump crankshaft, driven, as already described, off the rear end of the oil pump spindle at half engine speed. The bore of the fuel pump plunger is 15 mm. and the stroke is 17 mm. The outer ends of the pump barrels are as shown and are fitted with threaded plugs, which form compression chambers.

The small non-return suction valves are situated directly above and below the two compression chambers, and the two fuel delivery valves are fitted above the compression chambers. The valves communicate with the compression chambers through small ports drilled in the pump barrel. Both the suction and delivery valves are of the poppet type, and each delivery valve is spring loaded by means of a small brass wire coiled spring.

The valves are supported in guides drilled in the unions which form valve boxes, and to which the fuel delivery pipes from the fuel tanks and to the carbureters are connected. The internal diameter of both these pipes is 10 mm.

It will be noticed that both the suction valves are fed by the same fuel supply pipe, as shown in the sketch.

The center portion of the fuel pump body, which is a gun-metal casting, forms a small circular crank chamber for the pump plunger and is fitted at the bottom with a detachable cover plate, which is secured by six set screws. The whole of the pump crank chamber is filled with oil under pressure from the main lubrication system, through an oil pipe connected to the center of the pump body casting, and leading from the rear end of the detachable main oil-lead pipe on the engine. By this means the efficient lubrication of the yoke and sliding bush and also of the seating of the pump plunger is assured.

#### R. A. E. Tests of Fuel Pump

Flow tests at three speeds with varying heads were taken; in order to represent working conditions in the engine, flow tests were also taken through jets similar to those employed on the engine.

The fuel pump was run at three speeds, viz.: 550, 800, and

1275 r.p.m., and the outlet pipe was connected to the pump against a variable head from zero to 6 lb. per square inch.

The maximum and minimum fuel delivery at these speeds are given in the following table:

R.P.M.	Maximum flow	Minimum flow
	Zero head	6 lb. head
550	300 pt. per hr.	167 pt. per hr.
800	422 pt. per hr.	264 pt. per hr.
1275	630 pt. per hr.	498 pt. per hr.

Curves of delivery against varying heads at constant speed are quite normal, and it is evident from them that the valves are acting well, and that the drop in delivery with increasing head resistance is due to cavitation. The pressure of the oil in the pump case during these tests varied between 15 and 20 lb. per square inch, and the leakage of oil and fuel past the end bearing of the pump spindle during one hour's run was approximately one pint.

#### Tests Through Engine Delivery Jets

In the engine the fuel is delivered through restricting jets (Fig. 25) into the constant-level tanks, which feed the jet chambers below, and are provided with overflows to the main fuel tank. In the tests both outlets of the pump were connected by a Y piece with one delivery pipe, the end of which was closed by a plate 1/16 in. in thickness, having two 0.07 in. diameter jet holes drilled through. The fuel pump was run at the three speeds as in the former tests, and the following results recorded of delivery and head resistance:

R.P.M.	Head resistance	Pints per hour
550	4.5 lb.	160
800	9 lb.	218
1275	25 lb.	360

#### Starting Gear

The principle of the Maybach starting gear is now so well known that only a brief description of the mechanism and a few details of the construction will be necessary. In the semi-diagrammatic cross-sectional drawing of the engine, Fig. 18, the working principles of this simple and distinctive starting mechanism are clearly shown. By the depression of the hand lever A on the induction side of the engine, all the tappets are lifted off their cams through the action of small lugs formed on the top of the tappets, which fit into slots cut in the tubular lay shafts BB. All the valves, both inlet and exhaust, are thus opened in the cylinder heads; and at the same time the hand lever A closes the shutter C in the exhaust manifold by the connection of levers shown in the drawing. The valves and exhaust shutter are then locked in this position by a peg, which is inserted in two holes D, which now coincide in the hand lever A. By the action of a large hand suction pump E in the pilot's seat, gas is then drawn into the combustion chambers through the inlet valves and induction pipe from the carbureters as indicated in the diagram. When the cylinders are charged the valves are returned to their normal positions by the withdrawal of the locking pin in the hand lever A, and simultaneously the free passage in the exhaust manifold is again opened by the shutter C. Ignition is then effected by means of a Bosch

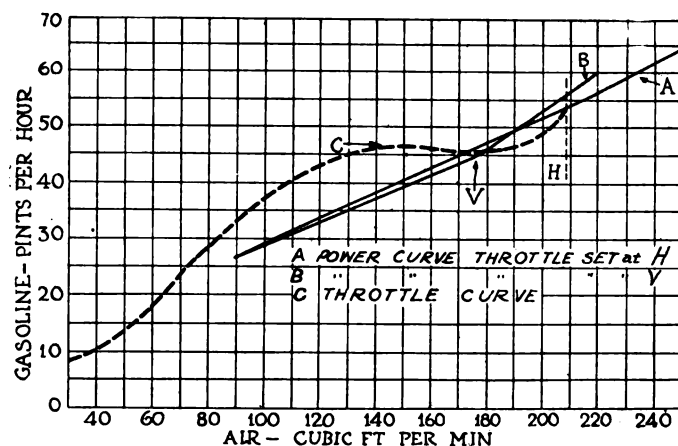


Fig. 31—Carburetor test curves



hand-starter magneto in the pilot's seat. It will be noticed that the exhaust shutter lever is provided with a spring-loaded tie rod to insure a true seating for the shutter. In order to prevent the engine from being started until the hand lever has been released to its off position, the locking hole in the lever which takes the pin is made in such a way that only a special form of locking pin can be used. For this purpose the handle of the starting magneto is made easily detachable, and is used for the purpose of locking the hand lever A. It is thus practically impossible to cause ignition with the valves open and the exhaust passage closed, which, of course, would cause firing back into the carbureters, and probably also result in destroying the hand pump.

The Maybach engine (No. 1261), after several slight repairs had been carried out to the cylinders and propeller hub flange and coupling, was erected on a test bed, coupled to a Heenan and Froude dynamometer, and submitted to the following power and consumption tests, including a one hour's duration test at normal speed. The results of the calibration tests are as follows:

R.p.m. ....	1200	1300	1400	1500
B.-hp. ....	258	279	294.5	304.5
Brake, M.E.P. ....	120.5	120.3	118	113.9
Petrol consumption in				
pints / B.-hp. hour	.53	.52	.526	.545

The results of these tests are shown graphically on the diagram (Fig. 32).

#### One Hour Test

At the conclusion of the above tests a run of one hour's duration at normal revolutions (1400 r.p.m.) was carried out with the following results:

Average b.-hp. ....	290
Fuel consumption ....	20 gal. = .55 pints per b.-hp. hour
Oil consumption ....	11 pints = .038 pints per b.-hp. hour
Oil pressure ....	5 lb. sq. in.
Oil temperature ....	67 deg. C.
Water temperature (inlet) ....	57 deg. C.
Water temperature (outlet) ....	68 deg. C.

#### Valve Timing During Tests

Inlet	Exhaust
O. 8 deg. E.	O. 33 deg. E.
C. 35 deg. L.	C. 7 deg. L.
Magneto advance	38 deg. E.

Running was steady at all speeds between 900 and 1400 r.p.m. but, owing to the fact that the propeller hub flange on the crankshaft was damaged and was running slightly out of truth, the vibration became excessive above 1400 r.p.m. Considerable trouble was experienced with the water connection between the cylinders on the exhaust side. The running became unsteady below 900 r.p.m.

#### Distribution

Owing to the exhaust manifold being fitted as part of the engine starting gear, it was not possible to form an idea of the distribution. A diagram of the inlet and exhaust valve lift is shown graphically in Fig. 10.

F.G. C. Ap. D. (L.).  
May, 1918.

J. G. WEIR,  
Lieut.-Colonel, Controller,  
Technical Department.

#### GENERAL DATA

Make of engine and rated hp. ....	Maybach 300-hp.
Type number ....	1261
Number and arrangement of cylinders ....	Six vertical
Bore ....	165.0 mm. = 6.50 in.
Stroke ....	180.0 mm. = 7.09 in.
Stroke/Bore ratio ....	1.09:1
Area of one piston ....	213.825 sq. cm. = 33.2 sq. in.
Total piston area of engine ....	1282.95 sq. cm. = 199.2 sq. in.

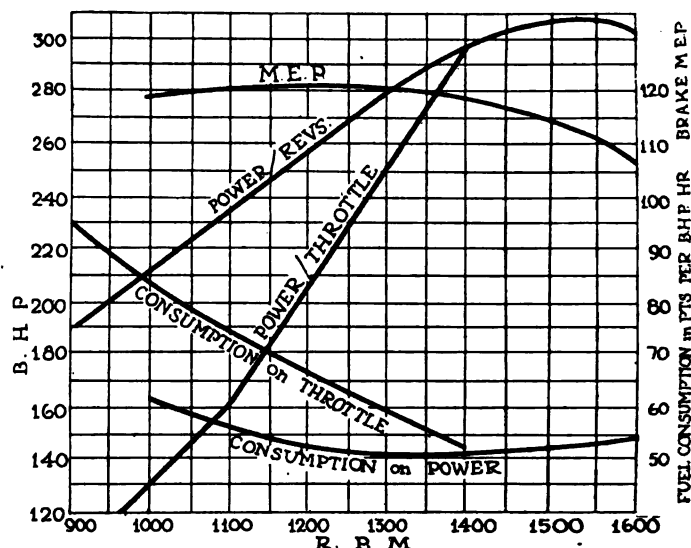


Fig. 32—Horsepower, m.e.p. and fuel consumption curves

Swept volume of one cylinder ....	3848.85 cu. cm. = 235.3 cu. in.
Total swept volume of engine ....	23093.1 cu. cm. = 14120.0 cu. in.
Clearance volume of one cylinder ..	778.9 cu. cm. = 47.64 cu. in.
Compression ratio ....	5.95:1
Normal b.-hp. and speed ....	290.0 b.-hp. at 1400 r.p.m.
Maximum b.-hp. and speed ....	304.5 b.-hp. at 1500 r.p.m.
Normal b.m.e.p. ....	117.7 lb. per sq. in. at 1400 r.p.m.
Maximum b.m.e.p. ....	120.5 lb. per sq. in. at 1200 r.p.m.
Piston speed ....	1654.0 ft. per min. at 1400 r.p.m.
Mechanical efficiency (calculated) ..	86.0 per cent
Indicated mean pressure (calculated) ..	137.0 lb. sq. in.
Fuel consumption per b.-hp. hr. ..	0.526 pint = 0.473 lb.
Brake thermal efficiency ....	28.9 per cent
Indicated thermal efficiency ....	33.6 per cent
Air standard efficiency ....	51.0 per cent
Relative efficiency ....	65.9 per cent
Cu. in. of swept volume per b.-hp. ..	4.80 cu. in.
Sq. in. of piston area b.-hp. ....	0.678 sq. in.
Hp. per cu. ft. of swept volume ..	360.0 b.-hp.
Hp. per sq. ft. of piston area ....	212.4 b.-hp.
Direction of rotation of crankshaft	Anti-clockwise (facing propeller)
Direction of rotation of propeller ..	Anti-clockwise (facing propeller)
Type of valve gear ....	Overhead valve rockers and push rods
Type of starting gear ....	Maybach of special design
Number of carbureters ....	Two Maybach
Bore of main jets ....	Variable from 0.0 to 2.5 mm.
Bore of pilot jets ....	Variable from 0.0 to 1.1 mm.
Fuel consumption per hour ....	19.33 gal.
VALVE AREAS AND GAS VELOCITIES.	
Diameters.	
Induction pipe ....	62.0 mm. = 2.44 in.
Inlet port ....	45 × 67 mm. = 1.77 × 2.64 in.
Exhaust port ....	45 × 67 mm. = 1.77 × 2.64 in.
Exhaust branch pipes ....	66.0 mm. = 2.60 in. (approx.)
Cross Sectional Areas.	
Induction pipe ....	29.26 sq. cm. = 4.57 sq. in.

Inlet port .....	30.15 sq. cm. = 4.67 sq. in.	Inertia, lb. sq. in. piston area, mean .....	53.25 lb. sq. in.
Inlet valve ( $\pi$ dh.) .....	4.416 sq. in. (total)	Weight of rotating mass of connecting-rod .....	5.625 lb.
Exhaust valve ( $\pi$ dh.) .....	4.366 sq. in. (total)	Total centrifugal pressure .....	1106 lb.
Exhaust port .....	30.15 sq. cm. = 4.67 sq. in.	Centrifugal pressure, lb. sq. in. piston area .....	34.4 lb. sq. in.
Exhaust branch pipes .....	34.11 sq. cm. = 5.31 sq. in.	Mean average fluid pressure, including compression .....	48.0 lb. sq. in.
<b>Gas Velocities.</b>		Mean average loading on crankpin bearing, total from all sources in terms of lb. sq. in. piston area .....	118.0 lb. sq. in.
Induction pipe .....	196.1 ft. per sec.	Diameter of crankpin .....	66.0 mm. = 2.598 in.
Inlet port .....	196.1 ft. per sec.	Rubbing velocity .....	15.85 ft. sec.
Inlet valve .....	208.0 ft. per sec.	Effective projected area of big end bearing .....	43.23 sq. cm. = 6.70 sq. in.
Exhaust valve .....	210.0 ft. per sec.	Ratio. Piston, area/projected area of big end bearing .....	4.96:1
Exhaust port .....	196.1 ft. per sec.	Mean average loading on big end bearing .....	585 lb. sq. in.
Exhaust branch pipes .....	172.5 ft. per sec.	Load factor on big end bearing ...	9270 lb. ft. sec.
<b>INLET VALVES (Two per cylinder).</b>		<b>CYLINDERS.</b>	
Outside diameter .....	54.0 mm. = 2.126 in.	Over-all height of bare cylinder from top of base chamber .....	479.5 mm. = 18.87 in.
Port diameter (in cylinder head) ..	48.0 mm. = 1.89 in.	Depth of spigot at base of cylinder ..	3.5 mm. = 0.13 in.
Width of seating .....	3.5 mm. = 0.137 in.	Diameter of cylinder over water jacket .....	185.0 mm. = 7.28 in.
Angle of seating .....	30 deg.	Valve centers (between inlet and exhaust) .....	63.0 mm. = 2.48 in.
Radius under valve head .....	20.0 mm. = 0.787 in.	Thickness of flange at base of cylinders .....	12.0 mm. = 0.47 in.
Lift of valve .....	9.45 mm. = 0.372 in.	Number of holding-down studs per cylinder .....	Four
Diameter of stem .....	11.0 mm. = 0.433 in.	Diameter of holding-down studs ..	19.0 mm. = 0.74 in.
Over-all length of valve .....	136.5 mm. = 5.373 in.	Thickness of water jacket .....	1.0 mm. = 0.039 in.
Number of springs per valve ....	One	Mean thickness of combustion chamber wall .....	8.0 mm. = 0.31 in.
Free length of spring .....	52.5 mm. = 2.066 in.	Mean thickness of cylinder barrel ..	3.0 mm. = 0.11 in.
Length of spring in position (no lift) .....	39.5 mm. = 1.55 in.	Tensile stress .....	6640 lb. sq. in. (approx.)
Mean diameter of coils .....	51.0 mm. = 2.00 in.	(Assumed maximum pressure 450 lb. per sq. in.)	
Gage of wire .....	No. 6 B.W.G.	<b>PISTON.</b>	
Ratio length of spring/lift of valve ..	4.21:1	Type of piston .....	Cast-iron (flat crown)
Weight of valve complete with spring .....	0.843 lb.	Diameter at top .....	164.25 mm. = 6.466 in.
Weight of spring bare .....	0.281 lb.	Diameter at bottom .....	164.75 mm. = 6.486 in.
Inlet valve opens, deg. on crank ..	8 deg. early	Length .....	151.00 mm. = 5.944 in.
Inlet valve closes, deg. on crank ..	35 deg. late	Ratio. Piston length/cylinder bore ..	0.914:1
Period of induction .....	223 deg.	Number of rings per piston .....	Three piston rings, one scraper ring
Inlet tappet clearance .....	0.3 mm. = 0.012 in.	Position of rings .....	All above gudgeon-pin
<b>EXHAUST VALVES (Two per cylinder)</b>		Width of rings .....	6.5 mm. = 0.255 in.
Outside diameter .....	54.0 mm. = 2.126 in.	Gap of rings in cylinder .....	1.39 mm. = 0.055 in.
Port diameter (in cylinder head) ..	48.0 mm. = 1.89 in.	<b>CONNECTING ROD.</b>	
Width of seating .....	3.5 mm. = 0.137 in.	Length between centers .....	310.0 mm. = 12.205 in.
Angle of seating .....	30 deg.	Ratio. Connecting rod/crank throw ..	3.44:1
Radius under valve head .....	9.0 mm. = 0.354 in.	Little end bearing type .....	Floating cast-iron bush
Lift of valve .....	9.34 mm. = 0.368 in.	Floating bush, diameter, inside ..	38.0 mm. = 1.496 in.
Diameter of stem .....	11.0 mm. = 0.433 in.	Floating bush, diameter, outside ..	44.3 mm. = 1.743 in.
Length of valve guide .....	80.0 mm. = 3.149 in.	Floating bush, effective length inside .....	93.0 mm. = 3.661 in.
Over-all length of valve .....	152.5 mm. = 6.00 in.	Floating bush, projected area of bearing on piston-pin .....	35.35 sq. cm. = 5.48 sq. in.
Number of springs per valve ....	One	Ratio. Piston area/projected area of little end bearing .....	6.06:1
Free length of spring .....	52.5 mm. = 2.06 in.	Big end bearing. Type .....	Bronze shell lined white metal
Length of spring in position (no lift) .....	39.5 mm. = 1.55 in.	Big end bearing. Diameter .....	66.0 mm. = 2.598 in.
Mean diameter of coils .....	51.0 mm. = 2.00 in.	Big end bearing. Length (actual) ..	73.56 mm. = 2.893 in.
Gage of wire .....	No. 6 B.W.G.	Big end bearing. Length (effective) ..	65.5 mm. = 2.580 in.
Ratio. Length of spring/lift of valve ..	4.21:1	Big end bearings. Projected area ..	43.23 sq. cm. = 6.700 sq. in.
Weight of valve complete with spring .....	0.881 lb.	Ratio. Piston area/projected area of big end bearing .....	4.96:1
Weight of spring bare .....	0.281 lb.	Number of big end bolts .....	Four
Exhaust valve opens, deg. on crank ..	33 deg. early	Full diameter of bolts .....	14.0 mm. = 0.551 in.
Exhaust valve closes, deg. on crank ..	7 deg. late	Diameter at bottom of threads ....	12.0 mm. = 0.472 in.
Period of exhaust .....	220 deg.	<b>INERTIA FORCES, BEARING LOADS, ETC.</b>	
Exhaust tappet clearance .....	0.4 mm.	Weight of piston, complete with rings and piston-pin .....	14.05 lb.
<b>INERTIA FORCES, BEARING LOADS, ETC.</b>		Weight per sq. in. of piston area ..	0.4235 lb.
Weight of piston, complete with rings and piston-pin .....	14.05 lb.	Weight of connecting-rod complete ..	8.93 lb.
Weight per sq. in. of piston area ..	0.4235 lb.	Weight reciprocating part of connecting-rod .....	3.305 lb.
Weight of connecting-rod complete ..	8.93 lb.	Total reciprocating weight per cylinder .....	17.355 lb.
Weight reciprocating part of connecting-rod .....	3.305 lb.	Weight per sq. in. piston area ....	0.538 lb.
Total reciprocating weight per cylinder .....	17.355 lb.	Length of connecting-rod (centers) ..	310.0 mm. = 12.20 in.
Weight per sq. in. piston area ....	0.538 lb.	Ratio. Connecting-rod/crank throw ..	3.445:1
Length of connecting-rod (centers) ..	310.0 mm. = 12.20 in.	Inertia, lb. sq. in. piston area, top center .....	137.0 lb. sq. in.
Ratio. Connecting-rod/crank throw ..	3.445:1	Inertia, lb. sq. in. piston area, bottom center .....	75.5 lb. sq. in.
Inertia, lb. sq. in. piston area, top center .....	137.0 lb. sq. in.		
Inertia, lb. sq. in. piston area, bottom center .....	75.5 lb. sq. in.		

Total cross sectional area, bottom of threads .....	4.520 sq. cm. = 0.70 sq. in.
Pitch of threads .....	1.5 mm.
Total load on bolts at 1400 r.p.m..	5824 lb.
Total load on bolts at 1600 r.p.m..	7602 lb.
Stress per sq. in. at 1400 r.p.m....	8320 lb. sq. in.
Stress per sq. in. at 1600 r.p.m....	10,860 lb. sq. in.
<b>CRANKSHAFT.</b>	
Number and type of main bearings	Seven bronze shell lined white metal
Cylinder centers .....	187.0 mm. = 7.362 in.
<b>Crank-pins.</b>	
Outside diameter .....	66.0 mm. = 2.598 in.
Inside diameter .....	38.0 mm. = 1.496 in.
Length .....	74.0 mm. = 2.913 in.
<b>Journals.</b>	
Outside diameter .....	66.0 mm. = 2.598 in.
Inside diameter .....	36.0 mm. = 1.417 in.
Length, propeller end .....	67.0 mm. = 2.638 in.
Length, rear end .....	67.0 mm. = 2.638 in.
Length, center .....	67.0 mm. = 2.638 in.
Length, intermediate .....	67.0 mm. = 2.638 in.
<b>Crank Webs.</b>	
Width .....	95.0 mm. = 3.740 in.
Thickness .....	23.0 mm. = 0.906 in.
Radius at ends of journals and crank-pins .....	4.5 mm. = 0.171 in.
Weight of complete shaft .....	99.9 lb.
<b>WORKING CLEARANCES.</b>	
Piston clearance, top (total) ....	0.75 mm. = 0.029 in.
Piston clearance, bottom (total) ..	0.25 mm. = 0.009 in.
Side clearance of connecting rod in piston (total) .....	11.8 mm. = 0.464 in.
Side clearance of big end on crank-pin (total) .....	0.44 mm. = 0.0173 in.
End clearance of crankshaft in main bearings .....	3.0 mm. = 0.118 in.
Clearance of valve stem in guide (inlet) .....	0.12 mm. = 0.00472 in.
Clearance of valve stem in guide (exhaust) .....	0.15 mm. = 0.0059 in.
<b>LUBRICATION SYSTEM.</b>	
Number and type of oil pumps ...	Three, rotary gear
Oil consumption per hour .....	11.0 pints
Oil consumption per b.-hp. hour ..	0.037 pints
Oil temperature .....	65 deg. C.
Oil pressure .....	5.0 lb. per sq. in.
Specific gravity of oil .....	0.899 s.p.g.
Ratio. Pump speed/crankshaft speed .....	1:2
Pump delivery (calculated at 100 per cent volumetric efficiency) ..	91 gal. per hour at normal engine revs.
<b>IGNITION.</b>	
Number and type of magnetos ...	Two Bosch
Firing sequence of engine .....	1-5-3-6-2-4
Ignition timing (fully advanced) ..	38 deg. early
Number of plugs per cylinder ....	Two
Type of plugs .....	Bosch 3 point
Ratio. Magneto speed/engine speed	1.5:1
<b>COOLING SYSTEM.</b>	
Number and type of water pumps.	One centrifugal
Diameter of inlet pipe .....	54.0 mm. = 2.126 in.
Diameter of outlet pipe .....	50.0 mm. = 1.966 in.
Diameter of rotor .....	111.0 mm. = 4.36 in.
Water capacity of one cylinder ...	1284.0 cu. cm.
Number and type of radiators ....	One, semicircular honey-comb
Ratio. Water pump speed/engine speed .....	2:1
Water temperature, inlet .....	57 deg. C.
Water temperature, outlet .....	68 deg. C.
<b>FUEL PUMP.</b>	
Number and type of fuel pumps..	One Maybach, double acting
Bore .....	15.0 mm. = 0.59 in.
Stroke .....	17 mm. = 0.66 in.

Normal delivery .....	264 pints per hour at 800 r.p.m.
Maximum delivery .....	630 pints per hour at 1275 r.p.m.
Ratio. Pump speed/crankshaft speed .....	1:2
<b>WEIGHTS.</b>	
Weight of complete engine, dry, with propeller boss and exhaust manifold .....	911 lb.
Weight per b.-hp. ditto .....	3.10 lb.
Weight of fuel per hour .....	139 lb.
Weight of oil per hour (s.p.g. 0.899) .....	12.36 lb.
Total weight of fuel and oil per hour .....	151.36 lb.
Gross weight of engine in running order, less fuel and oil (cooling system at 0.65 lb. per b.hp. ....	1102.0 lb.
Weight per b.-hp., ditto .....	3.79 lb.
Gross weight of engine in running order, with fuel and oil for six hours (tankage at 10 per cent weight of fuel and oil) .....	2100.9 lb.
Weight per b.-hp., ditto .....	7.14 lb.

## GENERAL ANALYSIS OF WEIGHTS

DESCRIPTION OF PART	No. per Set	Average Unit in Lbs.	Weight of Complete Set in Lbs.	Percentage of Total Weight
Cylinders, bare .....	6	32.75	196.50	21.59
Pistons, complete with rings and piston-pin set screws .....	6	12.30	73.80	8.11
Piston-pins .....	6	1.75	10.50	1.15
Connecting-rods and floating bushes.	6	8.93	49.12	5.39
Crankshaft, complete with oil rings.	1	99.90	99.90	10.98
Crankshaft extension, with nut and pin .....	1	4.00	4.00	0.44
Inlet valves .....	12	0.43	5.25	0.57
Exhaust valves .....	12	0.47	5.70	0.62
Inlet and exhaust valve springs ...	24	0.28	6.74	0.74
Inlet and exhaust valve collars, with cotters and locking device .....	24	0.12	3.00	0.32
Thrust, complete with ball races, propeller hub flange and camshaft driving sprocket .....	1	17.68	17.68	1.94
Camshafts .....	2	10.00	20.00	2.20
Overhead valve rockers, complete ..	12	1.08	12.99	1.42
Overhead rocker bearings, complete.	24	0.42	10.50	1.15
Valve tappets and guides .....	12	0.93	11.25	1.23
Crankcase, top half .....	1	94.30	94.30	10.36
Crankcase, bottom half .....	1	41.32	41.32	4.54
Bearing caps .....	6	2.68	16.12	1.77
Front bearing cap .....	1	5.56	5.56	0.61
Crankcase holding-down bolts, with clamps, nuts and washers .....	14	2.40	33.60	3.70
Induction pipe, complete .....	1	9.09	9.09	1.00
Propeller hub, with bolts and nuts..	1	21.00	21.00	2.30
Inlet valve push rods .....	6	0.48	2.90	0.32
Exhaust valve push rods .....	6	0.49	2.97	0.33
Inlet and exhaust stiffening plates..	2	2.00	4.00	0.44

DESCRIPTION OF PART	No. per Set	Average Unit in Lbs.	Weight of Complete Set in Lbs.	Percentage of Total Weight
Oil pumps, with drive and pipe.....	1	9.00	9.00	0.98
Rear cover plate .....	1	6.06	6.06	0.66
Front cover plate .....	1	4.00	4.00	0.44
Water pump, complete .....	1	8.50	8.50	0.93
Camshaft, oil and water pumps driving gears .....	1	13.65	13.65	1.50
Wireless clutch .....	1	5.06	5.06	0.55
Revolution counter gear .....	1	2.62	2.62	0.28



DESCRIPTION OF PART	No. per set	Average unit in lbs.	Weight of complete set in lbs.	Percentage of total weight
Machine-gun interrupter gear .....	1	1.82	1.82	0.20
Petrol pump .....	1	3.50	3.50	0.38
Magnetos .....	2	10.75	21.50	2.36
Magneto wiring .....	1	4.75	4.75	0.52
Oil pipes .....	1	4.00	4.00	0.44
Self-starter gear .....	1	6.00	6.00	0.66
Exhaust manifold .....	1	27.00	27.00	2.96
Carbureters .....	2	16.00	32.00	3.51
Miscellaneous .....			3.75	0.41
Total weight of engine .....			911.00	100.00

## METALLURGICAL ANALYSIS OF PRINCIPAL PARTS

	Carbon	Graphite Carbon	Combined Carbon	Silicon	Manganese	Sulphur	Phosphorus	Nickel	Chromium
	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
Cylinder head.	2.57	0.91	1.60	0.70	0.181	0.34			
Cylinder barrel 0.49			0.33	1.01	0.028	0.054			
Cylinder water jacket .....			0.27	0.63	0.032	0.037			
Piston .....	2.42	0.83	1.29	0.83	0.111	0.30			
Gudgeon pin floating bush	2.39	0.65	1.43	0.76	0.146	0.47			
Gudgeon pin.. 0.28			0.23	0.48	0.028	0.022			
Connecting rod 0.15			0.33	0.31	0.027	0.010	1.42	0.49	
Inlet valve... 0.53			0.30	0.48	0.032	0.044	4.01	0.51	
Exhaust valve. 0.10			0.20	0.26	0.019	0.023	3.62	1.16	
Crankshaft ... 0.31			0.31	0.63	0.030	0.015	4.01	0.33	
Camshaft .... 0.40			0.25	0.23	0.022	0.040	3.46	0.63	
Camcore ..... 0.17			0.23	0.75	0.036	0.014	0.47		

PART	Lead p.c.	Iron p.c.	Tin p.c.	Copper p.c.	Zinc p.c.	Antimony p.c.	Silicon p.c.	Manganese p.c.
Big end bearing metal .....	3.51		80.05	6.34		9.90		
Main journal bearing ....	0.92		77.65	10.00		11.18		
Crankcase ...	0.99		0.87	12.01		Alumi- num (by Diff) 86.57	0.56	trace

## MECHANICAL TESTS

Mechanical tests were made on the crankcase and crankshaft, the results of which are given below:

CRANKCASE	Mark	Diam.	Max. Stress	Elongation p. c.
T .....	0.253		11.65	1
L .....	0.254		11.28	1

CRANKSHAFT	Position	Diam.	Mark	Yield Stress Tons sq. in.	Max. Stress	P.c. Elong on 4 A	R. of A. p.c.	Impact Ft. Lbs.
End .....	1	0.254		59.0	63.1	14.3	56.3	17.21
Journal .....	2	0.254						
Web .....	3	0.254		61.6	64.1	15.1	54.6	16.121
Long .....	4							
Crank pin, long..	5	0.254		63.6	67.1	15.1	55.7	12.12
Web, trans. ....	7	0.254		61.4	65.3	7.2	10.5	5.5

## Fuel and Lubrication Test of Buda Engine (Page 877)

TABLE I—FUEL TESTS

	Gravity, Deg. B.	Spec. Gravity	Lbs. per Gal.	Gals. per Lb.	Approx. BTU per Lb.	Per Gal.	IBP Deg. F.	EP Deg. F.	Gasoline, per Cent	Kerosene, per Cent	Heavy Distillate, per Cent
Commercial gasoline.....	56.9	.7491	6.236	.1604	18569	115796	128	429	54	39	2
Cracked gasoline.....	49.3	.7808	6.501	.1538	18493	120223	120	393	46.5	49.5	3
Cracked benzine.....	44.8	.8009	6.668	.1500	18494	120224	120	423	23	73.5	3.5
Synthetic crude.....	44	.8046	6.699	.1493	18440	123530	120	454	31	65	3.5

## TEST WITH GASOLINE

Lbs. Fuel	Duration of Run	R.P.M.	Load	B.H.P.	B.H.P. per Rev.	R.P.M.	B.H.P.	Internal Friction H.P.	I.H.P.	Total Lbs. Fuel per Hour	Total Gals. Fuel per Hour	Lbs. per B.H.P. Hour	Gals. per B.H.P. Hour	B.H.P. Hours per Lb.	B.H.P. Hours per Lb.	
1	5'55"	391	88.4	11.46	.2930946	400	11.62	.8	12.42	10.14	1.626	.88489	.13993	1.13	7.04668	Average for all runs 7.8 B.H.P. hours per gallon.
1	4'23"	591.5	87	17.14	.2895270	600	17.37	1.87	19.24	13.69	2.195	.7986	.1222 plus	1.252	7.795	
1	3'23"	780	89.5	23.26	.29620	800	23.66	3.33	27.19	17.73	2.843	.7624	.1222 plus	1.3118	8.170	
1	2'26"	988	83	30.62	.309919	1000	30.99	4.66	35.65	24.83	3.981	.8109	.13 plus	1.233	7.6889	
1	2'10"	1200—	88.5	35.39	.2949166	1200	35.39	6.40	41.79	26.47	4.2447	.74795	.12—	1.3369	8.337	

## TEST WITH "CRACKED" GASOLINE

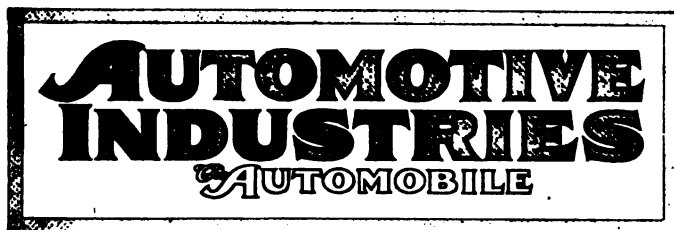
Lbs. Fuel	Duration of Run	R.P.M.	Load	B.H.P.	B.H.P. per Rev.	R.P.M.	B.H.P.	Internal Friction H.P.	I.H.P.	Total Lbs. Fuel per Hour	Total Gals. Fuel per Hour	Lbs. per B.H.P. Hour	Gals. per B.H.P. Hour	B.H.P. Hours per Lb.	B.H.P. Hours per Lb.	
1	5'49"	400 plus	92	12.26	.3065	400	12.26	.8	13.06	10.32	1.5874	.84136	.1295	1.188—	7.723188	Average for all runs 7.97 B.H.P. hours per gallon.
1	3'46"	590	89.5	17.59	.2981356	600	17.89	1.87	19.76	15.93	2.45	.905628	.13928	1.104	7.177104	
1	3'01"	787—	92.5	24.26	.308259	800	24.66	3.33	27.99	19.89	3.05968	.82—	.12612	1.22	7.93122	
1	2'32"	993 plus	95	31.43	.3165166	1000	31.66	4.66	36.32	23.68	3.64	.7534	.1158129	1.127	8.626827	
1	2'11"	1200 plus	89	35.59	.2965883	1200	35.59	6.40	41.99	27.48	4.227	.772	.1187	1.295	8.418795	

## TEST WITH "CRACKED" BENZINE

Lbs. Fuel	Duration of Run	R.P.M.	Load	B.H.P.	B.H.P. per Rev.	R.P.M.	B.H.P.	Internal Friction H.P.	I.H.P.	Total Lbs. Fuel per Hour	Total Gals. Fuel per Hour	Lbs. per B.H.P. Hour	Gals. per B.H.P. Hour	B.H.P. Hours per Lb.	B.H.P. Hours per Lb.	
1	5'57"	395 plus	93	12.24	.3098734	400	12.39	.8	13.19	10.08	1.512	.8239	.12353	1.12	7.46816	Average for all runs 8.23 B.H.P. hours per gallon.
1	3'56"	588	92	18.03	.306632653	600	18.40	1.87	20.27	15.25	2.287	.8490	.1268	1.182	7.881576	
1	3'16"	785 plus	94.5	24.72	.3149	800	25.19	3.33	28.52	18.37	2.775	.743	.11226	1.35	9.00180	
1	2'29"	983	95.5	31.28	.3182 plus	1000	31.82	4.66	36.48	24.16	3.623	.772	.1158248	1.294	8.628392	
1	2'05"	1193 plus	89	35.38	.296563285	1200	35.59	6.40	41.99	28.8	4.319	.814	.12207	1.23	8.20164	

## TEST WITH SYNTHETIC CRUDE

Lbs. Fuel	Duration of Run	R.P.M.	Load	B.H.P.	B.H.P. per Rev.	R.P.M.	B.H.P.	Internal Friction H.P.	I.H.P.	Total Lbs. Fuel per Hour	Total Gals. Fuel per Hour	Lbs. per B.H.P. Hour	Gals. per B.H.P. Hour	B.H.P. Hours per Lb.	B.H.P. Hours per Lb.	
1	5'17"	399—	91.8	12.20	.3057644	400	12.23	.8	13.03	11.36	1.696	.93065	.139	1.07	7.16793	Average for all runs 8.02 B.H.P. hours per gallon.
1	4'10"	584	91	17.71	.303253424	600	18.20	1.87	20.07	14.4	2.1495	.813	.1219	1.23	8.23977	
1	3'02"	780	91.5	23.76	.3048718	800	24.39	3.33	27.72	19.78	2.954	.84	.12426	1.22	8.17278	
1	2'08"	983	92	30.13	.30651068	1000	30.65	4.66	35.31	24.32	3.645	.8073	.10106	1.24	8.30676	
1	2'11"	1181	86	33.84	.28653683	1200	34.38	6.40	40.78	27.48	4.102	.812	.1212	1.23	8.23977	



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## Reconstruction

ONE of the first results of the cessation of hostilities has been a modification of the order curtailing the supply of materials to automobile manufacturers for the remainder of the year, and instead of our automobile plants being on a 100 per cent war basis on Jan. 1, next, as would have been the case had the war continued, they will be on a nearly 100 per cent peace work basis.

From the standpoint of the industry the war came to a close at an opportune time, just before all normal production had ceased. Some of the smaller concerns were still turning out automobiles at their usual rate, and for them there will be no conversion problem. All of those who have been either partly or wholly on war work will make the most strenuous efforts to get back to peace-time production in the shortest possible time.

There is always an advantage in being in the field early, but the importance of sound judgment and quick action probably never was greater than it is now. Production of several leading makers of auto-

mobiles has been discontinued entirely for some time and many other makers have been on a greatly reduced schedule. It is therefore not unreasonable to assume that a very considerable potential demand has grown up which will readily absorb the greatest possible production of the industry for many months to come.

There will, of course, be a certain class of prospective buyers which will hold back on account of the ruling prices, which are very materially higher than those of two years ago. These prices are based not so much on an abnormal relation between supply and demand as upon the high cost of labor and material. For some time at least the cost of both will remain unchanged, and though they are likely to drop gradually it is exceedingly doubtful whether we shall ever come back to the price levels of 1914.

Production cannot wait for these price adjustments. There are many urgent needs which it has been impossible to satisfy during the war period, and these will become a factor in the market first. In these cases prices will not stand in the way. When these demands have been met there may be an adjustment of prices, but this will hardly take place before the rush of spring business has subsided.

## Export Opportunities

WHILE endeavoring to meet the needs of our own country we must not shut our eyes to opportunities beyond our borders. All branches of our automotive industry have expanded enormously during the past 5 or 6 years and before very long they will not only be in position to take care of a vast amount of export business, but may even be dependent upon such business to keep going at anything like full capacity.

It is generally admitted that after the war competition in foreign markets will be fierce. But America was rapidly forging to the front even before the war, while during the early years of the conflict, when we were practically without competition, our automobile exports increased by leaps and bounds. During the early part of the reconstruction period we will be at a decided advantage over our European competitors who have been at war for more than 4 years and who have not been manufacturing any automobiles and motor trucks for private purposes. Moreover, the tremendous demand for cars and trucks in the late belligerent countries of Europe is not only the result of the enforced suspension of manufacture, but is also largely due to the heavy destruction of other means of transportation. Probably during the first year of peace much of the automobile manufacturing equipment in Europe will be devoted to salvaging military automobiles. Altogether it is quite evident that European manufacturers will be for a long time fully occupied with the demands made upon them by their home markets, leaving the field comparatively free to American makers to cultivate the markets of the smaller and non-industrial countries. It would certainly be a great blunder for our manufacturers to neglect this unparalleled opportunity.

## Industrial Demobilization

IT is even more difficult to demobilize a nation industrially than it is to demobilize an army. In fact one problem is a part of the other, because in demobilizing industry it must be left largely in a position to absorb the demobilized army.

Industry must be left in as busy a condition as it was during the war in order to accomplish this result, and in addition the industries which were non-essential for war, but highly essential for peace, must be brought back to a healthy life so that they can help take up the labor slack.

There must be no such mistake as to assume that we have learned to do perpetually without what were classed during wartime as non-essentials. All of civilization consists of these products. Better methods of transportation, better houses to work in, the tools and instruments of art and music and a long list of others, are all classed as non-essentials during war and yet these are the things which make it an advantage to live a life of civilization.

In our own industry we have a problem to face which is the reverse of what took place when this country entered the war. The Government needed us at that time and therefore gave us its assistance financially and in every other way to put our factories on a war basis.

The Government still needs us, but this time to help it solve the problem of placing our demobilized troops in valuable positions where they will contribute to the wealth of the nation by assisting in production.

Our industry is also in a position to render invaluable assistance in the work of reconstruction. We are going to have plenty to do, but we cannot throw ourselves from a war-time to a peace-time basis overnight, and it may be possible that our productive efforts will have to broaden to other lines than those handled during the war.

A factory which has its plans aligned with those of reconstruction, and whose products are attuned to the necessities of reconstruction times will succeed far better than one which attempts to take up its work where it left off when we entered the war.

A fresh set of plans will be necessary.

## Glare Control

ANYONE listening to the discussion on headlight glare control at the meeting of the Illuminating Engineering Society last week could not fail to form the opinion that the attempt of New York State to solve the headlight problem in a scientific manner had proven a complete fiasco. Moreover, it was plain that the failure was due not to incompetency of the men selected by the state authorities to work out the scientific elements of the problem, but to disinclination on the part of the authorities to be guided by the recommendations of experts. The charge was made that the test specifications were too technical and not sufficiently practical. As the specifications are based directly on road tests in which observations were made by a large number of observers of more or less night driving experience,

the charge of impracticability is ill-founded. There is certainly a very serious defect in the law, in that it permits the result of scientific tests to be set aside and decisions on the legality of certain anti-glare devices to be made on the basis of an individual road trial.

All tests on visibility and sensitiveness to glare have shown that there are enormous differences between individuals in this respect. The only approach to a scientific solution of the problem is to get a large number of observations with different observers and base the minimum illumination and maximum glare limits on these. After these values have been once determined, all further tests should be made in the laboratory, because there it is much easier to make the conditions in different tests uniform.

The subject of glare control is a most important and a most serious one. It is a matter of public safety. Serious and even fatal accidents due to improper road illumination are by no means rare, and while we cannot hope to eliminate them entirely, we should certainly do our best to reduce them to a minimum. On the other hand, commercial interests are likely to be affected by any attempted solution of the problem. But when it is a question of public safety against individual commercial interests the duty of the authorities is clear. All anti-glare devices are intended to increase the safety of night driving, but it is not sufficient that they improve matters as compared with the use of plain lens headlights. What is required of them is that they be sufficiently effective to render the light absolutely safe according to the results of tests.

A law which provides for scientific tests of headlights to determine their safety and then permits the Secretary of State to set the results aside and make his decision on the basis of a "judgment" or guess-work test is a snare and a delusion. It may take some moral courage to rigidly and impartially apply scientific test specifications to anti-glare devices, but the conditions demand that this should be done.

WITH the cessation of hostilities there must of necessity come a large contraction of aircraft production. At the present time airplanes are a Government monopoly, manufacturers being forbidden to produce for other than Government account. In order to prevent unnecessary confusion and hardship during the period of reconstruction it is now proposed that this monopoly, which was established for war purposes, should be maintained for the present. It is certainly a fortunate circumstance that the greater part of our aircraft work was given to firms in the automobile industry, which upon the return of peace can and will return to their old field of activity. In the placing of contracts the one great consideration was capacity for quick and efficient production, but facility of demobilization now looms up as another important reason why it was wise to entrust the automobile industry with the major part of the aircraft production program.



# □ Latest News of the

## No National Shows in 1919

### N. A. C. C. Votes Against New York and Chicago Events—Dealer Show Sentiment

WASHINGTON, Nov. 19—No National Automobile Shows this winter, but definite assurances that automobile production will resume normal capacity by May, 1919, were the chief features resulting from a meeting here yesterday by representatives of more than 100 automobile makers and members of the National Automobile Chamber of Commerce.

The vote against holding shows this winter was overwhelming. The manufacturers do not believe that they will be able to prepare such exhibitions in the short time allotted and do justice to the industry or properly and fittingly celebrate the military victory.

Although the national shows thus are no longer a possibility, sentiment among dealers is very strong for local exhibitions in the various large centers. President Vesper of the National Automobile Dealers' Association has placed himself and his association on record as favoring such shows. The Chicago Automobile Trade Association has sent a resolution to Washington urging that Chicago dealers have a hand in any shows which are put on in that city. Kansas City, Boston, Hartford and a number of other cities already are figuring on staging exhibitions. Pittsburgh has a show this week which is proving a wonderful stimulant to business.

The meeting developed that the production of passenger cars for 1918 will be 1,000,000, as compared with 2,000,000, which would have been the normal output had not the industry been curtailed 30 per cent last March and 50 per cent in July by the Government.

The manufacturers were unanimous in their belief that the industry will get back to normal and full production some time this coming spring.

Prices of cars will probably remain at present levels in most instances, it was stated, owing to high prices for materials and labor and also because reduced prices can only come with increased production. Truck production, greatly stimulated by the war, would have broken all output records had it not been for the curtailment of the industry, which made the output for the last half of the year the same as that for July to December, 1917. As the production for 1917 was 160,000 trucks, *this curtailment let the industry down*

to a production of 80,000 trucks for the last half of this year.

General discussions involved suggestions that the elimination of war work should progress with a constant view as to the effect on labor. Contracts, it was said, should be canceled in proportion to the growing capabilities of the plants to assimilate the war workers for peace time employment. A suggestion that the War Industries Board become a Peace Industries Board and control conversion from war to peace was approved and committees were appointed to co-operate in this work as follows:

**Passenger Car Committee**—R. B. Jackson, Hudson Motor Car Co.; A. I. Phelps, Dodge Bros., and H. H. Rice, Chevrolet Motor Car Co.

**Motor Truck Committee**—George M. Graham, Pierce-Arrow Motor Co.; Windsor T. White, White Co., and R. H. Boyston, Service Motor Truck Co.

Charles Clifton, president of the National Automobile Chamber of Commerce, presided at the meeting and practically every large motor car company was represented, including Packard, Pierce-Arrow, Locomobile, Paige-Detroit, Studebaker, Cadillac, Buick, Chevrolet, Chalmers, Peerless, Overland, Cole, Hudson, Hupmobile, Maxwell, Kissel, Reo, Mitchell, Briscoe, Liberty, Premier, Lexington, Oldsmobile and Stutz.

The possibility of export business was briefly discussed and it was stated that with reversion to the peace production large exports are anticipated. It has been impossible to fill the export orders during the past year due to lack of shipping facilities and there is large demand from foreign countries now awaiting fulfillments.

It was shown during the meeting that the automotive industry has contributed more toward victory than any other American industries excepting steel. It took on more than \$1,000,000,000 worth of war work for not only trucks, airplanes, passenger cars and trailers, but for such articles, not relating to the industry, as shells, helmets, submarine chasers and mine anchors. In addition it has given hundreds of technical men such as mechanical engineers, metallurgists, chemical engineers and production managers to the service, and thousands of chauffeurs, repairmen and special skilled mechanics.

### \$75,000,000 Worth of Airplane Contracts Cancelled

NEW YORK, Nov. 21—Government contracts for training and fighting planes amounting to approximately \$75,000,000 and held by the Curtiss Aeroplane & Motor Corp., Buffalo, have been cancelled. Late last week the company

## No Automotive Parts Taxation

### Senate Finance Committee Removes Clause from Pending Revenue Bill

WASHINGTON, Nov. 19—The Senate Finance Committee has removed from the pending Revenue Bill the floor sales tax and the stock tax on automobile and truck parts.

These taxes were to be applied against parts sold by or held in stock by dealers, and were regarded as very harmful as they would have applied to parts held in stock many years as well as those purchased recently. It is expected that the recommendation of the Senate Finance Committee in removing this tax from the Revenue Bill will be approved by Congress.

The National Automobile Chamber of Commerce now proposes to request Congress to remove the general tax against automobiles and trucks, including the 5 per cent sales tax, on the grounds that passenger cars and trucks have proved themselves essential during the war and further that the tax will be a brake on prompt resumption of peace-time capacity of production and sales.

discharged 6000 of its men. The cancelled contracts cover almost entirely orders for JN-4 training planes, an order for SE-5 fighting planes, which is understood originally to have been for 1000 and is now cut to 250 or approximately the number for which the company has parts on hand; the USB, the De Havilland 9 for the army, the HS-1 and the F-5 for the navy.

About the only government contracts which remain include orders for 144 training planes, 60 large flying boats and about 75 smaller boats. It seems likely in view of these cancellations that it may be necessary for a large part of the Buffalo plant to be shut down. Rumor has it that the Churchill plant may be used for the production of the new \$500 Overland car. Nothing official, however, has been given out.

### Will Recruit Workers for Peace Industry

WASHINGTON, Nov. 21—The Community Labor Board of the U. S. Employment Service, through which workers in non-war industries have been recruited for war industries, will now recruit war workers for peace industry and later aid the replacement of soldiers in peace industry. The Boards will work with the War Department and the War Industries Board, sending in weekly reports to the latter indicating local labor conditions.

# Automotive Industries

## Two Makers Reduce Prices

Cadillac Cuts Off \$300 and Chevrolet from \$50 to \$145  
—Unrest Follows Move

### CADILLAC PRICES

Model	New Price	Old Price
2-Passenger	\$3,220	\$3,520
5-Passenger	3,220	3,520
7-Passenger	3,220	3,520
Victoria	3,615	3,915
Sedan, 5-pass.	4,090	4,390
Suburban, 7-pass.	4,340	4,640
Coupe	4,395	4,695
Landulet	4,495	4,795

### CHEVROLET PRICES

Model	New Price	Old Price
30-Roadster	\$715	\$845
Tour	735	865
Coupe	1110	1225
Sedan	1185	1325
Chassis	865	815
FA-Roadster	1045	1095
Tour	1045	1095
D8-Tour	1585	1685
F-Delivery		
Chassis	1325	1375
With body	1460	1510
Body and top	1545	1595

NEW YORK, Nov. 21—The General Motors Corp. is the first manufacturer to make public any alteration in price schedules of its products following the signing of the armistice. Cadillac prices have been reduced a straight \$300 and the prices of the various Chevrolet models have been reduced from \$50 to \$145.

The action of these two companies in reducing prices at this time has caused some little apprehension on the part of dealers who see harmful results to themselves because of the effect on the buying public which will naturally have a tendency to hold back on purchases now that the possibility of a general lowering of prices has become apparent. It is stated that dealers will be protected by the General Motors Corp.

Detroit manufacturers of cars and trucks state that the action of the General Motors Corp. will not have any effect on the prices of other cars. On the contrary, it is stated that instead of a reduction, it is more likely that there will be an upward trend. It is considered not unlikely that further increases in price will become effective before large production is again reached.

Other subsidiaries of the General Motors Corp. have not made any price changes and it is stated that none are contemplated for the immediate future. Announcement of the reduction in Cadillac prices was made through half page advertisements in the daily papers which stated that "prices will be brought at once to the figures which prevailed before Cadillac production was restricted by

governmental order. Decreased output resulting from governmental curtailment necessitated an increase of \$300 on all Cadillac models. This \$300 increase is now removed on the entire Cadillac line—the readjusted prices to be in effect as of 12 o'clock midnight, Saturday, Nov. 16." Herewith are the new and old prices of both Cadillac and Chevrolet lines.

### Prices of Commodities Will Remain as Established, Says Baruch

WASHINGTON, Nov. 21—Bernard M. Baruch stated to-day that the War Industries Board will continue all maximum prices on steel, copper, lumber and other commodities that have been established until the date originally set in the price fixing orders. As those dates approach, the board will consider the advice of extending the period of price control or removing that control. The tin-pooling agreement between the United States and the Allies, by which tin had been purchased for consumers in this country by the Government for 45 cents less than the market figures, will be continued until liquidation has been completed.

Mr. Baruch stated also that the automobile industry presented a memorandum through Hugh Chalmers informing him that it had gone forward with the plan of having the industry on a strictly war basis by January, but he now asks the board to allow the industry to retract its steps and go back to a peace basis.

The industry, Mr. Baruch said, asked a generous adjustment of war contracts, and he stated that while the War Industries Board has no control over these adjustments he is in favor of generous treatment and will urge that the cancellation of government contracts be slow and conservative. Mr. Baruch also advised the continuation of some permanent government agency, such as the Department of Commerce, to exercise control of industrial conservation for peace times, similar to the work performed by the War Industries Board during the war.

### Want Foreign Trade Investigations Enlarged

WASHINGTON, Nov. 20—The National Automobile Chamber of Commerce is preparing a presentation asking the House Committee on Appropriations to substantially increase the immediate appropriations for the Department of Commerce and the 1920 appropriations, to allow the department to make other investigations in all foreign countries of general business conditions and particularly the automobile business situation. The presentation will probably be ready within a few weeks.

## S. A. E. Meeting Dates Jan. 12-14

"Carry Through Meeting" to Be Followed by "Victory Dinner"—War Subjects

NEW YORK, Nov. 20—The Society of Automotive Engineers' winter meeting has been definitely placed on the calendar for Jan. 12-14, and is to be held in the auditorium of the Engineering Societies Building, New York. The "Carry Through Meeting" will be brought to a close with a "Victory Dinner" which is to be held at the Hotel Astor.

The meeting will be almost entirely devoted to war and post-war matters, and it is expected that the program of speakers will be of unparalleled interest because of the great events which have been taking place and because a number of men usually diffident about appearing in public have consented to address the sessions.

The views of many men who have been engaged abroad with our Army or that of our Allies will be given. There has never been a time when members of the S. A. E. were more actively engaged in professional work in so many lines of national importance to the world and to the automotive industry. The time is at hand to acquire broader views and entirely new conceptions of engineering subjects.

A number of matters relating intimately to the automotive industries which it is planned to cover include fuel, thermodynamics of the internal combustion engine, carburetion, including the use of heavy fuels and apparatus designed to compensate for variations in atmospheric density, etc. Tanks, types of post-war automobiles, radial-type aeronautic engines, relation in plane design of performance to weight, power and location of engine, and farm and road tractors will be discussed.

The recent intensive work in aircraft engines will be discussed and the lessons to be learned therefrom in automobile practice considered. The development of motor patrol boats will be covered as well as important features of stationary and farm engines and motorcycles for delivery and messenger service.

### Highways Convention Dec. 9-13

CHICAGO, Nov. 18—The date of the convention of the Highway Industries Association has been changed to Dec. 9 to 13. This was found necessary because of conflict with the meeting of the War Service Committee of the United States Chamber of Commerce.

## Petroleum Losses Enormous

13,000,000 Barrels Wasted at Refineries in Course of a Single Year

WASHINGTON, Nov. 18—More than 13,000,000 barrels of petroleum at a cost of at least \$29,000,000 has been lost each year through various oil losses at refineries, according to a statement issued to-day by the United States Fuel Administration.

The administration in its second letter calling the attention of oil producers and refiners to the need for conservation states that of 315,034,680 bbl. of crude oil received by refiners in 1917 13,073,789 bbl., or 4.1 per cent, were wasted. For the first 6 months of 1918 total deliveries to refiners amounted to 156,321,646 bbl., of which 6,893,140 bbl., or 4.40 per cent, was lost.

After pointing out these figures in its publicity the Fuel Administration requests the refiners to examine their traps, stop the leaks at the sources and carefully inspect the complete refineries to prohibit avoidable waste.

Following are the figures showing the oil lost in 1917 and the first 6 months of 1918:

Districts	Per Cent Loss 1917	Per Cent Loss Mo. 1918
New York, Philadelphia and Baltimore	7	6
Pennsylvania, New York, East Ohio and West Virginia	5	6
Western Ohio, Indiana, Illinois, Kentucky and Tennessee	6	9
Average per cent of the above districts	6	7
Oklahoma, Arkansas and Kansas	4	4
Texas and Louisiana	3	4
Average per cent Oklahoma, Arkansas, Kansas, Texas and Louisiana	3½	4
Colorado, Wyoming and Utah	7	7
Average per cent of the above districts being all east of California	5½	6
California, per cent	2	2

### Weekly Aircraft Production

WASHINGTON, Nov. 16—At the time that the armistice was signed 300 De Havilland planes and 20 Handley-Page bombing planes were being turned out weekly, according to a statement made yesterday by John D. Ryan, director of aircraft production. Mr. Ryan also told of a radio telephone which had been developed for and successfully used in the airplanes in the A. E. F., and by means of which aviators were in verbal communication with their squadron commanders.

"There are some details concerning this radio telephone which we cannot yet discuss," Mr. Ryan said, "but worked out during the months of experiment the device went into actual service some weeks ago and I have myself, standing on the ground, given orders to a squadron flying in the air and watched them manoeuvre accordingly. The transmission of the

voice is clear enough to be heard distinctly through the sound of the engine."

Mr. Ryan would not discuss the distance from which the radio telephone worked, but it is said to be a matter of some miles.

That radio telephones were a regular part of American aerial equipment has only been made public since the capture of a German order to the German air squadrons demanding that an American airplane with wireless telephone equipment be shot down and brought to the rear for examination.

### Nine Deaths at Flying Fields

WASHINGTON, Nov. 15—Nine deaths resulted in aviation training at fields in this country for the week ended Nov. 2. Three fatalities occurred at Barron Field, Everman, Texas; two at Selfridge Field, Mt. Clemens, Mich., and one each at Carlstrom Field, Arcadia, Fla.; Ellington Field, Houston, Texas; Rich Field, Waco, Texas, and Rockwell Field, San Diego, Cal.

For each fatality reported, a total of 2435 hours of flying, or 194,800 miles of air travel, is shown. There were no fatalities at the 21 other flying fields in the United States.

Two deaths were reported from Payne Field, West Point, Miss., as the result of accidents in flying during previous weeks. They are not included in the figures for the week ending Nov. 2.

### Training Departments for Aircraft Factories

WASHINGTON, Nov. 18—Effective training departments have now been established in all the leading aircraft factories, according to a statement made by Stanley Bradley, manager of the National Airplane Manufacturers' Association, to Director Charles Clayton, Training and Dilution Service. Some six months ago the Curtiss Aeroplane Corp., Buffalo; the Standard Aircraft Co., Elizabeth, N. J., and the Dayton Wright Airplane Co., Dayton, instituted training rooms which have since become models for other manufacturers. The Fisher Body Co., a long-established wood-working concern working upon airplanes, has a well organized and managed training room. The leading manufacturers engaged upon the production of air motors all recognize the importance of well developed training rooms.

### All Highway Projects Approved

WASHINGTON, Nov. 18—The United States Highway Council announced to-day that no further applications need be made to it for approval of highway projects, that previous disapprovals are revoked, and pending applications require no further action. Procedure in securing materials and transportation should follow normal practice, said officers of the Council. The removal of restrictions, however, does not affect highway bond issues, which are under control by the Capital Issues Committee. State highway departments will not be asked to submit programs for next year's work.

## Board to Co-operate on Contracts

Will Advise on Reduction or Termination After Consideration of Effect

WASHINGTON, Nov. 15—The War Industries Board has arranged with all war making agencies of the Government for co-operation in the cancellation of contracts to prevent possible confusion in industry.

The various Governmental agencies will notify the War Industries Board promptly of revisions and adjustments of war contracts in excess of \$100,000. Although it has never been the function of the War Industries Board to make contracts, and while it cannot assume responsibilities financially with regard to them, the board will undertake by advice and recommendation to control the situation so as to stabilize the flow of materials, labor and plant facilities back to peace channels. It will maintain contact with the Labor Department for the release of labor from war industries for peace pursuits.

Co-operation with the War Industries Board in its plans to prevent disturbances of labor and industry was ordered by Major General Goethals to-day. Purchase bureaus of the War Department were notified that the War Industries Board will approve or reject the reductions of orders or termination of contracts after consideration of:

- 1—The effect on the industry.
- 2—The effect on labor.
- 3—The effect on the locality.
- 4—The effect on the contractor.

The office of the Director of Purchase, Storage and Traffic, War Department, will be the point of contact between the War Department and the War Industries Board, and the cancellations or reductions of contracts will be approved or rejected by the Director of Purchase, Storage and Traffic after consultation with the War Industries Board.

Any orders placed, however, subsequent to Oct. 1, 1918, may be reduced, suspended or canceled without the approval of the Director of Purchase, Storage and Traffic. Also contracts and orders for less than \$25,000 can be canceled or reduced without the approval of the Director of Purchase, Storage and Traffic.

When contractors are willing to terminate contracts and state in writing that the termination will not be accompanied by disturbance of labor, the various purchasing divisions can terminate the contracts without the approval of the Director of Purchase, Storage and Traffic.

Contracts on which the work has not begun may be suspended without special approval and complete cancellations of all orders in an industry for a product may be made in all places at the same time without securing special approval, but notice must be given in advance of such action. Notice is to be given to



various contractors working on Government orders that no new labor should be engaged on such orders without the approval of the Procuring Office of the War Department and no new contracts are to be placed by contractors on suppliers or sub-contractors without the approval of the Procuring Office.

Following is the agreed statement sent out to all Section Chiefs of the War Industries Board with regard to the control of cancellation of contracts:

1. Herewith attached, marked "A," copy of the procedure that has been agreed upon with the Army on the above subject.
2. You will note it is clearly the intention that the Commodity Sections shall continue to be the point of contact with organized industry. The recommendation of the Commodity Sections is required before the Government purchasing agency proceeds with final negotiations for reducing requirements, in order to insure the best method of handling the reductions, considering the stability of all industries and localities.
3. It must be borne in mind that, although the Commodity Sections will in every way assist by making recommendations, as explained in the preceding paragraph, it is not proposed that the War Industries Board participate in negotiations or share in the responsibility for the details of the financial adjustment with contractors in such matters as disposition of raw materials on hand, damages, depreciation, etc. (For your information, however, we attached, marked "B," memorandum as to the steps taken by the War Department in this matter.)
4. Notwithstanding the definite distinction that has been made between the cancellations that require the concurrence of the War Industries Board, and those that do not require such concurrence, it is not the intention to preclude the possibility of the Government procurement departments obtaining assistance of the War Industries Board, Commodity Sections, whenever they can be of service, as explained in paragraph 2.
5. The Section Chiefs will be charged with the responsibility of notifying other sections of the War Industries Board of recommendations that may involve other contracts for component parts, and also of furnishing the executive secretary of the Requirements Division with proper data in order that the necessary records may center in one place.
6. Where there is an opportunity to discriminate between cancellations in various localities the Section Chief will secure the approval of the Director of Facilities before finally clearing the reduction or cancellation, in order that each locality may be protected, so far as possible, from an unnecessary number of cancellations at one time. In order that the Director of Facilities may have up-to-date information at all times, the executive sec-

## Ford Releases 25,000 Cars

### To Return Immediately to Quantity Production of 3000 Per Day

DETROIT, Nov. 19—The Ford Motor Co. is to return to a peace-time quantity production basis at the earliest possible moment. Already deliveries of cars have started to dealers, and it is expected that a production of 3000 cars per day will be reached very soon.

The Ford company has been producing cars for the Government for a long time, and it is because practically all of its Government contracts have been canceled that it is possible for the company to commence deliveries practically at once.

There are on hand 25,000 cars contracted for by the Government which are immediately released for dealers, and these will be apportioned throughout the United States.

The Ford shops are to return to a peace-time basis as rapidly as possible. The switch-over from manufacture of munitions and war supplies already has been started. While this is being completed the assembly units in various large cities heretofore used by the army will be utilized by the Ford company again almost at once.

### To Base Wages on Work, Not Sex

WASHINGTON, Nov. 18—The cessation of activities in military operations has created several problems regarding women in industries, according to Mary Van Kleeck, Department of Labor, and readjustment of conditions must be met

retary of the Requirements Division will notify him of all cancellations or reductions in such detail as he may require.

7. Whenever the Commodity Section, for any reason, deems it desirable that the transaction be considered in conference between the head of the department in which it originates and the chairman of the War Industries Board, the matter will be immediately called to the attention of the chairman.
8. Records of meetings and reports of Commodity Sections will be rendered as heretofore.—George N. Peek, Acting Vice-Chairman, War Industries Board.

"B" memorandum referred to in the above was one issued by Major General George W. Goethals, Director of Purchase, Storage and Traffic, through the War Industries Board and the Committee on Public Information last week, explaining the method of making adjustments in connection with "termination of contracts in the public interest" and previously announced in AUTOMOTIVE INDUSTRIES.

by various agencies of the Federal Government created for that purpose. The chief danger, said Miss Van Kleeck, is that women will remain in certain industries or be introduced into new ones on a lower wage basis than is paid to men. Consequently the Government will work for an established wage scale on the basis of occupation and not of sex. It also plans to guard against dangers to health of unsanitary working conditions, long hours and night employment during the reconstruction period. Although many women will be required to give up their positions with the return of soldiers, the Department of Labor believes that a number will be unable to withdraw entirely from gainful employment, and plans are also being considered to prevent such women suffering from lack of work.

### Allot Commodities for Export to Mexico

WASHINGTON, Nov. 18—In view of the increasing scarcity of many commodities of prime importance and necessity to the United States, and which at the same time this Government desires to share with Mexico, it has become necessary for the War Trade Board to allot such commodities for export to Mexico in order to equalize the distribution throughout the neighboring republic in an equitable and orderly manner consistent with the maximum amount of such commodities as can be spared.

Prospective importers in Mexico will facilitate the granting of licenses for export by the War Trade Board by presenting copies of their orders for supplies in triplicate to the nearest American consular officer, who will visé such orders and retain one copy for his file, returning the original and one copy to the applicant.

The importer should forward both viséed orders to the prospective exporter in the United States with instructions to attach the original viséed order to his application to the War Trade Board for an export license covering the commodity specified in such order, or file the original viséed order with the War Trade Board at Washington, D. C., and thereafter, in filing applications for licenses to export the commodities specified on such order, refer to the order by the consulate stamp serial number, which will be affixed to the order, and also the consular address, as "Mazatlan, Serial No. 4782."

In cases where American consular officers are not easily accessible to the prospective importer a statement to that effect should be attached to the order, giving the name of the nearest place where a consular officer is stationed.

### Railroad Lumber Gets Priority

WASHINGTON, Nov. 18—The War Industries Board has issued a ruling giving lumber orders for railroads the highest priority to permit construction which has heretofore been delayed by war requirements.

## Flying Fields to Be Closed

### Government Not to Demobilize Air Service—Expected to Develop Plane Industry

WASHINGTON, Nov. 19—Orders have been issued by the Division of Military Aeronautics for closing Selfridge Flying Field, Mt. Clemens, Mich.; Chanute Field, Rantoul, Ill., and Scott Field, Belleville, Ill., and the Air Service Mechanics' School, St. Paul. Arrangements have also been made giving cadets training for flying option of immediate discharge or completion of their training. If they are elected to continue their training they will be discharged when they graduate. Non-flying officers will be given the opportunity to complete flying training.

Although these plans indicate that the Government contemplates demobilization of the Army Air Service, officials declare that such assumption would be incorrect and that instead the Government expects to father the airplane industry and to promote it to the highest degree. Plans are being considered not only for some retention of the military Air Service, but also for development of peace time air activities.

Secretary Baker has stated that the Air Service is the field of military enterprise in which the greatest developments can be expected and it will without doubt continue to form an important part of the Army. Congress is expected to form recommendations shortly for continuing the aviation branches on a larger scale than the other arms of the service and for further improvements and developments of airplanes and engines.

At present flying is practically a Government monopoly, since the supply of lubricating oil, the castor bean oil, the flying training fields and many of the plants devoted to production are directly owned by the Government. The 32 flying fields fully equipped and built in this country are practically the only flying fields. The aviation schools controlled by the Government and capable of turning out 2000 men a month with ratings as Reserve Military Aviators form the only important flying training schools.

Outstanding contracts for military planes, which total about 30,000, it is expected will be cancelled. Many of the orders for these have been slowed down. The aircraft officials stated to-day that they will shortly make announcement of the exact suspensions, cancellations and continuations of orders.

#### To Sell Bosch and Eisemann

NEW YORK, Nov. 20—Both the Bosch Magneto Co., with plants in New York and Springfield, Mass., and the Eisemann Magneto Co., Bush Terminal, Brooklyn, N. Y., will be sold by the Alien Property Custodian early next week. It is not

anticipated, however, that this sale will bring about any change either in the personnel of the companies, in the production or in the product. It is stated that a certain portion of the stock in each company is owned by enemy aliens and it is this portion which will be sold. In the case of the Eisemann company, it is expected that present American holders of stock will bid in that portion now held by enemy aliens. It seems likely that the same procedure will obtain in the case of the Bosch Co. The statement to the effect that the Eisemann Co. was considering dissolution is branded as false and baseless by officials of the company. No such move is in contemplation, according to them. At the present time the Bosch Magneto Co. is operating three shifts a day and is heavily obligated for Government contracts. Recently the cancellation of the entire third series of 25,000 Class B trucks has necessitated a cancellation of magnetos for these vehicles. It is pointed out, however, that these are virtually standard instruments and that for this reason the Bosch company is not badly affected.

#### Overland Completes Moline Purchase

TOLEDO, Nov. 20—The Willys-Overland Co., which several weeks ago purchased control of the Moline Plow Co., has completed the deal. Of the \$10,000,000 common stock Willys-Overland acquires slightly over 82 per cent. In exchange it issues \$6,376,800 of the Willys-Overland preferred, \$3,105,900 Electric Auto-Lite Corp. preferred and \$1,649,200 Curtiss Airplane Corp. preferred. It is stated that the present daily production of 50 tractors will be increased to 125 as soon as release of materials is permitted.

#### F. T. C. Complains About Klaxon

WASHINGTON, D. C., Nov. 20—The Federal Trade Commission has issued a formal complaint against the Klaxon Co., Newark. The concern is charged with refusing to sell to dealers who insist on reselling to the public at prices they deem inadequate. In other words, the Federal Trade Commission believes that the Klaxon Co. is forcing retailers to maintain standard fixed resale prices on their products. The company is further charged with selling its horns on the condition, agreement or understanding that dealers shall at all times carry a minimum stock to the value of \$300. The company must appear before the Commission on Dec. 31 to answer the charge.

#### Pittsburgh Show Helps Trade

PITTSBURGH, Nov. 20—Pittsburgh is holding an automobile show this week and the benefit to business is being felt all along Motor Row. Sales began to pick up as soon as the show began to be talked about in the newspapers. The dealers plan to continue active selling during the winter to get their stocks well out of the way by the time new production comes through. Rain, influenza and other things have held the attendance down during the first part of the week.

## Adjustment of War Contracts

### Clearance Committee to Deal with Proposed Cancellations Suggested

WASHINGTON, Nov. 15—The earliest possible announcement of a comprehensive plan for adjustment of war contracts to prevent the possibility of business panic is urged on President Wilson by the War Service Executive Committee of the Chamber of Commerce of the United States in a letter made public yesterday. The letter, signed by Harry A. Wheeler, president of the chamber, suggests the immediate creation of a clearance committee to which all proposals to cancel contracts would be referred by the Government departments concerned.

#### President Considering Action

The committee expresses satisfaction that the President has indicated that he is giving earnest consideration to this subject and points out that its letter is for the purpose of calling attention to the serious situation that might be brought about if the utmost care is not exercised in dealing with the matter.

Cancellation of contracts in the last 10 days, it is pointed out, has caused a great deal of apprehension and disturbance and the fact is emphasized that great difficulties will have to be faced unless the transition from war to peace production is gradual. Cessation of work in the small number of instances where steps have already been taken, it is declared, is causing uneasiness among the country's banks which have extended credit to contractors and sub-contractors.

#### Reconstruction Most Important

Many phases of reconstruction will be taken up at the reconstruction conference of industrial war service committees called by the Chamber of Commerce of the United States early in December at Atlantic City. The sudden termination of the war makes reconstruction the most important business problem to-day. The 350 war service committees which will meet will be divided into 10 major groups to include food products, textiles, heat, light, power, metals, minerals other than iron and steel, iron and steel, wood and wood products, chemicals, leather, earthen products and industrial professions. Prior to the dividing of the committees into 10 major groups there will be 35 related groups, under which will be a group on oil and oil products, gas, engines, automobiles and accessories, steel and iron products, rubber, allied products and farm operating equipment.

#### Consider Price Stabilization

Questions to be taken up will include the best legal means to stabilize prices, labor finance, methods of Government contract cancellation, possible continuation of Government temporary war divisions during the period of reconstruction,

effect of war on business, raw material sources, possible benefits of continuation of war conservation, and possible continued control by the Government of raw materials.

#### New Air-Brake for Trucks and Trailers

NEW YORK, Nov. 19—A new air-brake for motor trucks and trailers, especially such as are engaged in inter-city transportation, has been developed by the Parker Air Appliance Co., Cleveland, O. These brakes were given a very severe tryout on a 2-ton Walter four-wheel-drive tractor and a 5-ton Troy trailer which carried a 7-ton load for the Good-year Tire & Rubber Co. from Akron to Boston recently. The outfit negotiated the roads over the Allegheny Mountains without mishap and the trial was considered satisfactory in every way.

Air pressure is pumped up by means of a 4-cylinder 1½ x 1¼ Kellogg air pump operated from the tractor engine. The outfit further comprises an unloader valve and two tanks, one on the tractor and the other on the trailer. Air pressure is carried at 90 lb. per square inch and the air passes to the tanks through the unloader valve. The brake cylinders measure 2¼ x 6 in. and are connected to the main tank through a distributing valve. There is also a valve on the trailer tank which is so arranged that the brakes are automatically set in case the trailer becomes uncoupled. The usefulness of this valve was shown on one occasion during the trip, when the trailer broke away from the tractor on a steep grade and was automatically stopped by its pneumatic brakes almost instantly. We expect to print a full illustrated description of these brakes in an early issue.

#### Bituminous Production Drops

WASHINGTON, Nov. 19—Bituminous coal production for the week ended Nov. 9 was 10,409,000 tons, an output lower than that of the corresponding period in 1917. This is the first time that production has fallen below the 1917 figures for a like period. Anthracite production totaled 87,000 tons, 5.8 per cent increase over the previous week. During the week ended Nov. 2 total loss by all causes from 100 per cent production was 20.4 per cent, of which labor shortage comprised 10.6 per cent, car shortage 5 per cent, mine disability 3.1 per cent and all other causes 1.7 per cent.

#### Show Managers to Meet

NEW YORK, Nov. 20—The National Association of Automobile Show Managers, representing all the principal dealer shows in the United States, will meet at the Hollenden Hotel, Cleveland, Nov. 25 and 26, to arrange schedules and to plan the resumption of shows, which had been called off because of the war. Thus far Minneapolis, Cleveland and Kansas City have definitely decided on shows and other cities are understood to have plans nearly completed. Minneapolis plans to duplicate the enormous automotive exposition that it held last winter.

## Copper Production Maintained

### Existing Levels of Prices and Wages to Be Undisturbed at Present

WASHINGTON, Nov. 16—The present rate of production and the existing levels of prices and wages in the copper industry will be maintained until Jan. 1 following a conference here to-day between members of the industry with the War Industries Board.

The present rate of production is to be maintained in the mines, smelters and refineries, continuous employment being thus insured during the first period of the transition from a war to a peace basis. The present level of prices of the metal and the existing wage scale are to be preserved. The War Industries Board or whichever other Government agency may be designated in the future will continue the regulation of prices and allocation of copper until the next meeting between the industry and the Government.

One of the allied governments within the last 24 hours has requested information on delivery of 200,000 tons of the commodity, which was accepted as a sign that the European demand would not only be large but immediate. Another point given consideration was the prospective requirements for civilian consumption, due to the curtailment of the productivity of many American industries for the last 18 months because of the needs of the war program, which have created a demand that should prove a factor in stabilizing conditions generally.

The civilian demands in Europe and elsewhere, held in check for more than 4 years, should work to the same end, it was thought, since America produces approximately 75 per cent of the world's copper supply. The reconstruction work in the belligerent countries was another point of discussion as well as the demand that Germany and her former allies will have to satisfy when she is again rehabilitated and has re-established her commercial relations with the rest of the world.

#### Hope for Tractor Concessions

CHICAGO, Nov. 19.—The hope of securing still further concessions in the way of materials and a virtual letting down of the bars on tractor production for the smaller and newer concerns in the business is the reason for an important meeting of the executive committee of the American Tractor Association which will be held in Chicago on Friday of this week.

Three important matters will be taken up by the committee.

First, the matter of materials and production. The recent decision of the Priorities Division of the War Industries Board that manufacturers of farm operative equipment may go ahead on a

basis of 87½ per cent of their 1918 schedules does not at all help the smaller manufacturers of tractors. They still are bound by the provisions of the revised ruling of Circular No. 35, permitting a maximum of 100 machines, which was recently announced by the Board, and which resulted from a visit of the War Service Committee of the association to Washington.

What the small companies want now is practically unrestricted production, so that they may go ahead with the development of their designs and the establishment of trade connections. Now that the war is over and there is an evident disposition on the part of the Government to let down the bars on essential industries the association hopes for favorable consideration.

The advisability of sending another committee to Washington within the next few days will be considered at the meeting of the committee and some decision will be reached.

Secondly, the committee will consider the feasibility of undertaking the backing of a permanent exposition of tractors and tractor parts, to occupy a floor in the Leiter Building, State and Van Buren Streets, Chicago.

Thirdly, the committee will consider and outline plans of future activity for the association.

The membership of the association continues to grow and now numbers 27 manufacturers of tractor parts, with two publications. The membership committee is actively at work and confidently predicts a membership of at least 100 by Jan. 1, 1919. The membership stands as follows at present:

#### The Membership List

Agrimotor, 20 E. Jackson Blvd., Chicago.  
American Tractor Corp., Peoria.  
Aulson Tractor Co., Waukegan.  
Geo. D. Bailey Co., Chicago.  
Baldwin Chain & Mfg. Co., Worcester.  
Beaver Mfg. Co., Milwaukee.  
Beltrall Tractor Co., St. Paul.  
Borg & Beck Co., Moline.  
Brewer Mosel Auto Co., Madison.  
Bullock Tractor Co., Chicago.  
Climax Engineering Co., Clinton.  
Coleman Tractor Co., Kansas City.  
Comet Automobile Co., Decatur.  
H. C. Domen Co., Oshkosh.  
P. J. Downes Co., Minneapolis.  
Erd Motor Co., Saginaw.  
Evans Mfg. Co., Hudson, Ohio.  
A. Finkl & Sons, Chicago.  
Foote Bros. Gear & Mach. Co., Chicago.  
Hooven Radiator Co., Chicago.  
Illinois Tractor Co., Bloomington.  
International Research Engineers, Los Angeles.  
Interstate Tractor Co., Waterloo.  
Kohl Tractor Co., Cleveland.  
Kokomo Electric Co., Kokomo.  
John Lauson Mfg. Co., New Holstein.  
Monarch Tractor Co., Watertown.  
Motor Age, Malters Bldg., Chicago.  
The Oakes Co., Indianapolis.  
John Obenberger Forge Co., West Allis, Wis.  
Perfex Radiator Co., Racine.  
Powell Tractor Co., Elwood, Ind.  
Reed Tractor Co., Kalamazoo.  
Reed & Glaser, Indianapolis.  
Shelby Tractor & Truck Co., Shelby.  
Splitdorf Electrical Co., Chicago.  
Square Turn Tractor Co., Norfolk, Neb.  
Star Tractor Co., Findley.  
Stone Tractor Mfg. Co., Texarkana.  
Turner Mfg. Co., Port Washington, Wis.  
U. S. Tractor & Machy. Co., Chicago.  
Victory Tractor Co., Greensburg, Ind.  
Wilcox Bennett Carburetor Co., Minneapolis.  
Wisconsin Farm Tractor Co., Sauk City.  
Wolverine Tractor Co., Saginaw.  
York Corrugating Co., York.  
Zelle Tractor Co., St. Louis.



## Shipping Urged for Latin America

### Pan-American Commerce Organization Asks Assignment of Vessels

WASHINGTON, Nov. 18—Immediate assignment of ships for trade with South and Central America has been suggested to the Shipping Board by the United States Section of the International High Commission and Pan-American Commerce Organization.

Secretary McAdoo, as chairman of the section, issued a statement yesterday emphasizing the need for ships for immediate Latin-American trade, and stated that official and commercial interests of North and South America demand better transportation facilities to insure closer commercial and financial relations.

"The United States Section of the International High Commission," said Mr. McAdoo, "has ventured to make to the Shipping Board a number of suggestions, some general and some specific, relating to the further prosecution of its constructive plans, as well as to the disposition of ships now in its control during their further operation by the board and otherwise. These suggestions include the immediate availability of ships for both east and west coasts of South America and the careful planning of freight allocation so as to avoid empty cargo space on south-bound trips.

"It will furthermore be necessary to develop a policy to meet the requirements of different industries and sections of both North and South America, in order that no undue hardships may be placed on any given industry or on any one section. Improvement of service for the West Indies and the avoidance of confusion and crowding of schedules by a careful adjustment of calling dates are also matters which have been submitted for the consideration of the Shipping Board.

"On July 19, 1915, I addressed a communication to the delegates assembled at the first Pan-American financial conference, emphasizing the necessity of united effort to provide adequately for the needs of their commerce and to enable them to avail themselves of the markets of the United States. Much has intervened since 1915 to delay and in many respects made more difficult the fulfillment of the task, but there is, however, a strong desire on the part of every agency of this government to contribute, within the measure of its power, toward giving to our Latin-American commerce the most adequate facilities."

### Good Roads Invaluable

WASHINGTON, Nov. 18—That good roads will be invaluable to the soldiers who will return from the army and who will be provided with farm land by the Department of the Interior was the state-

ment made in Congress by Congressman H. Z. Osborne yesterday in a general discussion of the Governmental provision for returning soldiers and sailors.

The Congressman pointed out that following the Civil War, contrary to the general pessimistic expectations, industry and agriculture both developed and expanded. At that time when the country had a population of 31 000,000 inhabitants the 2,000,000 soldiers who were mustered out found immediate employment.

Consequently it is expected that today with the population of 110,000 000, the mustering out of 3,500 000 soldiers will have no evil effect either upon industry or general labor conditions. Franklin K. Lane, Secretary of the Department of the Interior, in a letter to Congressman Osborne stated that the experience of wars proves that soldiers as a rule seek outdoor life following the wars and that this country has 230,657,755 acres of unappropriated land of which one-half is exceedingly cultivable.

It is planned to ask for legislation which will allow for the cultivation of this land by the soldiers who desire to till the soil, and in hand with this project comes the importance of sufficient farm tractors and good roads to allow for transportation by motor truck and passenger car. Consequently, said Congressman Osborn, there must be immediate legislation for provision of vast improvement and increase of transportation facilities. "especially the creation of a national system of good roads."

### Maximum Prices for Building Material

WASHINGTON, Nov. 18—The following maximum prices have been fixed by the War Industries Board, effective immediately and for the period ending Feb. 28, 1919, for the State of Virginia south of and including Petersburg and the States of North Carolina and South Carolina, for deliveries in full barge lots, f.o.b. point of origin, or f.o.b. cars plant, per ton of 2000 lb. net:

	Per Ton
Sand .....	\$0.50
Gravel .....	.95
Crushed Stone .....	1.30
Crushed granite .....	1.75

These figures do not include railroad ballast or screenings.

### May Re-Export to Bolivia

WASHINGTON, Nov. 15—Exporters shipping to Chile or Peru under license agreement not to re-export may re-export despite the agreement to Bolivia, according to an announcement by the War Trade Board to-day, provided that the re-export is not made to any person, firm or corporation on the enemy trading list.

### Can Use Oil for Roads

WASHINGTON, Nov. 16—The United States Fuel Administration has cancelled the order of last May restricting the sale and use of asphalt, road oil and other petroleum products for road purposes.

## Sufficient Cotton Airplane Fabric

### Domestic Production Now Averages About 1,200,000 Yards Monthly

WASHINGTON, Nov. 15—The production of American cotton airplane fabric is now averaging about 1,200 000 yards monthly, sufficient for all requirements, and capable of being largely increased if necessary. No more linen fabric is being imported from abroad for this purpose, and after the imported stock now on hand is exhausted, cotton fabric will be used exclusively in covering American airplane wings.

At the outbreak of the war in 1914 linen was the only material which had proved entirely satisfactory for covering airplane wings, the essential physical properties required being lightness in weight, proper absorption of dope, and strength and resistance to tear.

### Pre-War Production

The chief countries before the war producing flax for fine grades of linen were Belgium, Russia and Ireland. The Belgian supply was cut off from the Allies in 1914. The Russian flax was difficult to obtain and was later cut off entirely. In the meantime the consumption of linen for war purposes had increased enormously. By the spring of 1917, when the United States entered the war, the linen situation was very serious, and it was obvious that some substitute would have to be found.

In developing a cotton airplane fabric which would have the necessary qualities of the linen, the United States Government received the greatest assistance from the various cotton mills.

### Testing of Samples

Samples were made from cotton of many constructions and numbers of yarn, varying from No. 40 two-ply to No. 100 four-ply, the cloth having from 50 to 90 threads per inch. Yarns were in some cases mercerized under tension, and various twists were tried. Several cotton mills co-operated in this work.

When the new fabrics were secured, samples were put on airplanes, "doped" and varnished according to regulation practice, and tested in actual use at Langley Field and Pensacola. Flying tests were also made with several other varieties of fabric. The tests were for three months of service, averaging 10 hours per day. Members of the United States Air Service, members of the Foreign Flying Corps, and other experts assisted in the experiments. They reported that the cotton fabrics developed in the United States appeared to serve most favorably. Other very favorable reports have recently been received from tests made in Great Britain on American cloth sent over there.

After many experiments had been made the first contracts for 10,000 yards

each of cotton airplane fabric were placed in the middle of September, 1917. The results obtained with the first cotton fabric produced were satisfactory and it was decided to place further contracts for cotton airplane fabric.

#### Adopted Last November

Two fabrics were adopted, the specifications calling for a strength of not less than 80 lb. per in. in both warp and filling. The cotton used in the manufacture of the cotton airplane fabric had to be of a very long staple, and in November, 1917, the Air Service purchased 15,000 bales of long-staple Sea Island cotton.

The first quantity orders for cotton airplane fabric were placed in October and November, 1917, and were for 1,280,000 yards of grade A and 200,000 yards of grade B cotton airplane fabric. Deliveries of cotton airplane fabric started in January with the production of 173,000 yards. Production has gradually increased until at the present time 1,200,000 yards are being produced monthly.

Subsequent contracts have been let for cotton airplane fabric amounting to 11,513,084 yards. All of these later contracts, however, have been for grade A cotton fabric, as it now seems clear that this cloth is superior to the other.

While the cotton airplane fabric was at first only used for training planes, and the grade A standard linen fabric, which was imported from Great Britain, was used for combat planes, it was decided in April, 1918, that the grade A cotton fabric could be used for all types of planes.

#### Wages Increase; Workers Decrease

WASHINGTON, Nov. 16—Reports by automobile manufacturers to the Department of Labor show a continuation in wage increases and decreases in the number of workers employed. In July, 1918, 48 automobile makers employed 128,473 workers, with total payrolls of \$3,243,692 as compared with 127,962 workers at \$2,810,608 in July, 1917. In this instance the number of workers increased .04 per cent, while wages increased 15.4 per cent.

In July, 1918, 47 makers employed 113,449 workers at \$2,939,563 as compared with 118,007 workers at \$3,021,209 in June, 1918. Here there is a decrease of workers of 3.9 per cent and a decrease of wages of 2.7 per cent. A continuing decrease in the number of workers is shown by the fact that on July 31, 1918, 28 makers employed 80,290 workers as compared with 83,374 workers in 1917, and on July 31, 1918, 27 automobile manufacturers reported 67,409 employees as against 71,391 on June 30, 1918.

Two plants reported wage increases of 10 per cent, affecting 15 per cent of the employees in one plant and 50 per cent of the organization in the other. Another concern granted 10 per cent increases in some departments. The minimum wage in one plant was increased from 43 cents to 50 cents per hour. Another establishment allowed the entire organization the hourly rates overtime over 8 hours instead of 9 hours.

## Britain Plans for Canadian Trade

### Government Investigators Report Conditions to British Automotive Industry

MONTREAL, Nov. 18—When British firms are once again in a position to manufacture and to ship for overseas requirements, it is necessary that those that wish to regain their Canadian trade, or those wishing to enter the market in competition with the manufacturers of the United States, should be in a position to resume or to commence operations with a clear understanding of the task which lies before them.

To further this object His Majesty's trade commissioners have reported very fully to the British Society of Motor Manufacturers and Traders pointing out the difficulties and suggesting the best course of action to pursue. Extracts from the report follow:

If it is decided after careful investigation to deal strictly with Canadian buyers, the general methods, followed may be summed up as follows:

1. To send the firm's travelers from the United Kingdom at regular intervals to call upon buyers in Canada.
2. To sell only to jobbing or wholesale houses in Canada, under direct orders from them by mail or cable (based on samples, etc.).
3. To appoint a reliable Canadian commission agent for the whole of the Dominion, or agents for different provinces or districts, as circumstances may dictate. (The tendency in Canada is for commission agents to attempt to combine too many agencies. It is advisable to make a commission when appointing an agent that he shall not handle the agency of a competing firm, either American or British. Only agents of fairly long residence in the country should be appointed, and they should be familiar with every aspect of the trade, from the manufacturing to the selling end. Liberal salaries or commissions are necessary, the normal scale of wages being much higher than the United Kingdom, travelling expenses also must be liberal, on account of the great distances between important cities. Local agents are generally most favorably situated to deal with Provincial Governments, Municipalities, Government-owned railways, etc.).
4. To open a branch office or offices in Canada. (This method is only possible for firms whose output and prospective business will justify the annual expense of maintaining an office solely for their own use. When the class of trade calls for extended credit, such an office is advisable, a representative should be installed and an organization put into working order to take advantage of the situation immediately on the cessation of the war.)

#### One Wisconsin Farm in 44 Has a Tractor

MILWAUKEE, Nov. 18—The tractor was used on one out of every 44 farms of 100 or more acres in Wisconsin during the past year, according to figures compiled by the College of Agriculture, University of Wisconsin. The college credits the tractor with much of the \$300,000 in-

crease in the agricultural production of the State during the period. To supply operators for these tractors and the many new machines which are being purchased at this time and next spring, the college will give two courses in tractor and gas engine operation and maintenance. The first course starts Dec. 2. It is open to persons over 16 years of age, but the class will be limited to 50.

#### Post Office May Get Army Trucks and Planes

WASHINGTON, Nov. 15—Airplanes and motor trucks not needed by the Army after the conclusion of peace may be turned over to the Post Office Department by the Secretary of War under a provision of the post office appropriation bill for the present fiscal year. This was pointed out by post office officials in connection with discussion of the uses to which the large amount of motor equipment may be put. The airplanes, post office officials said, can be used in the proposed extensions of the aerial mail service, while motor trucks can be placed in service on the new parcel post routes which it is planned to establish.

#### Imports of Rubber

WASHINGTON, Nov. 18—The total exports of crude rubber from Para and Manaus, Brazil, according to a commerce report, during the month of August, 1918, amounted to 4,737,559 lb., compared with 7,587,087 lb. for the same month last year. The exports to the United States aggregated 3,911,945 lb., to Europe 703,000 lb. and to South Brazil 112,605 lb., compared with 4,598,307 and 2,988,780 lb. to the United States and Europe, respectively, last year.

The following table shows the several grades of rubber exported during August, 1918:

	From Para—		From Manaus	
	To United States, Pounds	To Europe, Pounds	To So. Brazil, Pounds	To United States, Pounds
Fine ...	956,074	324,712	112,605	\$16,142
Medium ...	48,670	16,405	.....	96,998
Coarse ...	440,354	198,691	.....	249,882
Caucho ...	404,728	163,201	.....	939,104
Total ...	1,809,824	703,009	112,605	2,102,121

#### Washington Sees a Handley-Page

WASHINGTON, Nov. 15—The first Handley-Page bombing plane exhibited in Washington for the inspection of the Air Service arrived yesterday, carrying seven passengers. The plane, which is from Mineola, Long Island, has a wing spread of 103 ft., weighs 14,000 lb. loaded, and has a capacity of 400 gal. of fuel. It is equipped with Liberty engines.

#### Vessels May Take Deck Cargoes

WASHINGTON, Nov. 18—Any unarmed vessels without convoys sailing from Atlantic or Gulf ports can now carry deck cargoes, according to a new ruling by the War Trade Board, which has rescinded the previous rulings preventing deck cargoes on such vessels.

## Open Market Now for Steel

### Preference and Priority Abolished—Makers Can Buy Supplies They Need

WASHINGTON, Nov. 21—Passenger car, truck and motorcycle makers can go into the open market and purchase materials and supplies at will, and the makers of steel and other necessary automotive materials can supply these in any quantities and to any purchasers as a result of the cancellation of all outstanding priority ratings and the preference list by the Priorities Division of the War Industries Board.

The order becomes effective Nov. 22. The preference list was a priority compilation of concerns engaged in war or other very essential work, used by the War Industries Board for determining the importance of industries and the granting of priorities.

Although the list did not name truck and motorcycle makers, the Priority Board gave recognition to those industries by granting certain priority rights.

With the cancellation of this list, which is completely terminated with the exception of Priority 4 for the navy, Emergency Fleet Corp, railroads, telegraph and telephone companies, the automobile, truck and other automotive industries can secure all necessary materials on an equal basis with all other industries.

Applications for priority certificates can still be made by various companies, but will only be granted when the need is especially urgent and clearly in the public interest. Production of food, which includes the manufacture of farm tractor, production of petroleum and the operation of mines and plants for reducing ores and metals are recognized as especially important and will be granted priorities when necessary.

The War Industries Board emphasizes the fact that the cancellation of the priority list has nothing whatever to do with cancellations of war contracts, as the priority list is entirely disconnected from the placing of orders.

#### Allow Floor Tax on Leased Cars

WASHINGTON, Nov. 20—The Senate Finance Committee has included a provision in the Revenue Bill allowing dealers to collect the floor tax on cars which are first leased and later sold. A ruling has also been made that in the case where a car is leased and is returned by the prospective purchaser without the closing of the sale, the car can be considered "used" and the floor tax will not apply upon its sale at a later time. This ruling and the provision are the result of work by the National Automobile Chamber of Commerce.

Many dealers in this country and particularly those in the West sell cars on what is known as the leasing plan where by a prospective purchaser leases an au-

tomobile by the month paying monthly rentals and at the expiration of 10 months owns the car. The provisions of the first Revenue Bill, which included a 1½ per cent floor tax, aroused the question as to whether the dealer or the renter owned the car and further the dealers objected to paying the tax on the car which had been returned by the renter, stating that this was being sold as a second-hand vehicle.

The ruling definitely decided that the dealer was always the owner of the car until the title passed into the hands of the renter, but the amendment provides the dealer can charge the renter with the floor tax when he takes title to the machine. If the car is returned by the renter prior to the 10 months it is classed as a second-hand vehicle and taxes do not apply to it. The tax under the provision of the new Revenue Bill is 5 per cent, as has been announced previously.

#### Deny Rumor of Labor Layoff

DETROIT, Nov. 20—Reports from Washington after the National Automobile Chamber of Commerce meeting Tuesday, stating that large forces of men had been laid off in the factories of the Chalmers Motor Co., Detroit, and Buick Motor Co., Flint, were denied by officials of both companies to-day. They declare that there is no truth in the statement and that no authorized representative made them. Walter E. Flanders, of the Chalmers, stated that the company is operating two shifts of 8 hours each on war contracts and that this will continue indefinitely. Buick makes emphatic denial of the Washington story. E. T. Strong, general sales manager, said production is going on the same as usual at the factory. Of course, there have been some slight changes made in the shifts, but this is not as a result of the armistice.

#### Detroit Trade Wants a Show

DETROIT, Nov. 20—The Detroit Automobile Dealers' Association desires to hold a 1919 automobile show, preferably in January, though the members of the association at a meeting Tuesday night were unable to decide just what action should be taken. Some were for holding the show in January while others insisted on a February date and some thought it would be better to stage the show as late as April. With no shows this winter in New York and Chicago, the Detroit dealers are hopeful of making their exhibit national in scope. As usual Detroit is without a suitable building in which to hold a show. Before a date can be set it will be necessary to locate a building.

#### Parkers Sell Rust-Proof Interest

DETROIT, Nov. 19—Clark W. and Wyman C. Parker have disposed of their entire stock holdings in the Parker Rust-Proof Co. of America, and the former has resigned his position as a director of that concern and is no longer connected with it in any capacity. Their stock interests have been acquired by A. V. Foster of Spitzer, Rorick & Co., Toledo.

## After-War Problems to Be Discussed

### Comprehensive Program Is Scheduled for Reconstruction Conference

WASHINGTON, D. C., Nov. 20.—The Reconstruction Conference of Industrial War Service Committees called by the Chamber of Commerce of the United States for December 3, 4, 5 and 6, at Atlantic City, N. J., promises to be one of the most important gatherings of its kind ever held. Although the program for the conference has not been entirely completed, enough of the details have been worked out to indicate the comprehensive way in which the conference will approach the problem of reconstruction. On December 3, the first day of the conference, the 350 war service committees meeting separately will take up questions of special interest to their own industries. At these meetings there will be formulated the policies of the industries represented by the committees and resolutions which individual crafts desire to present during the conference.

For the purpose of facilitating discussion and co-ordinating the ideas of the various industries represented, the war service committees after meeting separately will gather together in 35 related groups. Afterwards these related groups will assemble as 10 major groups representing the ten primary industries within the United States.

The 10 groups as defined for the purpose of the conference are as follows:

Food Products	Wood and Wood
Textiles	Products
Heat, Light and	Chemicals
Power	Leather
Metals and Minerals	Earthen Products
Iron and Steel	Industrial Professions

The 35 related groups, in which some changes will be made before the final program is approved, are outlined as follows:

Food Production and Exchanges  
Food Conversion—Milling—Canning—Meat  
Packers By-Products  
Oil and Oil Products (Animal and Vegetable)  
Coal and Coke  
Public Utilities  
Oil and Oil Products (Mineral)  
Gas Motors, Automobiles, Engines and the like  
Steel and Iron Production, Rolled and Drawn  
Steel and Iron Products, Fabricated or Manufactured  
Steel and Iron Products, Cast  
Machinery, Tools and Power Equipment  
Hardware  
Building Materials, except those otherwise specified  
Farm Operating Equipment—Agricultural Implements, Fences, etc.  
Non-Ferrous Metals, Brass and Alloys  
Gold, Silver, Precious and Alloyed Metals  
Wool and Wool Products  
Cotton and Jute Products  
Silk and Silk Products  
Rubber, Saturated and Coated Textiles and Allied Products  
Lumber and Products, except those specifically comprised in other related groups



## Subjects Suggested for Consideration and Discussion at the Meeting of Your Individual War Service Committee

- What legal methods or means could be introduced in the craft to better stabilize prices, during the Reconstruction Period, affected by the following:
  - Inventories on hand.
  - Orders placed at war prices but not delivered.
  - Labor costs and conditions.
  - Increased taxes.
  - Increased rates of interest.
  - An estimated increased demand for non-war materials restricted during the war period.
- Will an increased production of your commodity increase the price of material or labor, or will a controlled redistribution of material and labor from war industries prevent such an increase?
- Discuss the practice of the sale of commodities at a price less than the cost of production. Its injury and disturbance on the industries and the ultimate consumer. What methods would you suggest to remedy this evil?
  - If the Government sees fit to dispose of used materials and products in the open market, what effect will it have on your production and the sale of new goods? At home? Abroad?
  - If it is not advisable for the Government to sell these goods on hand, either home or abroad, what shall it do with them?
  - In this connection, what point of contact should business interests have with the Governmental departments in the sale or disposition of these various commodities?
- What is the estimated amount of labor, skilled and unskilled, male and female, required for the estimated 1919 production? What is to be the source of labor? How much must be moved? How much have you lost to war industries?
- What is your financing problem during the Reconstruction Period? Do you recommend Governmental aid? Is financial legislation needed? Should the Capital Issues Committee be continued during this period?
 

In this connection discuss and recommend what financial obligations, if any, the industries in your craft are under to the Government for moneys advanced for buildings, machinery or as loans or security for Government contracts. How are these to be liquidated or adjusted?
- What method would you suggest for the cancellation of Government war orders with your craft, that would create the least amount of hardship on the industries and permit a readjustment to normal commercial conditions?
- On undelivered Government orders, what percentage of materials on hand, supplied either by the Government or purchased by you for these Government orders, can be utilized by your craft for commercial purposes during 1919? What disposition shall be made of those not usable?
- Have you any suggestions to make as to the continuation of the War Industries Board or any of its divisions, or any other Governmental departments during the period of Reconstruction? Such Board or departments to have the authority to control materials and regulate prices. If so, for what period?
- What intelligent control of materials during the Reconstruction Period could the War Service Committee suggest which would prevent an over or under supply and avoid a demoralization of the market? Should this be controlled by the crafts or by a Governmental agency?
- What effect had the war program on your output? Was it increased or decreased? Will there be an increased demand during the Reconstruction Period? If materials are uncontrolled will prices go up or down?
- What is the estimated tonnage or unit of production of your raw materials for 1918? For 1919? Estimated demand for foreign commerce for 1919?
- What is the estimated demand for your finished product for 1919? How does this compare with the average demand per annum in weight or unit of production for a five year period immediately prior to 1914?
- Sources of your raw materials? Domestic or imported? If domestic, can railroad cross hauling be eliminated by purchasing nearer your plants? Causes of cross hauling? If imported, at what ports? Would other ports of entry be more advantageous? What ports and why?
- The value of a uniform method of cost accounting for the individual manufacturer and the craft as a whole.
- What suggestions of the Conservation Division made to your craft might, with financial profit to your craft, be continued during the readjustment period? Is it possible to maintain a conservation schedule after the war, without legislative authority?
- What methods and practices, other than those your craft has already introduced, would simplify production, save materials, eliminate wasteful practices, reduce the number of styles, without destroying individual creativeness?
- What propaganda is necessary to educate the retailer and consumer to accept these eliminations and simplifications, and what plans might be arranged for better functioning with committees of jobbers and retailers handling your commodities?
- What percentage of the commodities represented by your war service committee was produced in the United States before the war and what percentage imported? What suggestion have you to make for increased production for domestic and foreign commerce?
- What effect will foreign competition have on your business? Will it increase or decrease your production?
- What is the underlying reason for the importation of foreign-made goods—Prices? Styles? Label? Quality? Design? Or excess demand over domestic supply?
- What disposition should be made by the Government of her Merchant Marine?
- What steps have you taken, or do you propose to take, for the entire craft to take advantage of the Webb-Pomerene Bill, which allows combination for foreign trade, or have you other plans? What do you suggest as the best means of financing foreign credits? What percentage of the foreign commerce heretofore controlled by Germany can your craft obtain and supply?
- What study is necessary, and what suggestions have you to make, in order to determine what are the needs of our allied countries for rehabilitation, and how far can you supply both raw and finished materials until they have been rehabilitated?
- Has your craft been solicited by, or are you soliciting, foreign countries to supply these materials for rehabilitation purposes? If solicited, does this come from the Allies, or from neutral or enemy countries?
- Would you recommend the appointment of a committee of United States manufacturers to confer with similar committees from our Allies, to learn of their plans for protecting industry during the Reconstruction Period? Also to obtain information regarding commodities and supplies needed by them and ourselves during this period.
- When the demobilization of military forces takes place, how can these men best be returned to their former industrial pursuits, and how will it affect your labor situation?
 

In this connection, how closely should the Conference work with the Governmental bodies in the study of demobilization plans?
- What suggestions have you to make to encourage and stimulate public work, such as the building of roads, pavements, water and sewer extensions, the construction of public buildings, school houses, etc.? What effect will it have on the labor market?
 

In this connection consider the building program in the United States and especially the utilization or destruction of new plants built for war purposes. Location of convalescent and reconstruction hospitals near industrial centers so that these men can be trained in the factories nearest to the hospitals without creating new vocational schools.

Wood-pulp and Paper Products  
 Printing, Engraving, Lithographing and Materials  
 Office, Store and Bank Fixtures, Equipment and Office Devices  
 Furniture  
 Acids, Heavy Chemicals, Miscellaneous and Industrial Chemicals, Paints and Pigments, Artificial Dyes and Intermediates, Tanning Materials and Natural Dyestuffs  
 Fertilizer and Fertilizer Chemicals  
 Boots and Shoes, Harness and Saddlery  
 Tanning and Leather Raw Stock  
 Clay and Clay Products, such as brick, tile and semi-porcelain clay  
 Sand, Lime and Stone Cement (except when otherwise specified)  
 Distribution, Wholesale and Retail, not manufacturers who distribute direct  
 Engineers, Architects and Accountants  
 Medical Industries (Drugs and Pharmaceutical Chemicals, including Medicinal Chemicals, Pharmaceutical Chemicals, Biological Products, Essential Oils, Plasters, Dental Supplies, Surgical Instruments)  
 Trade Papers, Magazines, Newspapers and House Organ editors

A list of twenty-five questions has been sent out by the War Service Executive Committee to the members of all war service committees for use as a basis for the deliberations of the individual war service committees at their first meeting. These suggestions are not considered exhaustive and members of the committees have been requested to present other subjects which they think should be discussed. The subjects are given above.

### Good Prospects in Argentina

BUENOS AIRES, Oct. 11—Frederico A. Sarra Lima of the firm of Buxton, Olditch & Co., importers of automotive products, considers the prospects for the coming summer's trade exceedingly good provided conditions become more nearly normal. He states that owing to restricted production there are not a sufficient number of cars to meet the demand, that unsatisfactory shipping conditions

prevented development of the truck business and that unless there is some change in the present situation he does not think that the various distributors will be able to fill more than 50 per cent of their orders. Mr. Lima anticipates a demand for the smaller types of farm tractor, although but little has been done in this direction so far.

### Maxwell Passes Dividend

DETROIT, Nov. 21—The Maxwell Motor Co. has passed the dividend on its first preferred stock for the quarter ending Dec. 31, 1918. The reason ascribed is that the company has been operating 80 per cent of its capacity on war work, which has necessitated carrying a large inventory. A substantial modification or revision of war orders is anticipated which will necessitate a liquidation of the present inventory and conversion to peacetime basis.

## Score Application of Headlight Law

### New York Ordinance Held Not Entirely Satisfactory—Arbitrary Rulings by Secretary of State Defeat Purpose of Measure

NEW YORK, Nov. 15—That the new New York State Law providing for scientific tests of headlight glare control devices has not proved entirely satisfactory in its application was evident from the discussion held last night at the meeting of the Illuminating Engineering Society at the Engineering Societies' Building, this city. The program of the meeting called for a discussion of the 1917-1918 report of the Committee on Automobile Headlight Specifications.

Dr. Sharp gave a review of the work done by the committee during the past year. He said the work of this committee had culminated in the draft of specifications for laboratory tests required by the laws of the State of New York. He brought out the fact that while there are two points covered in the law, namely, the control of glare and the insurance of sufficient road illumination, the control of glare was the primary and most important object. Each driver has more or less control over his own light, but he cannot control the light from approaching vehicles and he is entitled to protection of the law against blinding glare emitted by them.

#### The General Requirements

The committee in its work had the headlight laws of several other states to guide it. Most of these called for elimination of all direct rays above a line 42 in. above the road surface, at a distance of 75 ft. ahead of the car. This specification led to the production of various devices, having the effect of throwing the beam of light downward. Other devices produced to bring lamps within the requirements of the law had the effect of scattering the rays.

The committee came to the conclusion that the point of observation, 75 ft. directly ahead of the car and 42 in. above the road surface, was not well chosen. They found that the average height of the eyes of a person on the road, whether walking or driving, is 5 ft. Moreover, in meeting another car the driver has to turn out and when he is close to it he is not in a direct line with the oncoming car but about 7 ft. to the left of it. In this position also he must not be annoyed by glare and it was necessary to provide, therefore, for measurements at three points.

In the first place to insure adequate road illumination, it was specified that at a distance of 200 ft. directly in front of the vehicle, and at some point between the road surface and a line 42 in. above it, the illumination must not be less than 1200 apparent candlepower. The object of the second measurement specified was to insure against blinding glare from the lamps directly in the path of the car. This measurement was to be taken at a distance of 100 ft. from the car and at a height of 60 in. above the road surface,

and it was specified that the intensity of illumination at this point should not be more than 2400 apparent candlepower.

To insure against glare in the path of oncoming cars that have swung to one side, a third test was specified. At a distance of 100 ft. ahead of the car, 7 ft. to the left of the axis thereof, and at 60 in. or more above the road, the intensity of illumination must not be more than 800 apparent candlepower. The purpose of the laboratory test, Dr. Sharp said, was to enable one to determine under easily reproducible conditions, whether the illumination obtained from a pair of headlamps was in conformity with the law.

#### Test Apparatus Demonstrated

Mr. Little, who had charge of the tests made by the committee, gave a demonstration of the apparatus used. A pair of headlamps was rigged up in the rear part of the room, and was adjusted to throw a beam of light on a screen on the stage. He showed how axial adjustment of the bulb would reduce and enlarge the beam, and if carried sufficiently far produce a dark spot at the center of same. He also showed the effect on the shape of the beam of placing the bulb outside the axis of the reflector.

L. B. Marks said that the committee had the laws of eight states to serve them as patterns. New York State already had an anti-glare law in 1917, but this was a dead letter. It was urged upon Senator Hewitt, who introduced the bill embodying the present law, that numerical measures should be inserted as to what constituted dangerous glare and sufficient road illumination.

#### Effect of Arbitrary Rulings

Some time ago a statement was given out by the office of the Secretary of State to the effect that between 45 and 50 different lenses had been tested by the laboratories under the direction of the Secretary of State. From a perusal of the report on these tests, issued by the Secretary of State, it was seen that the figures of the law were adhered to in certain cases and not in others. In the case of one particular lens of the diffusing type, it was recommended by the testing laboratory that it should be used with bulbs of 7 candlepower, type B, and 6 candlepower, type C, this low candlepower being necessary in order to prevent dangerous glare, to the left of the car's path of travel. However, the Secretary of State ruled that bulbs of a maximum candlepower of 24 might be used with this type of lens.

In the case of another lamp, the testing laboratory stated that it failed to meet with specifications of the headlamp law with bulbs of more than 5 candlepower, but the Secretary of State advised that bulbs of 17 candlepower could

be used with it when the lamps were tilted. Under the law, the Secretary of State is empowered to submit devices that have been subjected to laboratory tests to an additional road test, and to be guided by the results of this road test in his ruling.

G. H. Stickney said the problem of headlight glare control was not an easy one and that any law on the subject must be absolutely equitable. He thought that with a little more experience they might be able to define the limiting glare permissible more closely than at present, and that later specifications would probably be more strict than the present ones. In his estimation, a laboratory test under specified conditions was infinitely better than any road test, and he had a feeling that the clause providing for road tests was put in with the object of making the law indefinite. A strict enforcement of the law might be a hardship on some manufacturers, but it was important that a fair interpretation should be placed on all requirements of the law.

A. W. Seaman, who said he represented the New York State Automobile Association, observed that in the State of Massachusetts there were more accidents due to want of sufficient light than to blinding glare. He made the point that the society, in working out the specifications for the tests, had tried to be too technical and had not looked sufficiently on the practical side of the problem.

#### Law Not Specific Enough

Dr. Sharp said that some of the requirements of the headlamp law were not sufficiently specific. While it said that the illumination should be sufficiently intense to enable a driver to see a man a distance of 200 ft. ahead of the car, on a dark road, it did not specify other conditions. He thought it would require headlamp bulbs of several hundred candlepower to give sufficient illumination to enable the driver to see a man in dark clothing standing on a dark, oiled road, at that distance from the vehicle, and equally intense illumination to discern a soldier in khaki against a background of discolored foliage.

The charge had been made that the committee in drafting the headlamp test specifications had fallen down. He wanted to know in what way the committee had fallen down. They had drawn up the specifications, and the Secretary of State had adopted them, but later he made decisions contrary to them. So far the specifications had not had a fair and adequate trial, and as things were shaping themselves now, they were not going to have such a trial.

#### Buyer From Bombay Arrives Here

NEW YORK, Nov. 18—P. C. Sawyer, of the firm of Hill, Sawyer & Co., Bombay, India, is now in the United States. He is interested in securing, on behalf of his firm, representation for all classes of automotive equipment and machinery. Mr. Sawyer should be addressed care of the J. B. Crockett Co., 44 Whitehall Street, New York.

**G. M. to Start in Janesville Soon**

JANESVILLE, Nov. 18—General Motors expects to resume work on its new tractor manufacturing plant, projected in connection with the power farm machinery business of the Janesville Machine Co., recently acquired, within a few days' time. The company began work on the first unit, consisting of a machine shop and assembly room, costing \$250,000, on Aug. 8, but work was stopped under government orders early in October. The end of the war has brought relief from the restrictions and arrangements to complete the plant are now being perfected. The main building is about 50 per cent finished. President W. C. Durant and other General Motors officials visited Janesville during the past week to look after affairs, and expressed themselves as hopeful of being able to go through with the project without further delay.

**J. E. F. Plug to Start**

MILWAUKEE, Nov. 18—The J. E. F. Spark Plug Co., Milwaukee, which established a plant at 1826 Brown Street about a year ago to manufacture a new type of spark plug, has incorporated its business without change of style and with an authorized capital stock of \$100,000. The company is planning to take new and larger manufacturing quarters and greatly increase its output. It probably will enlarge its line of products also.

**Stewart Core Building Damaged**

BELOIT, WIS., Nov. 18—The core building of the Stewart-Warner Speedometer Corp.'s large foundry plant in Beloit, Wis., was considerably damaged, one man was killed, and ten seriously injured when an explosion occurred as a core-drying over was being lighted on Nov. 6. The foundry is executing large Government contracts for hand grenades. Federal authorities are making an investigation.

**McCord Completes Large Addition**

DETROIT, Nov. 18—The recently completed addition to the main plant of the McCord Mfg. Co., Inc., contains 134,000 sq. ft., making a total area of 287,000 sq. ft. of floor space. This plant occupies 4 acres of ground, and plants Nos. 2, 3 and 4 add approximately 130,000 sq. ft. to the manufacturing space of the company in and around Detroit.

The new addition was erected in anticipation of the increasing requirements of the government for war work, and the major part of this building is now exclusively devoted to the production of heavy duty radiators for trucks, tractors, stationary generating sets, etc. The company employs 1200 people.

**Boston May Have a Show**

BOSTON, Nov. 16—Some Boston dealers are agitating in favor of a show. The talk has started among the dealers and it is growing stronger daily. Now the matter will be put up to the directors of The Boston Automobile Dealers Association.

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

tion. Some of the men feel that as the Boston show takes place in March there is plenty of time to get ready for it, particularly as Chester I. Campbell may be relieved of his war work. And as Boston has a truck show in connection with a passenger car show even if it were not possible to get a lot of show cars there would be enough of the latter here to make a fine showing with the trucks.

**Investigate Disposition of War Trucks**

BOSTON, Nov. 16—Congressman Alvan T. Fuller, distributor of Packard cars and trucks in Eastern New England, sailed to-day for Europe on a two months trip to investigate motor conditions abroad for the government. He will visit all the countries there and learn at first hand what disposition is being made of motor trucks and cars by the war departments of Europe, and the problem of disposing of the thousands of vehicles overseas owned by the Government.

**Dealers Anxious About Government Vehicles**

BOSTON, Nov. 16—Boston dealers are wondering just what the effect will be if the Federal Government decides to do the same thing with its motor cars and trucks that it proposes to do with its auxiliary patrol fleet. The Navy Department is going to have a clean up sale of boats shortly. If the same thing follows with trucks and cars there will be a big sale of them in New England. In Massachusetts there are hundreds of motor cars used by army and navy officers, by officials of the shipping board, and a dozen and one different committees making headquarters in Boston.

**Aircraft Contracts**

WASHINGTON, Nov. 16—The following orders were placed by the Aircraft Bureau on Oct. 30, 1918:

Dayton-Wright Airplane Co., Dayton, services.  
Prest-O-Lite Co., New York, tanks of acetylene gas.  
Graton & Knight Mfg. Co., Worcester, belts.  
Silvex Co., South Bethlehem, spark plugs.  
James Cunningham, Son & Co., Rochester, windlasses.

**Corporations Cannot Develop Business**

WASHINGTON, Nov. 18—Corporations that desire to float securities for development of their businesses will have to secure the approval of the Capital Issues Committee, Treasury Department, of this city before the stocks and bonds can be offered to the public. This ruling continues in effect despite the armistice, according to an official announcement today by the Capital Issues Committee.

**Stinson Tractor Nearly Ready**

SUPERIOR, WIS., Nov. 18—The Stinson Tractor Co., Minneapolis, expects to have its new plant in Superior, Wis., ready to begin production by Dec. 1. The factory, which originally was erected for the Continental Motor Truck Co., is now receiving machinery and equipment, brought to Superior from Stillwater, Minn., where the Stinson company purchased a complete machine shop equipment at a cost of more than \$80,000. For the present the production will be confined to a four-plow tractor, but later a two-plow machine will be put in process.

**Dearborn Buys Smith Truck**

CHICAGO, Nov. 18—The Dearborn Truck Co. has purchased the good will and all materials of the Smith Motor Truck Corp. and will remove the equipment to 2515-2525 West Thirty-fifth Street, where it has recently acquired a new factory building. The Dearborn company has added to its line a complete worm-driven truck in two models of 1½ and 2½ tons capacity and two models of chain-driven trucks in 1 and 2 tons capacity.

**Major Mitchell Lewis Injured**

MILWAUKEE, Nov. 18—Maj. Wm. Mitchell Lewis, 107th Field Signal Battalion, Thirty-second Division, American E. F., has been wounded in action in France, according to word received by his family at Racine, Wis. Maj. Lewis received a machine gun bullet wound in the back of his neck, but was out of the hospital within a few days afterward. He has been in the front lines in various sectors for more than five months. Maj. Lewis formerly was president and general manager of the Mitchell-Lewis Motor Co., now the Mitchell Motors Co., and later established the Lewis Motor Car Co., Racine. He entered the service in May, 1917. He served as captain of Co. F, 2d Wisconsin Infantry, during the Spanish-American war.

**Export Licenses Still Good**

WASHINGTON, Nov. 18—All export licenses which were issued by the War Trade Board on or after Nov. 15, 1918, or export licenses unexpired on that date will be valid until used, unless hereafter revoked, notwithstanding that such licenses are stamped as expiring on Nov. 15, 1918, or subsequently thereto. Collectors of Customs and Post Office Departments have been advised accordingly. The above ruling will not apply to licenses for exportation of any commodity to Norway, Sweden, Denmark, European Holland, Iceland, Switzerland or Greece.

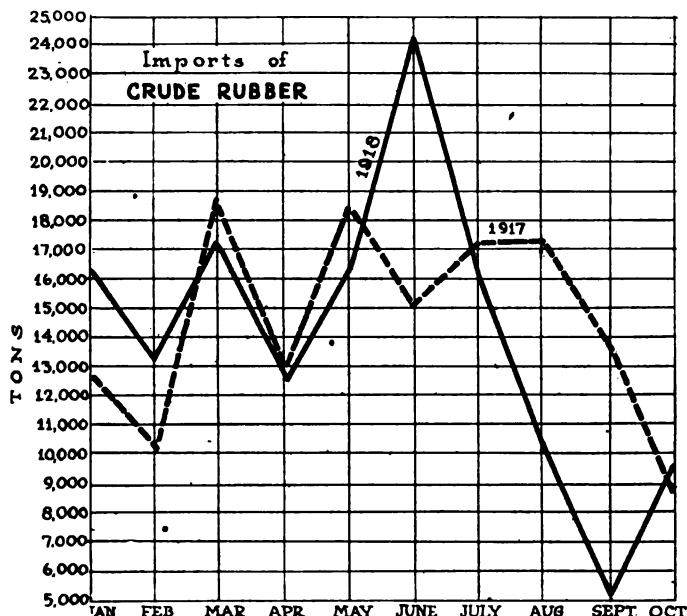
Maj. Sherman M. McFedries, of Milwaukee, who has been at the head of the Milwaukee ordnance corps office for several months, has been transferred to the production department, district ordnance office, Chicago, under orders issued Nov. 5.



# AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>		<b>Burlap:</b>	
Muriatic, lb. ....	.02-.03	8 oz., yd. ....	.17½-.17¾
Phosphoric (85%) ..	.35-.39	10½ oz., yd. ....	.21½-.22
Sulphuric (60), lb. .	.006	<b>Copper:</b>	
<b>Aluminum:</b>		Elec., lb. ....	.26
Ingot, lb. ....	.33	Lake, lb. ....	.26
Sheets (18 gage or		<b>Fabric, Tire (17½ oz.):</b>	
more), lb. ....	.42	Sea Is., combed, lb.	1.65-1.70
<b>Antimony, lb. ....</b>	<b>.13½-.13¾</b>	Egypt, combed, lb.	1.25-1.35
		Egypt, carded, lb.	1.20-1.30



A comparison of the imports of crude rubber month by month for ten months of 1918 and a similar period in 1917. Note the increase last month compared with September figures

### Importance of Safety Movement

WASHINGTON, Nov. 19—The immense practical value of the safety first and safety appliance movement now growing rapidly in American industrial establishments is brought out in a bulletin by the Department of Labor, Bureau of Labor Statistics, entitled "The Safety Movement in the Iron and Steel Industry, 1907 to 1917."

It shows that, measured in terms of human life and limb, the efforts at accident prevention during the past ten years have reduced death and injury in that industry by no less than two thirds. In 1907, out of every 1000 men employed, 242 were killed or injured during the year; in 1917, the proportion had been reduced to 81 per 1000.

The reduction in the later years would no doubt have been more rapid had it not been for the advent of the world war with its enormous dislocation to all orderly processes. Its first effect upon American industry generally was one of great depression. Employment in the iron and steel industry declined rapidly, reaching its ebb about the middle of 1915. Then began an upward movement in activity and employment which was entirely with-

out precedent. The demand for labor led to the introduction of entirely new labor elements and to a movement of labor from place to place such as had never before occurred.

This placed an enormous strain upon accident prevention efforts. On the whole, it may be said that the test was well met. But in some branches of the industry there was a condition bordering on demoralization. Accident rates went up rapidly, but in very few of the better organized plants did the new rates rise as high as they had been at the next preceding period of industrial activity, and by the middle or latter part of 1916 the situation almost everywhere was well in hand.

The safety movement in the iron and steel industry may thus be said to have passed with credit its most serious test. But there must be no resting on the oars. Accident rates are still too high. If necessary, the safety movement must revise its foundation principles in order to meet the new demand. This report, indeed, directly broaches the question, "Can serious industrial accidents be eliminated?" and seeks to prove that such a goal is possible of attainment.

Peelers, combed, lb.	1.05-1.20
Peelers, carded, lb.	.95-1.05
Fibre (¼ in. sheet base), lb.	.50
<b>Graphite:</b>	
Ceylon, lb. ....	.09-.22
Madagascar, lb. .	.10-.15
Mexico, lb. ....	.03¾
Lead, lb. ....	.08-.09
<b>Leather:</b>	
Hides, lb. ....	.18-.35¾
Nickel, lb. ....	.40
<b>Oil:</b>	
Gasoline:	
Auto., gal. ....	.24½
68 to 70 gal. ....	.30½
<b>Lard:</b>	
Prime City, gal. .	2.30-2.35
Ex. No. 1, gal. .	1.62
Linseed, gal. ....	1.88-1.90
Menhaden (Brown) gal. ....	1.30-1.31
Petroleum (crude), Kansas, bbl. ....	2.25
Pennsylvania, bbl.	4.00

<b>Rubber:</b>	
Ceylon:	
First latex pale crepe, lb. ....	.63
Brown, crepe, thin, clear, lb. ....	.60
Smoked, ribbed sheets, lb. ....	.61¾
<b>Para:</b>	
Up River, fine, lb. .	.68
Up River, coarse, lb. ....	.30
Island, fine, lb. .	.59
Shellac (orange), lb.	.74-.76
Spelter ....	.08¾
<b>Steel:</b>	
Angle beams and channels, lb. ....	.03
Automobile sheet (see sp. table).	
Cold rolled, lb. ....	.06¾
Hot rolled, lb. ....	.03¾
Tin ....	.72¾-.73¾
Tungsten, lb. ....	2.45-2.50
Waste (cotton), lb. .	.12¾-.17

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only per 100 lbs.	Primes when seconds up to 15 per cent are taken per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat, fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
<b>Automobile Sheet Extras for Extreme Widths:</b>		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
<b>Black Sheet Extras to Apply to Narrow Widths:</b>		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

The argument is briefly this: The statement that accidents cannot be entirely prevented rests primarily upon the conviction that accident occurrence is due in the main to the human factor, to the "carelessness" of individuals. Since a perfect humanity is not yet in sight it is urged that results which demand perfection cannot be expected. A careful analysis of a large group of fatal and serious accidents indicates, however, that such accidents are due primarily to fundamental engineering or structural defects in which the workman has no part. Numerous illustrations are cited.

A man in violation of orders walks under a swinging crane which breaks and he is killed. His "carelessness" is blamed, but the real cause was a faulty chain. An oiler is caught on a smooth shaft by some loose portion of his clothing. He is blamed because he had been forbidden to wear such clothing.

But it is possible to equip all shafts with bearings which render approach while the machinery is in motion wholly unnecessary. In general it is argued that structures so strong, so well designed, the material so well selected that they cannot fail are possible.

## Walter S. Gifford Resigns

WASHINGTON, Nov. 19—Brig.-Gen. Walter S. Gifford, Director of the Council of National Defense, has resigned to return to the American Telephone and Telegraph Co. as comptroller of that organization, his services having been loaned the Government throughout the war period.

E. V. Rippingille, assistant sales manager of the Hudson Motor Car Co., Detroit, whose time since the entrance of United States in the war has been spent in Washington, where he has been engaged in special work for the Government, has returned to his duties in Detroit.

R. R. Cook, one of the field organizers of the Lalley Electro Lighting Corp., has been appointed assistant sales manager. Previous to his connection with the Lalley corporation he was foreign sales manager of the Cadillac Motor Car Co.

O. C. Bornholt, formerly factory manager of the Holley Kerosene Carbureter Co., Detroit, has been appointed mechanical engineer of the Buick Motor Co., Flint.

C. W. Stephens has been appointed manager of sales for the Detroit Twist Drill Co., Detroit, succeeding Nelson J. Smith, who is now assistant to President Muir B. Snow.

A. E. Walden, for the last seven years experimental engineer of the Chalmers Motor Co., Detroit, has resigned to take charge of the Government experimental station at Indianapolis, under Captain D. M. Lasley.

W. J. MacInnes, formerly advertising manager of the old Rapid Motor Vehicle Co., Pontiac, Mich., has become associated with the Division of Films, Committee on Public Information.

H. D. Runciman has been appointed general manager of the Hoover Steel Ball Co., Ann Arbor, Mich. He was formerly assistant to the general manager.

## Fulton Declares 11 1/3 Per Cent Dividend

FARMINGDALE, L. I., Nov. 20—The Fulton Motor Truck Co. has declared accumulated dividends from Feb. 1, 1917, to July 1, 1918, amounting for the period to 11 1/3 per cent. These are payable Jan. 10.

## Standard Truck Enlarging Plant

DETROIT, Nov. 19—The Standard Motor Truck Co. is erecting an addition, 65 x 175, to plant No. 1. Construction of a second unit of the same size will be started as soon as the building is completed. These structures have been necessitated by rapidly increasing business.

## Men of the Industry

*Changes in Personnel and  
Position*

## New Zealand Dealer Coming

NEW YORK, Nov. 20—J. B. Clarkson of the Hope, Gibbons Sons and J. B. Clarkson, Limited, Wellington, N. Z., wholesale dealers in cars, motorcycles and accessories, has sailed from New Zealand and is expected in the United States some time during the month of November.

## Jobbers' Trial Jan. 6

NEW YORK, Nov. 21—Jan. 6 has been set as the date for the trial of the Government case against the National Association of Automobile Accessory Jobbers in the United States Court in this city. It is estimated that the trial will last until about the middle of February.

## Want Army Trucks for Mail

NEW YORK, Nov. 20—A plea for the employment of a large number of motor vehicles and personnel of the army in the parcel post motor truck routes was made here to-night by Fourth Assistant Postmaster General James I. Blakslee in an address presented before the Transportation Conference held under the direction of the Colt-Stratton Co.

Postmaster Blakslee pointed out that many thousands of the motor truck drivers who have seen service abroad and who soon will be returned to this country will naturally want to remain in the class of work which they can best perform and that their employment on new parcel post routes will provide many thousands of such men with immediate employment.

The Postmaster also asked for a large number of the War Department's motor trucks that are now in this country and may be returned from abroad. The War Department has given Postmaster Blakslee a 3-ton Packard semi-Class B truck, one of the Mack 5 1/2-tonners used by the Engineering Corps and one of the standardized Class B war trucks. Postmaster Blakslee will put these vehicles on routes during the coming week to ascertain whether they are suitable for the work in hand before he makes application to have any others of the same class turned over to him.

## To Map Air Lanes

WASHINGTON, Nov. 20—The future possibilities of civilian airplane use are suggested by an announcement to-day of the War Department that beginning Friday fliers will chart air planes throughout the United States. This will form the basis of complete air maps linking every important city and community in the country.

## Browne on Reconstruction Committee

MILWAUKEE, Nov. 18—George W. Browne, one of the leading motor car distributors and dealers of the United States, and distributor of the Overland and Willys-Knight in Wisconsin, has been selected as one of fifty manufacturers, merchants, business and professional men of Milwaukee to serve as a member of the "reconstruction council," a body created by the Milwaukee Association of Commerce to formulate and supervise methods of facilitating the reversion of industry from a war to a peace basis without undue disturbance of the economic equilibrium.

## Dearborn Tractor Plant on 100 Per Cent Schedule

DETROIT, Nov. 20—The tractor plant of Henry Ford & Son at Dearborn is now operating on a 100 per cent peace-time production schedule. The company has on its books orders for 20,000 tractors. To maintain production, the company will employ an additional 500 men between now and January. Charles E. Sorensen, General Manager, said: "Mr. Ford believes it is up to the workmen of the United States to support the manufacturers to the limit in order that materials may be produced for war ravaged Europe and progressive America. With this in mind our 3000 employees are working at a pace that should set a new record in industrial lines."

The special plant erected by the Government as a tank factory is being utilized to take care of increased tractor production.

## Weather Causes Shut Down of Plant

Weather conditions making it impossible to launch boats in the river Rouge during the winter months has caused the Ford Motor Co. to stop work at the Detroit Eagle plant. The remainder of the 100 Eagles ordered by the Navy Department will be completed at the New Jersey plant. Officers and enlisted men of the United States and Italian navies on duty at the Detroit Eagle plant will be ordered transferred in a short time at the main plant of the Ford company. Changes in the working shifts are being made. Most of the men who have been working from midnight till 8 a. m. are being transferred to other shifts, indicating that the Ford company is to operate only two crews for the time being. Apparently aircraft production has been cancelled.

## Pre-Armistice Contracts

WASHINGTON, Nov. 19—The following contracts were let by the Government prior to the armistice and just announced:

American Optical Co., Southbridge, Mass.; goggles, \$9,332.  
W. J. V. Motor Car Co., Newark; trucks, \$11,900.  
United States Tire Co., New York; tires, \$14,018.75.  
General Motors Corp., Flint; motors parts, \$16,125.  
Flske Tire & Rubber Co., Chicopee Falls, tires, \$15,973.60.  
Continental Auto Parts Co., Knightstown, Ind.; motor parts, \$9,732.50.

## Contracts Placed

WASHINGTON, Nov. 18—The following contracts, including purchases of AA chassis, B chassis, T passenger cars and huge quantities of supplies and tires, were passed by the Quartermaster Board of Review:

Ashtabula Nut & Bolt Co., Ashtabula, skid chains, \$6,380.  
Velle Motors Corp., Moline, motor parts, \$7,364.07.  
Fisk Rubber Co., Chicopee Falls, tires, \$11,726.  
Packard Motor Car Co., Detroit, Packard chassis, \$1,837,920.  
The Trailmobile Co., Cincinnati, pigeon-loft trailers, \$42,600.  
Peerless Motor Car Co., Cleveland, extra equipment, \$426,000.  
International Harvester Co., Chicago, bodies and troop seats, \$157,000.  
Continental Motors Corp., Detroit, trucks, \$505,000.  
Ford Motor Co., Detroit, Ford cars, \$483,760.  
Kelly-Springfield Motor Truck Co., Springfield, chassis "B," \$3,038,000.  
Kelly-Springfield Motor Truck Co., Springfield, trucks, \$769,250.  
Bosch Magneto Co., New York, magnetos, \$94,000.  
Winton Engine Works, Cleveland, generator sets, \$587,600.  
United States Tire Co., New York, tubes and casings, \$26,790.44.  
Packard Motor Car Co., Detroit, chassis (special equipment), \$738,540.  
Prudden Wheel Co., Lansing, wood wheels, \$80,000.  
Hayes Motor Truck Co., St. Johns, Mich., wood wheels, \$30,000.  
Ford Motor Co., Detroit, chassis "T," \$1,361,208.  
Westfield Mfg. Co., Westfield, Mass., bicycles, \$179,550.  
Republic Tire & Rubber Co., Youngstown, tires, \$39,712.  
U. S. Tire Co., New York, tires, \$124,560.  
Ford Motor Co., Detroit, ambulances, \$571,734.  
Pierce-Arrow Motor Car Co., Buffalo, chassis, \$3,690,390.  
Firestone Tire & Rubber Co., Akron, tires, \$11,816.20.  
McQuay-Norris Mfg. Co., St. Louis, piston rings, \$8,788.15.  
B. F. Goodrich Co., Akron, tires, \$12,177.  
Standard Motor Truck Co., Detroit, motor parts, \$22,068.31.  
Garford Motor Truck Co., Lima, trucks, \$2,706,704.  
Fisk Rubber Co., Chicopee Falls, tires, \$351,044.  
B. F. Goodrich Rubber Co., Akron, tires, \$431,360.  
Liberty Motor Car Co., Detroit, trucks, \$267,500.  
Cadillac Motor Car Co., Detroit, spare parts, \$95,039.62.  
Great Western Mfg. Co., Laporte, bicycles (contin.), \$79,775.  
Atlantic Refining Co., Philadelphia, gasoline, \$352,500.  
Davis Sewing Machine Co., Dayton, bicycles, \$84,925.  
Great Western Mfg. Co., Laporte, bicycles, \$79,875.  
Hercules Buggy Co., Evansville, bodies, \$286,000.  
Davis Sewing Machine Co., Dayton, bicycles, \$89,775.  
Goodover Tire & Rubber Co., Akron, tires, \$470,891.20.  
Goodover Tire & Rubber Co., Akron, casings and tubes, \$51,231.60.  
Firestone Tire & Rubber Co., Akron, tires, \$424,240.  
Kuhlman Car Co., Cleveland, bodies, \$143,000.  
Grand Rapids School Equipment Co., Grand Rapids, bodies, \$214,500.  
Glascock Bros. Mfg. Co., Muncie, Ind., bodies, \$214,500.

## Q. M. Orders Ford Cars Worth \$5 118,400

WASHINGTON, D. C., Nov. 16—Just prior to the signing of the armistice the Quartermaster Department placed orders with the Ford Motor Co. for Ford cars amounting to \$5,118,400.

## Quartermaster Contracts

WASHINGTON, Nov. 16—The following orders were placed by the Board of Review, Quartermaster Department, on Oct. 25:

## Contracts

Philadelphia, Atlantic Refining Co., Philadelphia, gasoline, \$5,000.  
Philadelphia, Atlantic Refining Co., Philadelphia, grease, \$3,340.  
The Ohio Canvas Goods Mfg. Co., Toledo, truck covers, \$11,475.  
H. C. Griffin & Co., New York, boxing trucks, \$12,500.  
Willis-Overland Co., Toledo, canvas covers, \$64,240.  
Ford Motor Co., Detroit, Ford cars, \$3,946,180.  
Ford Motor Co., Detroit, Ford cars, \$1,172,220.

## Machinery and Engineering Contracts

WASHINGTON, Nov. 15—The following contracts were placed by the Machinery and Engineering Materials Division, War Department:

Goodyear Tire & Rubber Co., Washington, hose suction.  
Dyneto Motor Corp., Syracuse, new way air-cooled engines (gas, electric), and parts.  
Penberthy Injector Co., Detroit, brass globe and check valves.  
Detroit Lubricator Co., Detroit, Mich., fusible plugs.  
S. F. Bowser & Co. (Inc.), Fort Wayne, pumps.  
International Harvester Co., Chicago, gasoline and kerosene engines.  
Hercules Gas Engine Co., Evansville, gasoline and kerosene engines.  
Novo Engine Co., Washington, repairs for Novo engines.  
The Cook Motor Co., Delaware, Ohio, gasoline engines.  
Bureau of Aircraft Production, Washington, spar varnish.  
General Asbestos & Rubber Co., Charleston, folded asbestos gaskets.  
Bethlehem Steel Co., Washington, switch stands.

## Calendar

## ENGINEERING

S. A. E. Meetings  
1919

- Jan. 8—Minneapolis Section, S. A. E.—Hotel Radisson. "Governors for Tractors and Truck Engines."  
Jan. 12, 13, 14—New York—Winter Meeting, Society of Automotive Engineers, Engineering Societies' Building.  
Feb. 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Radiator Cooling Fans."  
Mar. 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Tractor Service and Sales."  
Apr. 2—Minneapolis Section, S. A. E.—Hotel Radisson. "Implement's Designed for Tractor Belt Power and Their Characteristics."

## CONVENTIONS

- Dec. 4-5-6—Atlantic City—War Emergency and Reconstruction Conference of War Service Committees.  
Dec. 9-13—Chicago—Convention Highway Industries Association, Congress Hotel.  
Dec. 11—New York—Annual Dinner Portland Cement Association, Biltmore Hotel.  
Feb. 25-28—New York—American Road Builders' Assn., Sixteenth Annual Convention.

## SHOW

- Jan. 13-14—Des Moines, Ia.—First Tractor Show Des Moines Tractor & Tractor Club. H. J. Clark, Mgr.

## Signal Officer Contracts

WASHINGTON, Nov. 15—The following contracts were placed by the Chief Signal Officer:

Eaton Storage Battery, Orange, storage batteries.  
Willard Storage Battery, Evans Building, Washington, syringe hydrometers.  
Electric Storage Battery Co., Washington, 2000 storage batteries.  
Willard Storage Battery Co., Washington, hydrometer syringes.  
B. F. Goodrich Rubber, Akron, 7500 miles twisted pair wire.  
White Co., Cleveland, 1 kit tools for radio tractor.  
H. W. Johns-Manville Co., New York, 600 lb. Chatterton's compound.  
Willard Storage Battery Co., storage batteries.  
American Propeller & Mfg. Co., Baltimore, regulating air fans.  
Gould Storage Battery Co., storage batteries.  
Willard Storage Battery Co., storage batteries.  
U. S. Light and Head Corp., storage batteries.

## Modern Steel Rebuilding Plant

MILWAUKEE, Nov. 16—The Modern Steel Treating Co., Milwaukee, is rebuilding its plant at 619 Thirty-eighth Avenue, destroyed by fire Oct. 17, with a loss of \$25,000.

## Extracts from the Diary of Von Richthofen

(Continued from page 881)

seems not impossible that the day may come when a whole division will be transported in such a thing. In its body one can go for a walk. It contains an apparatus for wireless telegraphy by means of which one can converse with the people down below. In another corner are hanging the most attractive "liver sausages" which one can imagine. They are the famous bombs which cause such a fright to the good people down below. At every corner is a gun. The whole thing is a flying fortress, and the planes with their stays and supports look like arcades. I have never been able to find enthusiasm for these giant barges. I find them horrible, unsportsmanlike, boring and clumsy. I rather like a machine of the type of "le petit rouge." If one is in a small chaser machine it is quite immaterial whether one flies on one's back, whether one flies up or down or stands on one's head. One can play any tricks one likes, for in such a machine one can fly like a bird. The only difference is that one does not fly with wings, as does the bird albatross. The thing is, after all, merely a flying engine. I think things will come to this, that we shall be able to buy a flying suit for 60 cents. One gets into it. On the one end there is a little engine and a little airscrew. One sticks one's arms into the planes and one's legs into the tail. Then one does a few leaps in order to start, and one goes up into the air like a bird.

My dear reader, I hear you laughing at my story. But we do not know yet whether our children will laugh at it. Everyone would have laughed fifty years ago if somebody had spoken about flying above Berlin. I remember the sensation which was caused when in 1910 Zeppelin came for the first time to Berlin. Now no Berlin gutter-brat looks up into the air when an airship is coming along.



# AUTOMOTIVE INDUSTRIES

*The* AUTOMOBILE

YORK, NOV

1918



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## Never Has the Future Held Greater Promise Than Today

Today the world stands on the threshold of the greatest era of progress and prosperity ever experienced.

The triumph of freedom has killed for all time to come the doctrine that might makes right.

Through the sacrifice of millions who laid down their lives on battlefields, the humblest person, the smallest nation may now enjoy life, liberty and the

pursuit of happiness, free forever from the dread of a mighty but unscrupulous neighbor.

Let us all, therefore, turn our hearts and hands to our appointed tasks with renewed and joyous energy—not forgetting that now as during the dark days of war our first duty is to our Country and humanity.

Let every one of us play his full part in the great task of reconstruction that lies before us.

**Hudson Motor Car Company**

Detroit, Michigan



UTILITY PUMPS  
for All Cars \$12.00.  
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UTILITY HEATERS  
for All Cars \$9.00 to \$25.00



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There is a UTILITY Heater for every car, ranging in price from \$9.00 to \$25.00. Handled by good dealers everywhere. Send for booklet.

Dealers: Order of your jobber.



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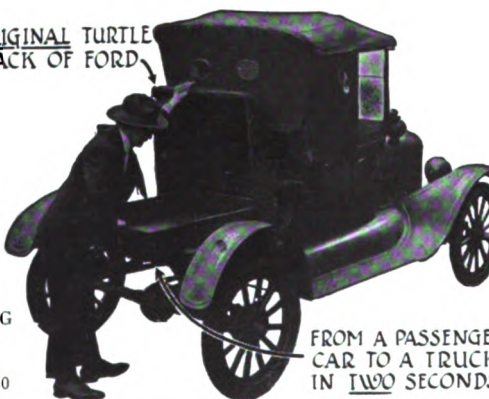
Sales Department

THE ZINKE CO., 1323 S. Michigan Ave.,  
Chicago

UTILITY PEDALS  
For Fords \$1.25



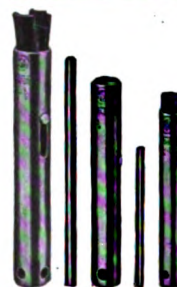
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DISAPPEARING  
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Price \$38.50

UTILITY UNIVERSAL  
WRENCH  
Set for All Cars \$3.50



# UTILITY

## Automotive Products

# AUTOMOTIVE INDUSTRIES

## THE AUTOMOBILE

VOL. XXXIX

NEW YORK, THURSDAY, NOVEMBER 28, 1918—CHICAGO

No. 22

## Probable Effects of War Motor Apparatus on Commercial Design

Solution of Many Problems Connected with the Development of  
Creeper Type Machines Should Be Useful—War  
Experiences Likely to Benefit Engineering

**W**ITH the war drawn to a close, it will be only a short time before a large number of officers who have served during the period of hostilities, in the non-combatant branches, will be released. In the Ordnance and Quartermaster departments there have been a large number of men recruited from the automobile and allied industries. These men are going to bring back into the industry the fruits of an experience which should be of material value in commercial life.

One of the results of our short period of war will be to reintroduce into the automotive industries a number of men who have gained an intensely valuable experience and, furthermore, it is going to be possible to adapt for commercial uses some of the highly valuable apparatus developed for war purposes. There has been a wide variety of new material designed for extremely rigorous usage, and since this material was planned without regard to experimental cost it is in the main the acme of useful design.

### Lessons from the Ordnance Department

It is not necessary to search further than the Motor Equipment Section of the Engineering Division, Army Ordnance, for a record of engineering accomplishment from an automotive standpoint. In fact, the work done during the past year in this section has never been duplicated in commercial life. With appropriations amounting to hundreds of millions, and the resources of the country both in

raw materials and manufacturing facilities at its disposal, this department has gone ahead on a program which has already placed this country at the head of the list in certain forms of motor equipment.

The work covered by this section has been of wide scope. It has embraced everything from heavy fighting tanks to motorcycles. It has included every sort of drive, including all forms of track-laying types as well as solid and pneumatic tired wheel variety. Out of this wealth of apparatus it is certain that we can derive some valuable lessons for commercial usage. Driven by military necessity, the Motor Equipment Section has designed special types of bodies adaptable to a wide line of truck chassis which show a marked ingenuity and utility and which immediately suggest the possibility of well-planned special body designs for industrial and merchandising requirements.

### Some Examples of Special Design

It may be interesting to cite a few typical instances of special design which are not surrounded by a veil of secrecy. Probably of greatest use from a military standpoint, and perhaps adaptable to a field not fully realized in agricultural and other peaceful pursuits, are the heavy type of track-laying tractors.

The heaviest of these brought out by the Ordnance Department is the 20-ton artillery tractor, which is a specially adapted 120-hp. Holt design. It is 252 in. in length and weighs 27,000 lb. with gasoline, oil



and water. Yet its ground pressure is only 7.17 lb. per square inch.

This tractor is particularly designed for hauling heavy guns and other weighty military material over all sorts of road and ground conditions. Its low unit pressure and high drawbar horsepower enable it to bring the heaviest pieces of artillery into action regardless of highly difficult conditions of terrain.

The 10-ton artillery tractor is a similar design with many of the same characteristics, though, of course, due to its lighter weight it has a higher speed capacity. The 20-ton pulls its load at 3.27 m.p.h. at 600 r.p.m., while the 10-ton pulls its load at 4.19 m.p.h. at 600 r.p.m., or at 5.59 m.p.h. at 800 r.p.m. There are also 5-ton and 2½-ton artillery tractors which travel at correspondingly higher speeds.

At first it would not seem probable that equipment of this kind would be readily adaptable to agricultural, commercial or merchandising purposes, yet there are many sections of the country where devices of this kind would be highly useful in logging, hauling and farming operations.

### Heavy Haulage Problems Attacked

There are many sections of the country undeveloped because of the difficulty of hauling heavy loads over the soft and marshy ground. It has always been true in this country that after a war considerable employment has been found for returned soldiers in the development of tracts of previously unimproved territory. The apparatus which has proven so valuable in war work over ground torn by shell fire cannot help but be of assistance in work of this nature.

The utilization of knowledge gained in special truck designs is certain to be a stimulation in the truck field. The success of the war designs, in which the co-operative efforts of various engineers in the truck industry were utilized to produce the best possible truck regardless of expense, has taught lessons which have already begun to make themselves felt.

While quite certain that the question of economy was the last considered in the war designs, and endurance and performance given the first consideration, it will not be necessary to discard all that has been learned in these designs to produce successful commercial vehicles.

### Work of Civilian Employees

The work of the Motor Equipment Section in regard to its line of trucks and truck bodies has been one of the bright spots in this country's rapid preparation for war. It is needless to say that the majority of the accomplishments in this field were made by men drawn from the automotive industries. In Washington in military and civilian capacities are men who are working at one-tenth their previous incomes in many cases. These men have gone wholeheartedly about supplying a line of motor equipment which has increased the mobility of our army equipment to a vast extent.

These trucks are of all sizes, some of them, such

as the F. W. D., Nash, White, Commerce and Dodge, have been taken almost entirely from commercial production, and with only slight engineering modifications have been made to fulfill a wide line of purposes. On these chassis have been mounted bodies adapted for carrying supplies, men and traveling repairshops which have been invaluable in maintaining the artillery and equipment of the armies in the field.

A great many of the ordnance vehicles have been mounted on the Nash 2-ton and the F. W. D. 3-ton truck chassis, and certain bodies have been mounted on both these chassis. From truck chassis like the 1-ton White, high-speed truck service has been required.

### Forecast of Vehicles to Come

For example, on this chassis has been mounted a staff observation car having a rated load capacity of 1 ton. This is a pneumatic tired job capable of carrying nine passengers. The front and rear seats comfortably seat three persons each and the folding auxiliary seats accommodate three more. The chassis is of White manufacture, conventional in design and has a rated capacity of 1 ton. The tires are 36 x 6 in. and the car is driven by a four-cylinder block cast White engine.

The car carries a complete set of mechanic's hand tools and body equipment tools, the latter consisting of shovels, pick, lantern and so forth. The body is also fitted with numerous chests for special equipment. It is provided with a four-speed gearbox and throughout is designed for severe overland service.

Probably the lightest truck chassis utilized by the Motor Equipment Section has been the Dodge. The light repair truck body mounted on this is typical of the sort of load which this chassis is relied upon to carry. It has a rated load capacity of 1000 lb.; the maximum gross weight loaded is 3600 lb. The body on this is an Ordnance Department design, while the chassis is very little different from the passenger car chassis made by Dodge Brothers. The body is made up entirely of steel and is divided into a front compartment which has a single seat and a rear compartment which is used for trucking purposes, closed by a tail-gate or door.

The front seat can carry three. The rear part of the body has the following inside measurements: length from back of seat to the tail-gate or door, 62½ in.; inside width, 46 in.; height, 48 in. The body carries a complete repair equipment of machine and carpenter tools, a mechanic's vise which can be attached to the tail-gate and a 2-ton block and tackle. In addition there are chests in which repair parts and emergency lubricants are carried.

### Adapting Commercial Designs

As an example of a body used on two chassis there is the machine gun car which is mounted on the 1-ton Commerce chassis and also the White chassis. This machine gun car is a standard design so arranged as to carry nine passengers, a machine gun, and various equipment such as spades.

(Continued on page 945)

# Resistance of Hot Spark Plug Insulators

Tests Conducted to Determine the Loss of Resistance of Insulators at Spark Plug Working Temperatures—How Such Loss Affects the Action of the Plug

By Dr. R. H. Cunningham

Consulting Ignition Engineer

**W**ITHIN the past 2 years considerable attention has been directed to the electrical behavior of certain insulating materials for spark plugs, and since the advent of the high-compression airplane engine with its plug-disturbing tendencies, both spark plug and engine manufacturers have had special reasons to urge the makers of such insulation to produce materials more suitable, both mechanically and electrically, to the requirements of internal combustion engines.

Although there is plenty of room for scientific criticism of the shapes, dimensions and design of some of the commercial spark plugs, both from a mechanical and an electrical standpoint, my aim in this article is only to discuss broadly the electrical behavior of some of the materials most commonly employed as insulators in spark plugs.

## Heat Impairs Insulating Qualities

It has long been recognized that when insulators such as porcelain, mica, quartz, etc., are heated up they become conductive to a certain extent, so that if these substances are used for spark plug insulation, forming the dielectric of a condenser, more or less leakage of charge takes place and gives rise to misfiring.

This leakage of electric charge is made up of two components, namely, leakage over the surface of the insulator and leakage through its substance.

Although it is quite possible to separate these two leakages numerically when the insulating material is of a certain form, it is rather difficult to do so in the case of the usual spark plug, owing to the shape of the insulator and to the disposition of its various metallic parts. In certain types of porcelain plugs, however, a fair idea of the surface leakage, as differentiated from the substance leakage, can be obtained by the means described below.

## Surface Leakage Must Be Considered

In giving data relating to the resistance of insulators of this kind, the customary method has been to state the resistance in ohms or meg-ohms between opposite faces of a cube of one centimeter length of side, and usually an alternating electric motive force of from 60 to 100 cycles and of approximate sine wave form is applied to the insulation under test. Although the meg-ohms of a centimeter cube are well enough to know from a scientific standpoint,

such knowledge conveys very little definite information to the makers of spark plug insulation and to spark plug manufacturers. Besides, the results obtained by the application of the alternating sine wave current to the insulation give but a very hazy idea of what occurs when the insulation is assembled in the plug and a portion of the latter is subjected within the hot compression chamber to the "steep front," high voltage electric surges that are delivered by efficient types of ignition apparatus.

It occurred to the writer, therefore, over a year ago, that it would be both interesting and instructive to study the leakage behavior of several commercial varieties of spark plugs, both in the cold state and when heated to temperatures of 100° C. or higher, applying, however, potential differences to the plug electrodes more closely equalling those applied in actual service. It seemed quite reasonable to infer that with the information such an investigation would furnish, one should be able to predict the electrical behavior of plugs in an engine from preliminary measurements of a few sample plugs of similar design and of the same material. Thus, if much leakage of current occurs in the hot plug, one logically infers that there will be at least a serious diminution in the intensity of the high-tension ignition spark, especially when the generator of the spark is capable of but feeble output. Nevertheless, it is conceivable that even if certain kinds of hot spark plugs do leak to some extent, the effects of such leakage upon the maximum voltage usually created at the points of the plug by the high tension ignition magneto or induction coil may be partly compensated by both the increased ionization that occurs on heating the plug, and the increased conductivity of the heated, smoky, gaseous dielectric filling the space between the points just prior to the ignition of the compressed gas.

## Maximum Temperature of Plug

During the consideration of the various methods whereby a solution of the above problem might be obtained, the first question that puzzled the writer was, "How hot does a spark plug become in a working combustion engine?" That part of the plug exposed to the surrounding air, and that part of the metal shell screwed into the usually water-jacketed cylinder, never become heated to the same extent as the portions of the plug within the cylinder. Now, although the plug points, and probably the tip end of the central stem of insulation undoubtedly do very often become red hot, at least

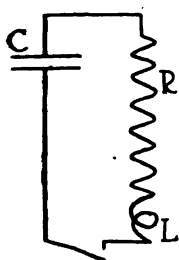


Fig. 1—Diagram of spark circuit

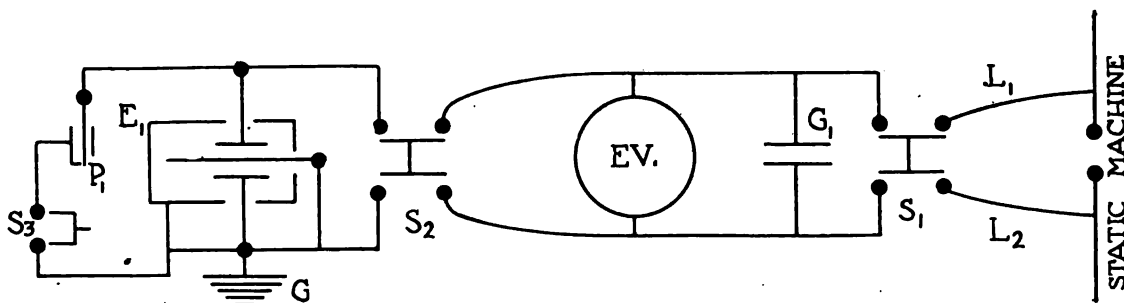


Fig. 2—Diagram of apparatus used in leakage tests

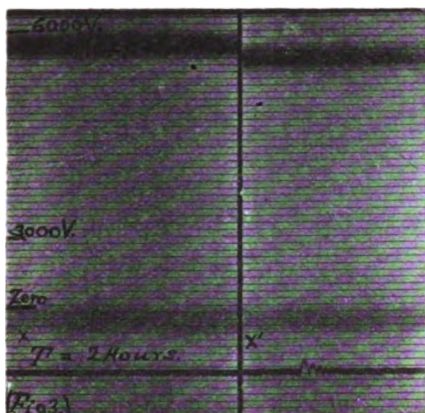


Fig. 3—Control curve of apparatus

for a brief period during the explosion stroke, very probably in a properly cooled engine the redness has disappeared from these parts early in the suction stroke, so that at the time of firing the compressed gas, the plug points and adjacent insulation, although quite hot, are no longer incandescent. Were this not the case, preignition from clean hot plugs would be quite the rule rather than the exception.

#### High Temperature Assumed

Since no definite information regarding the temperature reached by the plug in the average engine was obtainable, it was considered better to investigate the degree of leakage that is present in the plug when heated to a temperature somewhat higher than that reached by it in a working engine. If the plug still retained its sparking function under such conditions, the logical conclusion would be that, since the leakage increases with increase of temperature of the insulator, the plug would perform its function still better at lower temperatures. Although a number of plugs were investigated at temperatures varying from 23° C. to 360° C. the most striking results were obtained from those heated to a dull red heat usually, and in some instances to a cherry red (500° C. to 800° C.). Spark plugs are subjected to voltages of several thousand volts when performing their function within the engine cylinder, and the testing voltages applied to the plugs in my tests were of the same magnitude.

#### Compression Adds to Break-Down Voltage

It is a matter of common knowledge that with the spark points of the plug set at a given distance, 0.025 in., for example, the break down voltage of the gap in air at atmospheric pressure is considerably less than that in air at a compression of 75-125 lb. Owing to the fact that the critical break-down voltage of the gap varies in accordance with the distribution of the electrostatic field between the plug points, and with the shapes and the areas of the surfaces of the points, it is impossible to assign a definite break-down gap voltage to spark plugs of different styles that would be applicable to all the different commercial types of plugs. In the limited number of plugs tested by me, usually the critical break-down voltage of cold plugs with a 0.031 in. gap. ranged between 3400 and 3600, depending upon whether the spark tips were blunt, sharp, edged, round balls, etc., and also upon the number of individual prongs. In order to subject the plugs to the higher voltages required to break down the gap under compression, the prongs were bent widely open and a thin mica tube of suitable diameter and length was inserted into the open cavity of the plug between the outer shell and the central stem of insulation around the central metal electrode. Thus protected the individual plugs examined by me, all readily withstood, at room temperature, an e.m.f. of 12,000 volts steadily applied between the central electrode and the grounded shell.

Since the ordinary bridge and galvanometric methods of measuring resistance are not suitable where testing voltages of 6000 V. are employed, the method used and described by the writer was chosen, which commends itself for its simplicity and convenience, as well as for the fact that the accu-

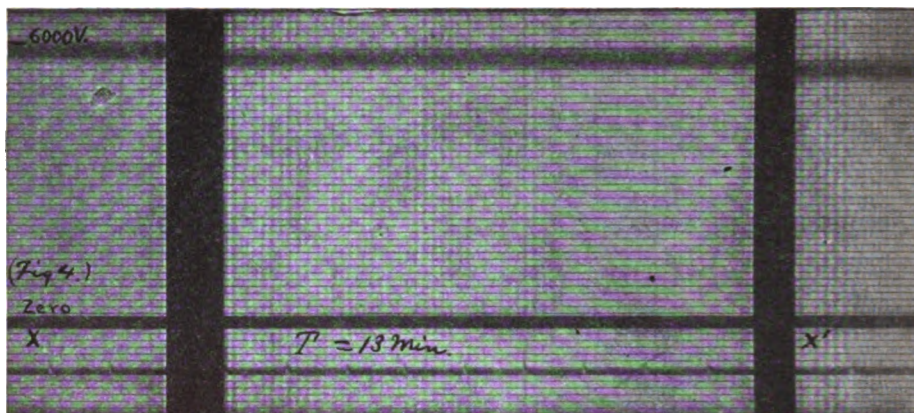


Fig. 4—Leakage curve of cold porcelain plug

acy of the results obtained are amply sufficient. Further by this method one can obtain a permanent photographic record that is practically free from errors due to defective observation by the investigator.

The method is based on the fact, demonstrated many years ago by Lord Kelvin, that if the resistance  $R$ , the inductance  $L$ , and the capacity  $C$  of an electric circuit, such as shown in Fig. 1 have such a relationship that  $R^2C > 4L$ , then the high tension charge of the condenser  $C$  will die away gradually, in such a manner that the discharge current is always in one direction. Since in our case the inductance consists of a few short pieces of stranded wire, the value of  $L$  is extremely small and may be neglected. Now if  $C$ , whose capacity in microfarads is accurately known, is charged to an accurately measured voltage and discharged through a very high resistance, such as the porcelain or the mica insulation in a spark plug, and if the time required for the voltage of the charge to fall to  $1/e$  of its original value,\* is accurately measured, then it can be readily proved mathematically that the time constant  $T$  of the condenser circuit equals  $RC$ . So that if we express  $T$  in seconds,  $R$  in meg-ohms and  $C$  in microfarads we have,

$$R_{mcg} C_{mf} = T.$$

Or if the time required for the voltage to fall to  $1/e$  of its original value is very long, owing to the very large value of  $R$ , a sufficiently accurate value of  $R$  can be determined by means of the well known formula,

$$R_m = \frac{T}{C_{mf} 2.303 \log \frac{V_1}{V_2}}$$

in which  $V_1$  is the voltage to which the total capacity is charged;  $V_2$ , the voltage of the charge after the expiration of  $T$  seconds.

#### Measuring Instrument Described

Since the resistance of the plug insulation may lessen considerably when the plug is heated, thus permitting the charge of  $C$  to disappear within a small fraction of a second, means are necessary whereby both the changing voltage and the time can be simultaneously measured. To accomplish this, one of the elements of a part of the total capacity  $C$  is permitted to move from a position of wide deflection toward the zero through a microscopic distance as the charge in the condenser either slowly or rapidly dissipates itself through and over the surface of the insulation of the plug. By using a microscope to highly magnify the slight movement of the movable element of the condenser and projecting the shadow of the moving element, in our case a gilded quartz fiber—upon the horizontal slit of a drum camera behind which is placed a moving sensitive photographic film, the moving shadow inscribes upon the rotating film the exact curve of the dead beat discharge of the capacity  $C$ . To mark small fractions of time

\* $e = 2.71828$ , the base of Napierian logarithms.



during the discharge, the beam of light through the microscope is momentarily intercepted at definite intervals by the spokes of a wheel rotated at a uniform speed. The deflections of the above variety of condenser, which belongs to the electrometer type of instrument and is known as a string electrometer, can be adjusted to be either proportional to the square of the difference of the potentials of its plates and string (ideostatic connection), or the instrument can be made to give deflections which are directly proportional to the difference of the potentials of its plates, by using the Heterostatic connection and employing an auxiliary electric charge to the string from a battery of small dry cells sufficient in number to generate an e.m.f. of several hundred volts. As a matter of greater convenience in working, and owing to the fact that our high tension dry cell battery happened to be out of commission during the earlier part of the investigation, the deflection scale of the various curves reproduced in this paper is of the former type. The calibration, for example, is such that if an e.m.f. of 3000 volts is applied to the capacity  $C$  of which the electrometer forms a part, a deflection of 1 cm. from the abscissa is produced; with 6000 volts a deflection of 4 cm. occurs. The value of any millimeter line of the scale can thus be readily computed from the following equation:

$$\frac{V_1}{V_2} = \frac{\sqrt{D_1}}{\sqrt{D_2}}$$

in which  $D$  is the deflection in centimeters and  $V$  the volts. To calibrate the instrument an accurate Kelvin electrostatic voltmeter, indicating to 12,000 volts, was used. To charge the total capacity, consisting of electrostatic voltmeter, condenser, connecting cables and high tension switches, any high tension source of steady direct current may be used. A Wimshurst static machine was found extremely handy for this purpose by the writer. Fig. 2 is a diagram of the connections used during the tests.

#### Control Curve of Apparatus

As with all leakage methods in which high tension electricity is used, a so-called control curve of the apparatus should be made before any attempt is made to obtain actual data of the resistances and leakages of the plugs or of insulation of other nature. Fig. 3 shows the beginning and the end of such a curve occupying a time of two hours. During this time the deflected shadow of the string moved two millimeters and hence the drop in voltage during this time was only 153 volts. With such a small change occurring in such a great length of time, errors from instrumental leakage occurring during the brief period of time required for the capacity  $C$  to discharge through the resistance of the heated insulation of the plug would be negligible. In very humid weather, however, the surface leakage over the insulation of the apparatus may be considerable, hence the tests are performed preferably on days when the humidity of the air is low.

In Fig. 4 a cold (27.5 deg. C.) porcelain-insulated open-end plug with spark points widely separated is made a part of the capacity, and switch  $S_1$  (Fig. 2) is closed. During a time of 13 min. the voltage dropped from 6000 volts to 5770. The resistance  $R$  is thus 133561.6 meg-ohms. By heating this plug to a dark red heat and letting it cool slightly until entirely dark, the discharge curve reproduced in Fig. 5 was obtained. The resistance in this instance dropped to 18.94 meg-ohms. Curve Fig. 6 is from the same plug when at a dull red heat and its resistance has become still less, viz., 3.157 meg. In Fig. 7, the curve is from a well known European plug in which the insulator is supposed to be of steatite. Its cold resistance is 109090.9 meg. and when heated dark red, its measured resistance dropped to 13.68 meg.

Since the leakage rates of the various plugs whose curves are reproduced in this paper approximate that shown in Fig. 4, when tested in the cold state, their reproduction is omitted in order to conserve space, and discharge curves from the heated plugs only are given.

#### Curve of Red Hot Mica Plug

Fig. 8 is a reproduction of a curve obtained from a red hot new mica plug, which, even at a heat, probably never reached in a working combustion engine, still possesses a resistance of

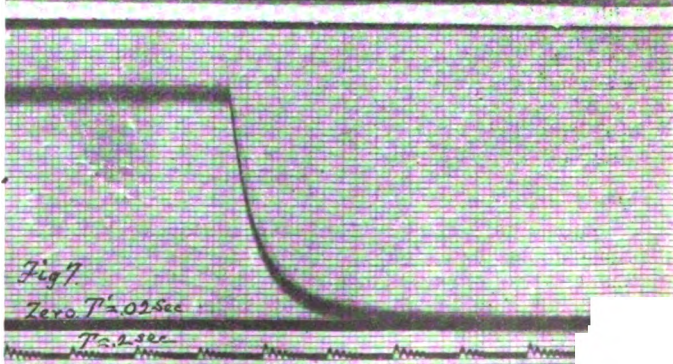
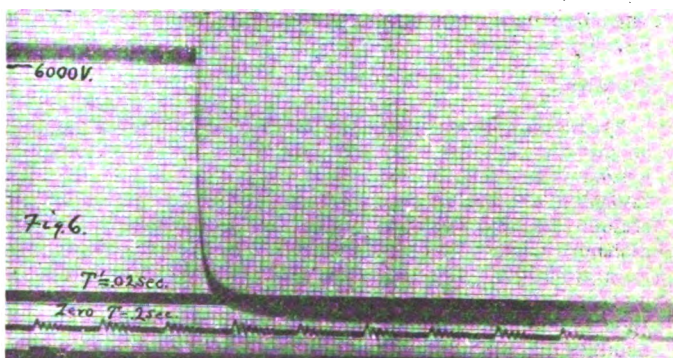
333.684 meg. At room temperature the same plug showed a resistance of 202105 meg. prior to the first heating.

Now it must not be inferred that all porcelain and mica plugs when heated, behave exactly like the few samples whose test results are recorded in this article. Quite the contrary, for early in the investigation it became evident that the amounts of leakage occurring in the different plugs when heated to the same temperature varied considerably, even in plugs composed of apparently the same kind of material and with a fairly similar distribution of the dielectric material.

To determine such differences quantitatively for all the different dielectrics employed in commercial spark plugs would necessitate a great many time-consuming observations. The writer did not have time for such an extensive investigation, but hopes that the following conclusions drawn from the observations he made may act as a stimulus to those especially interested in improving the quality and durability of insulating materials used in spark plugs.

#### Porcelain

The resistance of all the plugs with porcelain as the chief insulator was very greatly diminished by heating. Even at temperatures from 130 deg. C. — 200 deg. C. the lessening of the resistance was quite noticeable, although possibly not of an order to seriously interfere with the production of an ignition spark when the source of current possessed the power of average commercial ignition outfits. However when one of these plugs with its points separated so that sparking occurred from the central electrode across the surrounding porcelain stem to the shell, was heated to dull redness (about



Figs. 5, 6 and 7—Leakage curves of porcelain plug at dark red heat and at a dull red heat and of a steatite



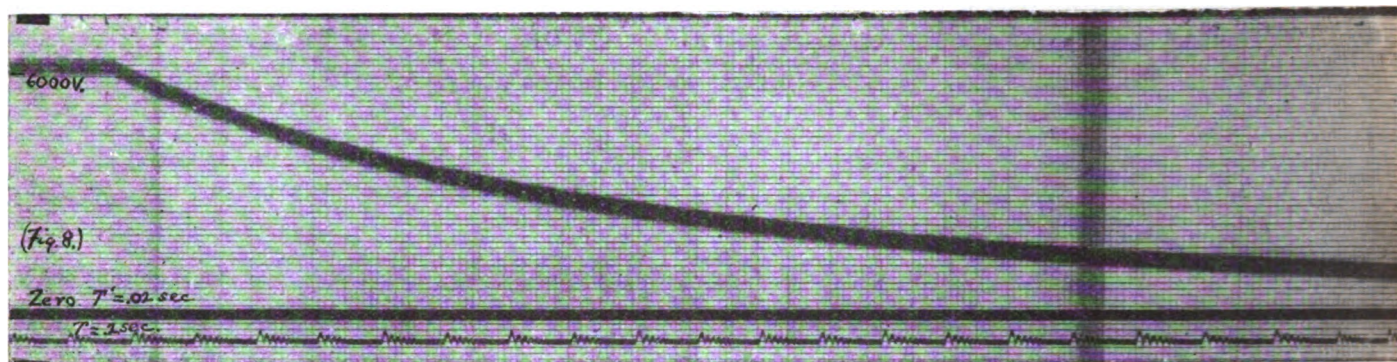


Fig. 8—Leakage curve of red hot new mica plug

500 deg. C.) and connected to one of the high tension leads of a very powerful high tension magneto of the shuttle armature type, even at a magneto speed of 1200 r.p.m., sparks similar to those of the cold plug could not be obtained. In the air space between the shell and the outer surface of the central insulation, innumerable fine reddish colored sparks were present, which continued for a few moments after the redness had disappeared from the cooling porcelain. As the plug cooled to darkness, the arc flame spark suddenly formed over the surface of the porcelain to the shell, the same as in the cold plug. It may be inferred that with a generator or induction coil of less output, before the sparking voltage over such a plug could be built up, a still further cooling of the plug would have to occur.

A further interesting phenomenon was also observed, namely, that on heating several porcelain plugs of different manufacture a number of times to dull redness, a progressive deterioration of the insulating qualities occurred, so that in the cold state the dielectric resistance was considerably less than before the plug had been alternately heated and cooled. From special tests made by the writer this change in the porcelain appears to be due not to the formation of surface cracks in the material, but to some molecular change of the material due both to the heat and to the passage of the current through the heated porcelain. How much this factor would influence the useful life of a porcelain plug under ordinary usage I am not prepared to state. Undoubtedly, however, this progressive deterioration would markedly shorten the useful life of such plugs when used in certain high-compression engines.

#### Steatite

Unfortunately only one specimen of this type of plug was at my disposal for examination. Broadly speaking, its behavior as regards its resistance was approximately equivalent to that of the better grade of porcelains. It apparently withstands heating somewhat better than most porcelains although when just below dark red heat, the leakage through it is sufficient to prevent the production of a spark by the average ignition generator. Although it deteriorated from repeated heating and cooling, the effect is not quite so pronounced as with porcelain. In the sample examined by me, a number of fine surface cracks appeared after the seventh reheat.

Judging from this single specimen, steatite seems to be somewhat preferable to porcelain, on account of its smaller loss of resistance from reheating, but the tendency to the formation of fine surface cracks after a few reheats is certainly not in its favor.

#### Mica

As was anticipated from our general knowledge of this substance as an insulator, the behavior of the various mica-insulated plugs was variable, and evidently depended upon the variety of mica used. Broadly speaking, the cold resistance of those new plugs in which apparently choice mica had been used was of a very high order, namely, 100,000 meg. or more. With some brands of plugs apparently insulated with mica of medium quality, on connecting the condenser charged to 6000 volts to the plug, the voltage would drop within 3 sec. or less

to about 5000 volts, then more slowly until at the end of half a minute or slightly more, a voltage of about 4250 was reached. At this point the discharge through the mica practically ceased and the deflected shadow of the string would remain stationary for many minutes. Such plugs, therefore, if subjected in the cold state to a voltage not over 4250 at atmospheric pressure and with air as the medium between the electrodes would perform their functions perfectly.

#### Red Hot Mica Plug

Between the hot porcelain plug and the hot mica plug made of high grade mica, there is quite a contrast. Although the resistances of the latter plugs lessen considerably when at a cherry red heat, nevertheless the amount of leakage is usually insufficient to prevent the production of an effective spark ample when an energetic ignition outfit is employed. Thus when the mica plug from which Fig. 8 was taken, was heated to a bright cherry red and actuated by a high tension magneto giving a large secondary current output, the arc flame spark from the central electrode over the insulation and air space to the shell was practically undiminished as far as the eye could detect even at a magneto speed as slow as 50 r.p.m.

After repeatedly heating and cooling the mica plugs it was observed that their resistances when cold, like those of the porcelain plugs, progressively decreased although more slowly. Thus in the case of a high grade mica plug with an original resistance when cold of 202105.2 meg. after heating and cooling 15 times, the cold resistance was found to have dropped to 13684 meg. The resistance when hot of this plug is now 96.6 megs. In spite of this great drop in resistance this plug is still capable of performing its function in an engine.

#### Surface Leakage

As mentioned above, it is practically impossible to differentiate between the leakage that occurs over the surface and that through the substance of the dielectric, owing to the particular shape and dimension of the insulation. Certain porcelain plugs, however, after being tested, can be partially dismantled and an approximate idea obtained of the extent of leakage liable to occur when the greater part of the central metal electrode has been removed from contact with the insulation, the metal shell of the plug, being left in contact with the insulation. As is well known, in damp weather, before the engine has become warm, considerable leakage occurs over the moist outer surface of the plug. In a few minutes, however, this moisture is driven off by the heat and its effect disappears. When that part of the plug within the cylinder becomes really hot and is in contact with ionized gas, it is conceivable that considerable escape of the electric charge takes place over the heated surface of the insulator.

To investigate this question the resistance of a new porcelain plug was measured cold and was found to be 133561.6 meg. After being heated ten times to 500 deg. C. its total resistance cold was 8450.7 meg. Its resistance hot was 3.157 meg. The central stem of this plug was removed and its end-portions were sawed off. These end-portions were then replaced in contact with the respective ends of the hollow porcelain tube and held firmly in position by a semi-circular spring clamp to which the high tension lead was attached. The shell

of the plug was grounded through the high tension switch  $S_1$  as usual.

The resistance cold of the plug was now 458015.2 meg. The total resistance being 8450.7, by the usual formula

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

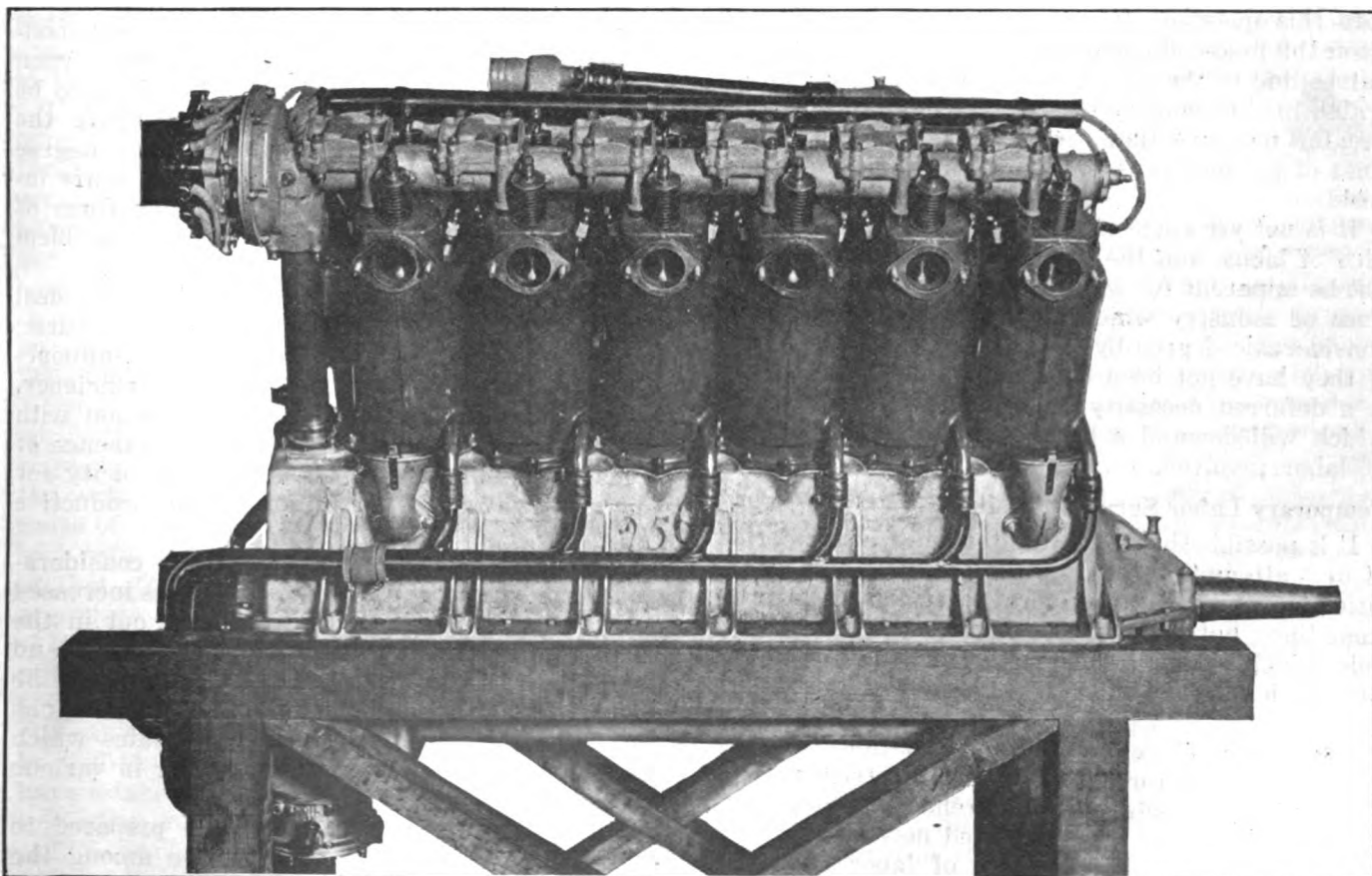
the resistance of the hollow porcelain was 8609.7 meg. The dismantled plug was then heated on its inner end to 500 deg. C. Its resistance  $R$  now measured 42.1 meg. Previously, its hot resistance was 3.157 meg-ohms, and by the above equation the resistance of the porcelain is found to be 3.41 meg. The surface leakage resistance in this case therefore was so great in comparison to that through the substance that it is negligible.

Stated broadly, the general effect of the leakage is to diminish the intensity of the current of the spark and when great enough, will cause complete failure of the spark. To get a clear conception of the somewhat complex phenomena concerned in the formation of the spark in the heated plug, it is better to recall to mind, first, the mechanism of spark production in the dielectric between the points of the plug in the cold state. This may be briefly summarized as follows: In the usual high tension ignition source, interruption of the primary current gives rise to a more or less rapid change of the magnetic flux in the iron core of the primary. Since the primary winding is surrounded by the fine wire secondary winding, both windings being magnetically fairly closely coupled, the changing flux generates by induction summative electro-motive forces in the numerous turns of the secondary winding. The resultant e.m.f. then forces the electric current through the resistance of the fine wire, until the distributed capacity of the winding, and the capacity of the terminals with the attached cables and spark plug have become charged

to a voltage great enough to force the electricity in the form of a spark through the ionized gas occupying the electrostatic field between the plug points. If the resistance of the spark plug has become greatly reduced from heating, molecular deterioration, etc., the supply of current from the secondary may not be delivered rapidly enough to the leaking plug to attain the minimum voltage required to strike across the spark gap. Hence the spark would fail, the secondary current passing through the dielectric of the plug. If, however, the ignition source is capable of delivering a large quantity of charging current in a very brief interval of time, the effects of plug leakage are not so noticeable in practice, for in this case there is a greater likelihood of the sparking voltage being attained in spite of the inappreciable quantity of current lost by leakage during the very brief time required for the plug-points to reach the requisite sparking voltage. After the passage of a spark between the plug points, the gap resistance, as is well known, falls for a time to the value of a few ohms; hence, although the heated dielectric of the plug is conducting a small proportion of the total current at this time, nevertheless its resistance in comparison to that of the gap is enormous; consequently, after the potential difference of the gap and its resistance have been lowered by the passage of the spark, only an insignificant quantity of current continues to leak through the dielectric of the plug.

Considering the above, it should be clear that where plugs are liable to become red hot by reason of high compression or other causes, it is advisable to employ an ignition source that is capable of delivering an extremely steep front type of secondary voltage wave. Further, when current begins to flow in the secondary windings of such a source, the reaction of its magnetic field upon that of the primary core should by no means be strong enough to inhibit the change of flux in that core.

### Side View of Liberty Aircraft Engine



*The Liberty engine, which was pronounced one of the greatest achievements in aircraft engine design by both foreign and domestic experts, is a twelve-cylinder Vee engine with 45-degree angle of Vee. It has hydraulically forged steel cylinder with welded-on sheet steel water jackets. With cylinder dimensions of 5 x 7 in. the engine develops over 400 hp. and weighs less than 800 lb.*



# Labor Is Not a Commodity

It Is a Service Involving the Ambitions and Aspirations of the Individual Worker—Formation of a Permanent Co-operative Organization to Solve Labor Problems Unapproachable Until This Is Understood

By Harry Tipper

**T**HE sudden entry into the period of readjustment indicates that the labor problem must be faced, and faced immediately. The cancellation of contracts which are not yet in production, the arrangements for the gradual reduction of other contracts, and the necessity for the absorption of this labor in other work indicate that the turnover of labor is likely to be increased; difficulties on rates of pay and a slacking up of efficiency in production are likely to come up continually for discussion and adjustment.

The question of the rapidity of a reduction in the rates of pay is a point about which some emphatic opinions have been expressed already by representatives of manufacturers' associations and of labor organizations.

It is evident that if the cost of living is to enter into this question of pay the matter may depend upon the financial condition; that is, the inflation of values due to the enormous reserve of gold concentrated in this country by the exigencies of war in a greater measure than the desires of the different lines of production to enter upon a reduced scale of costs.

It is not yet apparent that we shall have any surplus of labor, and the condition in this respect will not be apparent for some months. There are many lines of industry which have been suppressed to a considerable degree by the necessities of war, even if they have not been entirely stopped. And there is a deferred necessity of production in such lines which will demand a large increase in the amount of labor involved.

## Temporary Labor Surplus Possible

It is possible that a waiting tendency in the period of first attempts to analyze the readjustment necessities may provide a temporary surplus of labor in some lines, but there is no evidence at present available which would indicate any immediate general surplus leading to any large degree of unemployment.

These are of course only speculations, as the figures available for the different industries are not sufficiently complete and comprehensive to permit a proper estimate of the deferred necessities and a proper estimate of the release of labor from the war industries. The position, however, does indicate that some time is afforded the manufacturer before these adjustments become acute to lay his plans for an attack on the future labor problem so

that the later period of readjustment will not find him unprepared.

It is necessary, in order to place at the service of the manufacturer the types of organizations which have been considered and adopted in individual cases with notable success in some lines of industry, to depart for the time being from a further discussion of the fundamentals governing the growth and position of labor organizations and discuss the character and validity of some of these plans.

## Organized Labor Totals 14 Per Cent

The percentage of organized labor in this country is estimated as 14 per cent of the total available labor. However, in some occupations the organized labor is a very much larger percentage and is sufficient practically to control the operations of labor in that particular field. It is also true that an organized minority in periods of readjustment can control the actions of an unorganized majority when the problem becomes sufficiently acute. It is to be noted further that even in industries where the labor is not organized to any considerable degree the workers of a particular plant or locality are induced to get together in some temporary form of organization when the acuteness of the problem demands some action.

Any plan considered by a manufacturer to deal with the labor problem should be based, of course, upon the probable effect of such a plan in influencing the turnover of labor, the productive efficiency, the cost in units of production in comparison with other competitive organizations, the permanence of the machinery of adjustment, and the capacity for adjustment without interruption of the productive necessity.

Such a plan therefore must take into consideration the fact that organization of labor has increased almost 50 per cent since the war broke out in the official record of the occupational organizations, and that this increase is very greatly enlarged if it be considered to include the temporary organizations created for the purpose of settling disputes which have arisen in one occupation or another in various localities.

In fact, the manufacturer must be prepared to admit that some form of organization among the workers is likely, is to be expected, and must be considered in the formation of any plans to deal with the subject.

The question, therefore, is not a question of fight-

ing the organization of workers, but of meeting the present organized bodies of labor which are not capable of solving the problem for the individual manufacturer, and which are just sufficiently strong to disturb the normal operation without having the power to govern the practice thoroughly with a form of organization which will offer a prospect of solving these questions of stability, incentive, turnover, productive efficiency, etc., in connection with the individual manufacturers' organization, and which will at the same time provide the worker with a voice in the settlement of the conditions of his work at least as important as the voice which he secures in the determinations of his occupational labor organization.

Such an organization, moreover, should be of a character sufficiently permanent and continuous in the working of its machinery, to settle many questions before they have arrived at the point of dispute, and have created the mental dissatisfaction or the physical interruption which seriously disturbs the productive operations.

### Immediate Results Impossible

It is not worth while to discuss any such plan without suggesting to the individual manufacturer that the results to be expected from an organization within the industrial manufacturing unit cannot be secured immediately. It is clear that during the first part of the life of such an organization the efforts of such a body would not offer any advantage over the present methods of settling the questions of dispute between employee and employer, and would not indicate any of the economic benefits to be derived therefrom.

Unless the manufacturer is prepared to decide upon an organization with full confidence that it is fundamentally right and possesses possibilities of growth which must make it of value in its economic effects, and is therefore prepared to spend the necessary time to establish the machinery to create the working understanding and to generate the confidence which must obtain before any advantage can be secured, the discussions which follow will have little of interest to him and will be of small benefit.

Some time ago a manufacturing organization where the employers were having a dispute with the employees which had resulted in a strike requested the writer to act in connection with the matter because of his knowledge of labor affairs. The request was refused because when the dispute had arrived at that stage an arbiter was necessary and not an organizer.

It is not to be expected that the plans lately announced by four or five of the steel companies and the plans now in motion by one or two of the oil companies and other industrial organizations will be sufficiently formulated in less than 3 years to have established a working basis that will offer any indication of advantage.

In some cases where there has been an atmosphere of confidence between the executives of an organization and its employees established through years of contact, the machinery provided by a plan properly thought out, for the co-operative solution of

these questions, begins to show economic values more rapidly. Unfortunately, such cases are sufficiently rare in industries to make it necessary to emphasize the patience and the study which must be given to the building up of co-operative machinery within the industrial organization, which will provide a basis for the permanent adjustment of industrial relations.

It must be remembered by the manufacturer that the untold centuries of struggle by human beings to arrive at orderly systems of organization which will permit of individual development and at the same time emphasize the co-operative responsibility do not suggest any rapid solution of the whole of the difficulty.

Any of the plans adopted at present by the forward-looking individual concerns can be regarded only as a step in the right direction, and is a suggestion of machinery which can be employed to effect considerable progress in this matter and which will form the basis for future development along a hopeful line.

It must further be remembered by the manufacturer that a continuity of the present warfare between employers and employee, whether in thoroughly established organized groups or in temporarily organized bodies, will increasingly hamper the manufacturer in his industrial activities and remove from his control an increasing portion of this most important problem.

### Labor Not a Commodity

It was stated in the first article written in this series that labor is not a commodity, but is a service performed by human beings involving their individual ambitions and aspirations, their social responsibilities and necessities, and their political opportunities.

No approach can be made to the organization of permanent co-operative machinery for the solution of this problem unless this is thoroughly understood. All economic results arise out of the satisfaction of these human instincts and are directly proportional to the degree of satisfaction or discontent. In the final analysis the problem of human labor is a spiritual problem, its causes buried in those deep-seated instincts of growth and development which distinguish the thinking animal.

After all, however, it is true in human affairs as in mechanical affairs that the practical application of the principles limits their usefulness. The next article, therefore, will begin a discussion of various plans of industrial organization, analyzing their advantage and disadvantage and the difficulties which have grown out of their existence, as well as the possibilities expressed in their future.

This discussion will begin with the usual industrial organization and the modifications which have occurred in the last 25 years, so that upon this background the individual plans which have been created in some concerns in various lines of industrial work can be thoroughly considered, showing their departure from the usual method, the reasons for that departure, the advantages and future possibilities.

# Four Hispano-Suiza Models

## Lightness, Flexibility and High Mean Effective Pressure Features of This Engine for Fighting Planes

**T**HE Hispano-Suiza is notable for unusually light weight, great flexibility and high power per unit of piston displacement. Simplicity of design and ease of manufacture are also claimed for it. Its simplicity may be judged from a comparison of its number of parts with that of another well-known engine. It is stated that the Mercedes aircraft engine has approximately 900 parts to 400 in the Hispano-Suiza.

All Hispano-Suiza engines are manufactured under the Birkigt patents, which are owned by the Swiss designer, Marc Birkigt, formerly a designer of mining machinery, and the parent company, Automoviles Hispano-Suiza, the builder of the four-cylinder automobiles of that name before the war, with factories at Barcelona, Spain, and Paris, France. The French factory was turned over to the manufacture of Gnome aviation engines shortly after the outbreak of the war. The Hispano-Suiza engine was not adopted for the French air service until December, 1915.

When European factories proved unable to meet the demand for Hispano-Suiza engines in 1916, manufacturing rights were given to the Wright-Martin Aircraft Corp., New Brunswick, N. J., which completed several orders for the French Government. Later, when the United States entered the war, these engines were turned out in large numbers for the American Government.

French aviators quickly took to the Hispano-Suiza engine, and it became the favorite for fighting and pursuit work, especially when fitted to Nieuport and Spad planes. It was used by practically all the leading French aces, some of the most famous being Fonck, Guynemer, Nungesser and Lufbery.

There are two outstanding features common to all Hispano motors, these being the cylinder construction and the method of valve operation. The cylinders are separate steel sleeves flanged for attachment to the crankcase and with the valve seats cut in the heads, but instead of each cylinder having a sheet steel jacket welded to it, it has the customary design for aviation engines. The water jacket is an aluminum casting which makes the cylinders into a block. The cylinders are threaded externally for the greater part of their length and screw into the aluminum casting. This construction means that all working stresses are cared for by the steel sleeves, the aluminum casting having nothing to do except retain the water and carry the camshaft.

The valves are set in a straight line in each cylinder block, there being two to each cylinder, and their center lines are parallel to those of the cylinders. The stems are of very large diameter and hollow, and each valve carries a mushroom tappet screwing into the valve stem. The top of the tappet is hardened, and the camshaft, being mounted directly on top on the cylinder block, operates the valves by direct contact between the cams and the tappets.

Each tappet is serrated on the under side of its head and a serrated washer lies immediately beneath the tappet head. Under the washer are two concentric valve springs. The upper end of the whole valve stem is welded and the washer has two projections which engage with the slots, so preventing the washer from turning.

To adjust the clearance between tappet and cam a special tool is used which makes its fulcrum on the edge of the washer which cannot turn relative to the valve and then tightens or loosens the mushroom tappet, the serrations slipping over each other.

Four models of the Hispano-Suiza engine have been built in the United States. These are the Models A, I, E and H.

Model A has a bore of 120 mm. (4.72 in.) and a stroke of 130 mm. (5.11 in.) and develops 150 hp. at 1450 r.p.m. at sea level. Although formerly used for combat and pursuit work this engine has now been relegated to use in training planes.

Model I, also of 150 hp., is the same as Model A except that it has the new marine type of connecting rod; the magneto drive and the timing are different, and there are some slight changes in the piston mounting.

Although Model E has the same bore and stroke as Models A and I, its output is 180 hp., the compression ratio having been raised from 4.72 to 1 to 5.33 to 1 by increasing the distance from the center of the piston pin holes to the top of the piston. A large Stromberg carburetor (2 in. barrels) allows of high volumetric efficiency even though the speed of Model E is 300 r.p.m. greater than that of the Model I. Model E has been extensively employed in the British SE-5 planes, which are built for fighting and general purpose work.

All three of these models resemble the original design in their essential features, although many details are different.

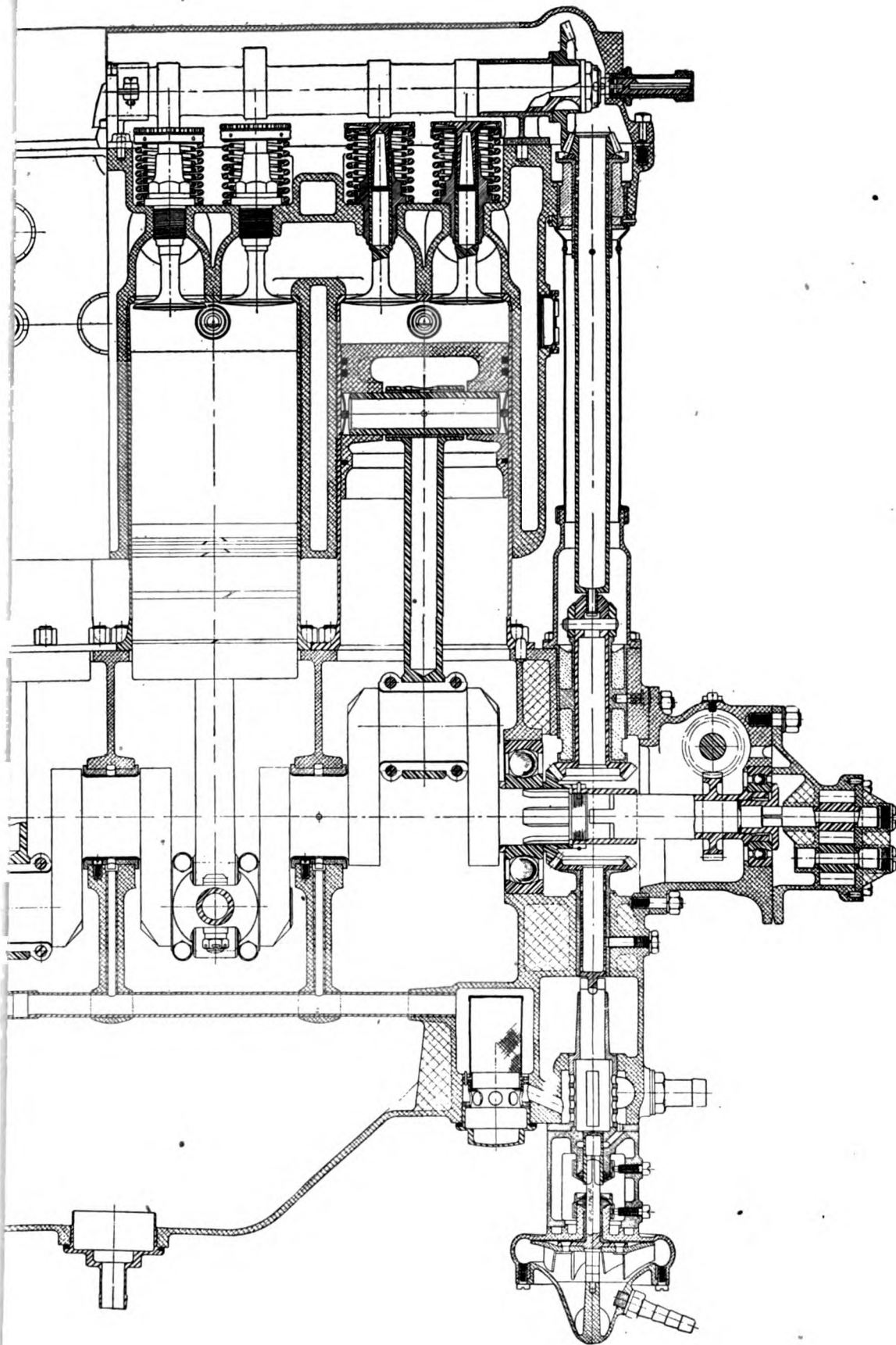
Model H, which is the 300-hp. model, is of American design except for its basic principles. Twenty-two of these engines have been completed by the experimental department at the Wright-Martin factory in New Brunswick, and tests have shown them to be very speedy and powerful. Model H has a bore of 140 mm. (5.511 in.) and a stroke of 150 mm. (5.905 in.), and differs from the other models also in the design of its carburetor and oiling system.

With the exception of the points of difference outlined above, the Model I may be taken as typical. The two halves of the aluminum crank case are ground so that their faces make a perfect fit, no gasket being used between them. The lower half of the crank case is very deep, forming a large oil reservoir and also serving to impart greater rigidity to the engine.

The cylinder blocks are of cast aluminum and incorporate waterjackets surrounding the heads of the forged steel cylinders, which are made in the form of sleeves threaded on the outside to screw into corresponding threads cut in the aluminum waterjacket. Each cylinder is flanged at the bottom and closed at the top, the upper surface being flat and containing the two valve seats. The cylinder blocks also embody the intake and exhaust passages and the valve ports.

A hollow four-throw crankshaft is used, 180 degrees between throws, the material used being chrome nickel steel, machined all over. Four plain main bearings, bronze-backed and lined with babbitt, and one annular ball main bearing at the rear (magneto end) of the engine carry the shaft, which is supported between the







crank case halves. A double-row, ball-thrust bearing located in the front of the crank case takes the thrust of either a tractor or pusher propeller. The crankshaft is provided with a taper at the front end, having a key for the propeller hub.

Connecting rods are tubular. The new type of rod, which is of American design, is forked at the bottom and bolted to a two-piece bronze box lined with babbitt, two bolts being used at each side. The bronze box bears directly on the crankshaft and the other connecting rod bears on the outer and central portion of the bronze box, the shaft itself working between the forked ends of the straddle rod. Bronze bushings are provided at the upper ends of each pair of connecting rods.

#### Piston Walls Tapered

The cast aluminum pistons are  $\frac{3}{8}$  in. thick at the head, this thickness tapering at the sides to  $\frac{1}{2}$  in. at the bottom. There are four narrow rings in two grooves at the top of each piston, and near the bottom there is one oil ring with a relief just below it. Case-hardened alloy steel is used for the piston pins, which are of large diameter and hollow in construction. These pins float in both sides of the piston as well as in the upper end of the connecting rods, a piston pin lock ring holding each pin in place.

A hollow overhead camshaft operates the valves in each cylinder block, being carried in three plain bronze bearings and driven by two pairs of bevel gears and a vertical shaft at the rear of the engine. These vertical shafts are protected by light steel tubing, and each is made with a screw driver, or Oldham coupling, type of joint slightly below the middle to permit removing the cylinder blocks without dismantling other parts. One of the camshafts—that in the left hand block—besides operating the valves, drives the piston of a small air pump mounted on the valve gear housing. This pump is used for maintaining pressure in the gasoline tank where the pressure fuel feed system is used. The oil-tight cast aluminum housings which inclose the camshafts and valve mechanism are easily removable.

#### Valves Direct-Operated

Tungsten steel valves with large diameter hollow stems are used, working in cast iron bushings. They are set parallel to the cylinder axes and the overhead camshafts operate them directly by making contact with case-hardened, flat-headed adjusting disks at the upper end of the stems, rendering rocker arms unnecessary. Each valve is held to its seat by two concentric helical springs, either one of sufficient strength to insure proper seating if the other breaks. Clearance between the cam contour and the adjusting disks may be easily corrected when necessary by means of serrated washers pressed upward by the springs which hold the adjusting disks in place, permitting easy turning with a special wrench which displaces the adjusting disks angularly in the valve stems. The whole assembly can slide freely lengthwise, although the spring retainer washer is held in place angularly by tenons engaging slots in the stem.

The inlet valves open at the same time that the exhaust valves close, 10 deg. after top dead center. The exhaust valves open 45 deg. before bottom dead center and the inlet valves close at 50 deg. after bottom dead center.

#### Pressure Oiling

Lubrication is by pressure, a sliding vane eccentric pump mounted vertically in the lower half of the crank case, directly under the rear end of the crank shaft, forcing oil to the bearings, etc. This pump is driven at 1.2 times crank shaft speed by the same bevel gear on the crankshaft that drives the vertical shaft at the rear

of each cylinder block. Where an oil radiator and reserve reservoir are used, practically no oil is carried in the sump of the crankcase, this being known as the dry sump system. In this case the oil is circulated through the oil radiator and reservoir by a gear pump situated on the magneto support bracket at the rear of the engine and driven from an extension of the crankshaft.

Oil is driven first from the vane pump through the filter in the lower half of the crankcase and then through a steel tube cast in the lower half of the case with connections leading to three of the main bearings, where the oil enters the hollow crankshaft and is distributed to the four crank pins. Oil is fed to the outer connecting rods through holes in the inner rod and is then diffused as a spray which combines with the oil thrown from the main crankshaft bearings to lubricate the cylinders, pistons and piston pins. At the front main bearing there is a by-pass leading around the outside of the bearing to a tube which runs up the front end of each cylinder block, the lubrication of the bearing itself being taken care of by an oil lead. Passing up the tube at the front of the engine, the oil is delivered to the hollow camshafts which distribute it through small holes to the bearings, cams, valve tappets and stems, the excess oil escaping through the rear end of the camshafts in the form of a stream which lubricates the vertical shaft bearings and driving gears before returning to the crankcase through the vertical shaft housing at the rear of the engine. The filter in the crankcase is fitted with a removable screen to permit easy inspection and cleaning.

#### Transverse Shaft Drives Magnetos

The two eight-cylinder Dixie type 800 magnetos are carried on a bracket at the rear of the crankcase. They are driven at crankshaft speed by a transverse shaft through gear type couplings. A small shaft at right angles to the transverse shaft is located directly beneath it in the center of the magneto support bracket and communicates the drive from the crankshaft to the transverse shaft by means of a helical gear. The left hand magneto runs clockwise and the right hand one anti-clockwise. Each magneto supplies two spark plugs in each cylinder, the plugs being located in bushings in the aluminum cylinder blocks. One of the bushings is on the inboard side of the combustion chamber and the other on the outboard side.

The firing order is as follows, L indicating the left hand block and R the right hand block, facing toward the propeller end of the engine and the numbers denoting the position of the cylinders, facing toward the rear of the engine: 1L-4R-2L-3R-4L-1R-3L-2R.

The spark advance on the Models A and I is 20 deg. and 20 min. before top dead center. That of the Model E is 25 deg. before top dead center.

#### Starter Equipment

Equipment with an electric or air starter is made possible by bolting a suitable bracket in place of the magneto support and oil pump assembly. A single-unit motor generator system may be used for a combination starter and long distance wireless outfit, as the magneto wireless connection has a radius of only approximately 5 miles. Engines used in pusher type seaplanes are sometimes equipped with a geared-down hand starting crank with a small magneto to give a hot spark at low speeds.

When arranged for gravity feed, the gasoline tank is placed so that it will give 1 to 2 lb. head at the carburetor for any position of the machine when in flight. Where pressure feed is used, the pressure is maintained by the pump located on the valve gear housing of the left hand

(Continued on page 946)



# Factors Concerned in the Causation of Industrial Accidents

## The Results of Investigations Among British Munition Making Establishments— How and Why the U. S. Bureau of Labor Differs with Some of the Conclusions

OF the many valuable contributions to the literature of industry which have come into being in the form of reports of the Health of Munition Workers Committee of the British Ministry of Munitions, by no means the least enlightening is the record of the investigation of the factors concerned in the causation of industrial accidents by H. M. Vernon, M.D. It is one of the many studies made by various authorities on different phases of the problem of conserving health and energy among the munition workers. The investigation covered by the report under consideration was made to determine, by means of a study of the distribution of accidents and output through the hours of the working period, the importance and effect of certain factors which influence accident occurrence.

During periods ranging from 9 to 21½ months, 50,093 accidents, occurring in four munition factories, were analyzed. The injuries considered were cuts, foreign bodies in the eye, burns, sprains and injuries incurred one or more days before they were reported.

Dr. Vernon, in his report, states that the factors concerned in accident production may be classified as:

1. Those of personal origin (such as nervous and muscular co-ordination in relation to speed of production, fatigue, physical influence, nutrition and alcohol consumption).

2. Those depending on external conditions not directly under the worker's control (lighting, temperature, humidity, ventilation and defects of machinery and absence of suitable protective mediums).

During the investigation, according to the report, "No attempt whatever was made to investigate certain factors such as defects of machinery and absence of guards."

### The Relation of Accident Occurrence to Output

The conclusion of the investigator is that most industrial accidents may be regarded as unavoidable and that "accidents depend, in the main, on carelessness and lack of attention of workers." In considering the relationship of the number of accidents to output, it developed that in one factory making fuses, during the morning hours the number of accidents increased with the output, and both accidents and output reached a maximum in the last or next to the last full hour of work. The conclusion arrived at by the author was that this increase of accident was "due partly to increasing speed of production and partly from increasing inattention arising from the thought of pleasure to come." It was found that among night workers, on the other hand, while the output followed a course similar to that of the day shift, the accident incidence, except that of eye accidents, was entirely different. It was found that the greatest number of accidents happened at the early part of the shift, and that the number gradually fell off during the night to about one-half of its initial value. The author attributes this to "the fact that the night-shift workers started work in a careless and excited state and calmed down gradually during the night."

In the other three plants, where 6, 9.2 and 12-inch shells were made, the hourly variation in the speed of production was very small, and the accidents incidence correspondingly steady.

The influence of fatigue on accidents to women was shown by the fact that the 12-hour day worked in the fuse factory

caused such fatigue in the women as to make the number of accidents occurring among them 2½ times as great as in a subsequent period during which they worked a 10-hour day. Reduction of hours from 12 to 10 per day had no effect on the number of accidents among the male workers. The report states that:

Even during the 10-hour day the women showed distinctly more signs of fatigue than the men did during the 12-hour day, not only by reason of the above-mentioned ratios between afternoon and morning accidents, but because the women showed a more rapid increase of accidents in the course of the morning spell of the 10-hour day than the men did in the same spell of the 12-hour day. Probably women would need to have their working day reduced to 9 hours before they escaped fatigue as successfully as the 12-hour day men. A 12-hour day of actual work in industrial pursuits was almost unknown in this country before the War, and has been exceptional during the War, so we may confidently conclude that as a rule fatigue has but little influence in the causation of accidents in men. If men worked longer than a 12-hour day, or even if they worked 12 hours or less upon heavier types of work than those imposed on them at the fuse factory, they would doubtless be liable to fall into the condition of excessive fatigue shown by the women.

### Artificial Lighting Cause of Accidents

In a discussion of the comparative frequency of accidents among the day shift and among the night shift, Dr. Vernon states that the alcohol consumption factor, in so far as it operates at all, must tend to increase night-shift accidents more than day-shift accidents. Artificial illumination, he said, had the same tendency; the excess of eye accidents occurring during the night shift over those occurring during the day shift was shown to be due to artificial lighting. The report states that temperature had a decided effect on accident occurrence, since "accidents increased considerably as the weather grew colder, and diminished as it grew warmer. In one factory, accidents among women were nearly 2½ times as numerous when the temperature was at or below freezing point as when it was above 47 degrees, while among men they were twice as numerous." The author points out that inasmuch as lower temperatures were experienced during the night-shift hours, accidents would tend to be more numerous then, and after study of accident incidence at various temperatures he recommends as the optimum temperature in munition factories one of 60 deg. to 64 deg. F.

Notwithstanding all these factors tending to increase night-shift accidents over day-shift accidents, it was found that, grouping all kinds of accidents together, fewer accidents—16 per cent less among the women and 15 per cent less among the men—occurred during the night shift than during the day shift. The author concludes that the determining cause was the influence of the psychical factor—the workers' mental attitude.

The following suggestions as to accident prevention are given:

In the first place, it is well to recognize that many industrial accidents, probably the majority of them, are unavoidable, and that at best one can only hope to reduce their number, and never to eliminate them entirely. Moreover, we have seen that speed of production is an extremely important factor in their causation, and often the most important factor of all, so any improvement of

factory conditions which increases speed of production inevitably tends to a more than proportional increase of accidents. Accidents depend, in the main, on carelessness and lack of attention of the workers, and so the more one can eliminate this lack of attention and increase the concentration of the worker upon his work, the more will accidents be reduced. As has already been pointed out, one wants to induce in all the workers throughout their hours of labor the same mental outlook as is present in the night-shift workers in the early hours of the morning. These workers have for the most part forgotten the pleasures and excitements indulged in shortly before coming on to night shift, and they have nothing but an unexhilarating breakfast and bed to look forward to. Such a mental state is impossible of achievement by the day-shift workers, but something in the way of mental calm and equilibrium can be attained by stopping all conversation except that relating to the work in hand. If the workers would consent to it it would be a good plan to induce temporary deafness by plugging the ears, and so shut out the noise of the machinery, which is in itself an important cause of distraction and fatigue. Again, if it were practicable—though it is seldom that it can be so—it would be of value to shut out the sight of surrounding objects by separating the lathes or other machines from one another by partitions. The worker, left to himself without sound or sights to distract his attention, could then concentrate himself entirely on the work in hand. It might be said that the monotony would be so great that nobody would stand it, but would it not be better to work for two 3 or 3½ hour spells every day under such conditions if the worker could thereby earn as much as he does under present conditions in two 4-hour spells? However, these conditions are mentioned only as an ideal, which should be aimed at wherever possible.

The careless habit of mind can also be diminished by stricter sobriety. There can be no doubt that the less alcohol the worker consumes the better it is for the quality and quantity of his work, and for his accident immunity. This applies especially to alcohol consumed by the day shift in the dinner hour and by the night shift shortly before coming on to work. The inclination of the day-shift worker to drink during his dinner hour can be combated to some extent by establishing factory canteens, where good food is obtainable at cost price, or slightly below it. The worker would then find it more convenient to stay in the works during his dinner hour than to go home, and so would escape the temptation of drinking. . . .

The production of excessive fatigue with its accompanying increase of accidents can be almost entirely avoided by choosing suitable hours of labor. It can also be combated by the introduction of seats for the standing workers to rest on occasionally when they are not actually working, and of the most suitable seats possible for sedentary workers. . . .

We have seen that even moderately defective lighting produced a considerable increase of eye accidents, and it is probable that it had some effect on other types of accidents as well, though it was not big enough to be detectable. Hence, the adequacy of the lighting of a factory should be tested from time to time by an expert, while the eye accidents could be reduced or eliminated by the use of suitable goggles. Though it might not be worth while to insist on the majority of workers using these goggles, it should be made a rule that they be worn by the grinders of tools and other specially exposed workers.

Following this, the report pointed out the importance of the temperature factor in accident causation, which, as the author said, was self-evident and needed no discussion. He suggested that thermometers be installed in the shops, and be consulted regularly by those in control of the heating.

#### U. S. Labor Bureau Differs

In a recent issue the Monthly Labor Review of the Bureau of Labor Statistics of the United States Department of Labor pointed out that some of the conclusions arrived at in Dr. Vernon's report were at variance in some particulars with those suggested by the compilations of the Bureau. The first difference noted was in regard to the importance of the interval after the nominal beginning of a working period in which the worker does not get at work. Dr. Vernon, on the one hand, thinks that the inclusion of this period in the tabulation introduces serious elements of error. The Bureau, on the other hand, holds that its data seem to indicate that the essential form of the distribution curve is not materially altered thereby. It is pointed out by the Bureau that it is the form of the curve, rather than the precise number of cases in a given division, that is the important matter.

The Bureau also differs with Dr. Vernon in his feeling that sufficient attention has not been given to the interval between the occurrence of an accident and its treatment at the dressing station. A large amount of material, based on dressing station reports, has been compiled by the Bureau, and inde-

pendent reports made by foremen and casualty clerks have also been studied, without the finding of any material difference in the distribution curves.

Dr. Vernon gives much importance to the mental attitude of the worker in certain cases. He says "inclination drove the day-shift women to attend the dressing station toward the end of the morning spell, but drove the night-shift women to attend it at the beginning," and "it follows, therefore, that in almost all accident statistics one must make a considerable allowance for these remarkable variations in the strength of the worker's inclination, though it is impossible to obtain a numerical measure of the extent to which inclination will falsify accident statistics."

The Bureau of Labor Statistics holds that "careful and extended experiment in the tabulation of various degrees of severity of accident, ranging from dressing station cases to those of not less than six weeks' disability, does not indicate that the influence of these mental states, though present beyond question, is of sufficient importance to modify the form of the curves.

The Bureau feels that Dr. Vernon has not given sufficient consideration to the importance of defects of machinery and absence of guards as causes of accidents. The other points of difference between the findings of Dr. Vernon and of the Bureau of Labor Statistics are set forth in the following paragraphs, which give first an extract from the former's report, and immediately after it the comment of the Bureau upon it.

#### Detailed Differences in Conclusions

*Speed of Production.*—The incidence of accidents (from hour to hour) showed a qualitative resemblance to the output variations, and it was concluded that varying speeds of production is the psychological responsibility for day-shift variations in accidents in men, though the night-shift output followed a similar course to the day-shift output, the accident incidence was entirely different. It was at a maximum at the beginning of the shift, and gradually fell the whole night through. This was due to the fact that the night-shift workers started work in an excited and careless state, and gradually calmed down during the night.

This contradiction between the day and night results is scarcely adequately explained by the difference in mood of the workers which is pointed out. That the situation is a very complicated one is further emphasized by the compilations of the Bureau, which indicate that for varied and extended kinds of work the morning spell presents two portions. In the first of these output and accidents both increase—accidents the more rapidly. In the second output continues to increase while accidents decline. Any complete explanation of accident distribution must take account of such cases as these as well as of those recorded in the memorandum.

*Fatigue.*—The influence of fatigue on accidents to women was strikingly shown in the fuse factory. The women's accidents were two and one-half times as numerous when they were working a 12-hour day as in a subsequent period when they were working 10 hours per day.

This, taken with other evidence presented and confirmed by the studies in other directions recorded in earlier memoranda, is a most important indication of the care needed in introducing women into work of this character. It is perhaps the most important practical finding of the memorandum.

*Psychical Influences.*—At all the factories the night-shift workers suffered fewer accidents than did the day shift. This was not because the output was smaller, as at the fuse factory it was distinctly bigger by night than by day. It was psychological in origin, and due to the night-shift workers settling down to a calmer mental state than the day-shift workers, and so becoming less careless and inattentive. The physical factor is one of the most important in accident causation.

Attention should be called to the fact that while these workers showed lower rates at night there are sorts of labor in which the night rates are constantly higher. It is difficult to understand why calmness should come at night to these workers and not to mechanics and toolmakers engaged in very similar tasks in other factories. It is impossible not to suspect that some other factor needs consideration.

*Alcohol Consumption.*—Indirect evidence as to the effects of alcohol consumption was obtained.

The conclusion of the author is that the influence of alco-

hol consumption is manifested more in the night shift than in the day. This conclusion is strongly confirmed by the experience of a large steel mill studied by the Bureau. In this mill it was found that the rates of discipline for alcoholic indulgence were from 2 to 10 times as great by night as by day. There was another interesting feature, namely, that both accident rates and the per capita use of alcoholics were declining during this period more rapidly for the night than for the day shift.

**Lighting.**—Accidents due to foreign bodies in the eye were 7 to 27 per cent more numerous in the night shift than in the day shift, though all other accidents were considerably less numerous. This was due to the artificial lighting, as the excess of eye accidents was most marked in the worst lit factory.

This is one of the most positive evidences of direct effect of lighting on the accident rate that have been offered. In most cases the lighting effect is so much complicated with other factors as to make it doubtful what its precise influence is.

**Temperature.**—Accidents were at a minimum at 65 to 69 deg. Fahr. and increased rapidly at higher temperatures and slowly at lower temperatures. Continuous records were kept of the town in which the shell factories were situated, and it was found that in all of them the accidents increased considerably as the weather grew colder and diminished as it grew warmer. In one factory the women's accidents were nearly two and one-half times as numerous

when the temperature was at or below the freezing point as when it was above 47 deg., whilst the men's accidents were twice as numerous.

In this connection it should be stated that in steel mills extra men are frequently employed in the summer as "spell" hands to relieve the regular crew. This introduction of relatively inexperienced men may be quite as important as the direct effect of summer heat.

**Prevention of Accidents.**—Accidents are largely due to carelessness and inattention, so they could be diminished by preventing the workers from talking with one another in the shops.

It was found that the women suffered twice as frequently from sprains as the men, and were especially liable to wrist sprains at the fuse factory, as they had not strength sufficient to push home the clamping lever of the lathes. The women at the shell factories suffered nearly four times more burns than men, chiefly from hot metal turnings. Hence the sprains could be reduced by alterations in the machinery and the burns by protecting the hands.

The conclusion that "carelessness and inattention" are largely the cause of accidents is not borne out by the studies of the Bureau. It may be stated, however, that ignorance and inexperience are largely the cause of accidents and that adequate training in the skillful doing of work will diminish them. The more closely the accident problem is studied the more evident does it become that skill rather than care is the remedy so far as minor injury is concerned.

## Army Airmen Fly Thousands of Miles

ARMY airmen are flying thousands of miles from field to field in the Middle West and Southwest, from the Atlantic to the Mississippi and through the Middle West and Southwest. Little is heard or seen of them even by the inhabitants of the country over which they pass. The following entries in the log of one airman who flew 1700 miles from Scott Field, Belleville, Ill., to Kelly Field near San Antonio, Tex., give a good idea of the work done in developing the school of the flier in America.

Captain F. M. Bartlett covered the 341 miles between Belleville and Clark Field, Memphis, in 3 hr. and 5 min. at an average speed of 110 m.p.h., favored by a stiff wind from the Great Lakes and at an altitude of between 7000 and 9000 ft. On the second leg of the trip between Memphis and Payne Field, West Point, Miss., wishing to stop for lunch, he descended and was close to the ground over an abandoned race track when he suddenly found the air so thin that he knew he could not get off this ground once he landed. He had difficulty in getting back to the upper air currents again, but by following a flock of birds which flew in an ascending circle, he secured enough altitude to continue. Approaching West Point, Miss., fine air was again encountered, but over this town he ran into an electrical storm and was forced to descend.

With clear weather the next day, he made the 230 miles between West Point, Miss., and Lonoke, Ark., without a stop, though his gasoline gave out just as he arrived over Eberts Field, which is near this point and Little Rock. Here bad weather held him up for 4 days.

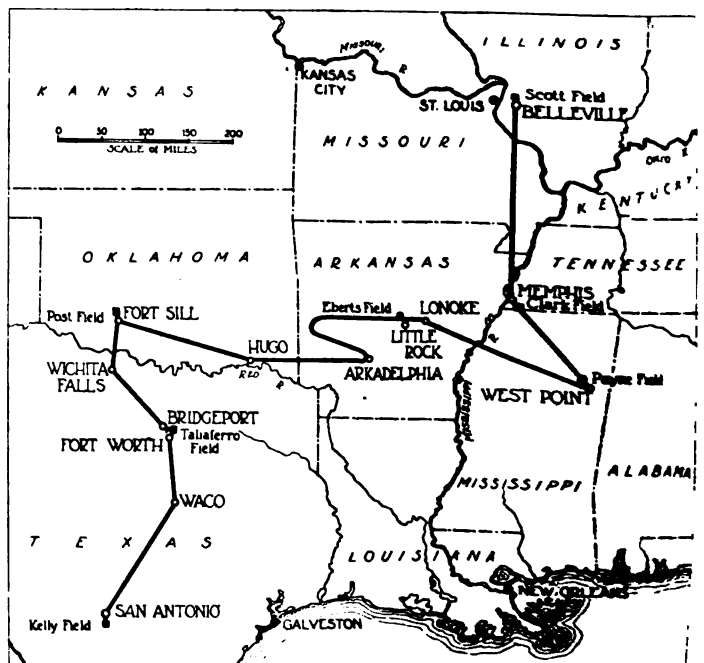
The 450 miles of the next leg between Eberts Field and Post Field, Fort Sill, Okla., which had not been covered before in an airplane up to this time, proved the hardest task in his whole trip. He made the distance, however, in 9 hr. of difficult flying over the Ozark Mountains and came down at Hugo, Okla., for gas.

He had made his course straight from Little Rock over the Ozarks in the air line for Fort Sill, but with nothing but a rough carpet of high hills and thick timber under him as far as he could see, and on account of the bad weather he abandoned the air line to the west and veered to the south. In the 60 miles in this direction from Hugo he encountered a gale of such force as to fell trees below him. He attempted to rise over it, was caught in a large wedge of black clouds, held in the grip of the storm and for 35 min. hung over Arkadelphia, Ark. His plane settled from an altitude of 6000 ft. to 3000 ft. and drifted about 2 miles side-wise when he finally broke through the storm and came out miles off his course.

Between Fort Sill and Wichita Falls, Tex., he again met

bad weather and had to be satisfied with a short mileage that day, not making Taliaferro Field, near Fort Worth, as he had planned. From the Falls this latter distance is 110 miles and Captain Bartlett again failed to make it on the day following, running into a stiff gale which held his ground speed down to 25 m.p.h. and he landed in the dusk at Bridgeport, just short of his destination.

The next day he made Fort Worth without trouble, but, leaving this post at 6.30 a. m., he encountered winds which shifted from south to east to north. This weather developed into a heavy storm and he was forced to land at Waco. Waiting here for the storm to pass he took off again under black clouds which hung as low as 600 ft. and with a strong south wind along the ground. He climbed to 3000 ft. and there found clear air and a brisk north wind. Corn husks blown from the ground followed him and various birds carried by this wind flew above him at 5000 ft., an unusual altitude for them. He finished his 1700-mile flight at 3.30 p. m., it having taken him from 6.30 in the morning to come from Fort Worth, a distance of some 295 miles.





# A New British Coke-Fired Steam Commercial Vehicle

Three-Ton Chassis Having Automatic Control of Steam Generating Functions and Manual Control Devices Arranged the Same as on a Gasoline Vehicle

**T**HOMAS CLARKSON of the National Steam Car Co., Chelmsford, occupies a unique position in the British motor vehicle industry. He was one of the pioneers in steam car development and has remained faithful to this form of motive power through all the years since the beginning of the industry in spite of the popular preference for "gas." Mr. Clarkson's work has been mainly in the field of commercial vehicles, and he has produced some very successful types, his London steam buses being particularly well known. His latest creation, the type IX chassis, is especially designed to meet war conditions in Great Britain. These conditions demand that a home-produced fuel be used, and the boiler is so designed that either solid or liquid fuel can be burned under it.

As there are a very large number of drivers accustomed to the control of gasoline vehicles, it was decided at the outset to standardize the controls of this new steam chassis, in order that a driver who has operated a "gas" vehicle can immediately operate the new vehicle, and will find each pedal and lever in the usual position and performing the same function as that to which he has been accustomed. In addition to the steering column there are a clutch pedal for the left foot, brake pedal for the right foot, side brake lever and change gear lever.

Experience having proved conclusively that an engine, whether steam or gasoline, cannot develop its full power unless it has sufficient piston speed, it naturally follows that in order to meet the extreme condition of heavy loads and soft ground, and light loads and hard ground, at least two gear ratios are necessary between the engine and the driving wheels. In the past it has been held that a steam engine having a wider range of flexibility than a gasoline engine could be fitted to a commercial vehicle without a gearbox, and many vehicles have been so constructed. It means, however, that in order to meet the heavy load and soft ground conditions a larger engine is necessary than would meet the ordinary working conditions, and one is led to the inevitable conclusion that an emergency gear ratio should be provided for this purpose.

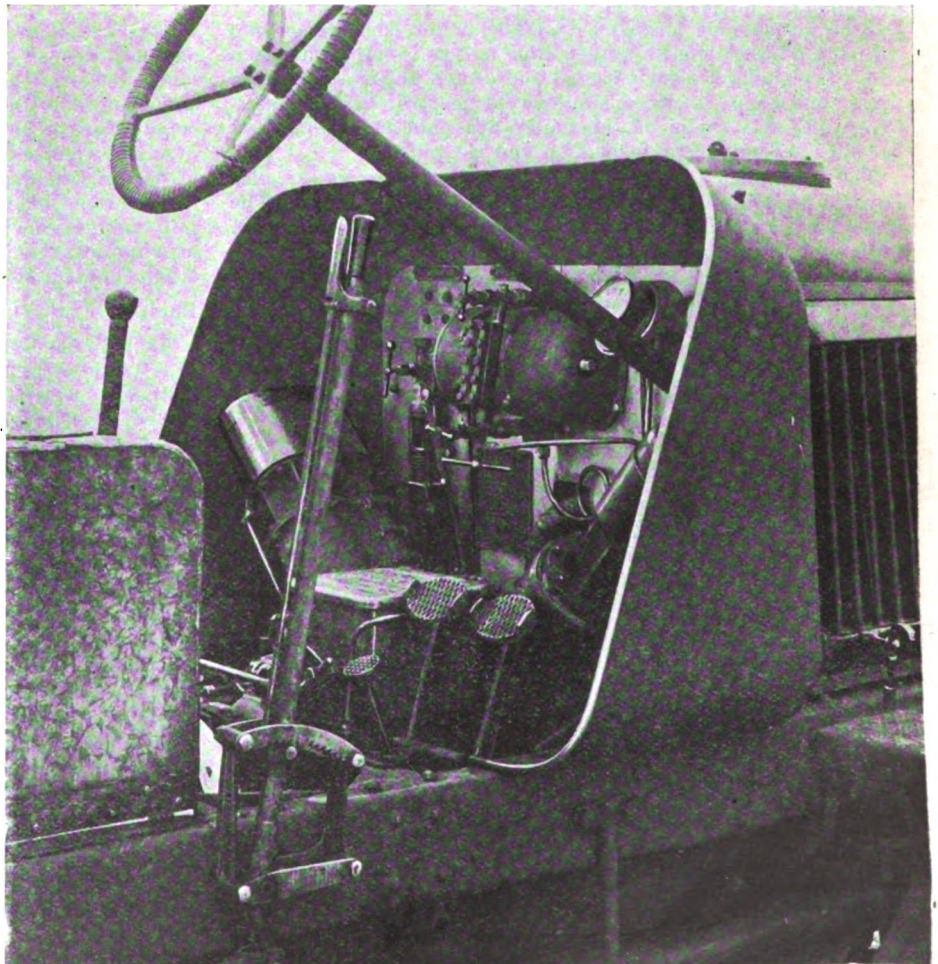
Once we have admitted the principle of the gearbox to the steam motor two important further advantages can be immediately secured.

The construction of the engine may be greatly simplified by the entire omission of the reverse gear, the necessary reverse motion of the vehicle being obtained by the introduction of two additional wheels in the gearbox. It should

be remembered that the reverse gear of an engine is rarely being used, but is always being subjected to wear. It is costly to make and to maintain, and therefore the employment of the one-direction engine is a distinct advance in simplicity and general efficiency.

The other advantage resulting from the adoption of a gearbox and clutch is that the engine can be run "free." This is useful not only for warming up in the morning, but when making long waits the engine can be allowed to turn over quickly, and in this condition the vehicle may be left for hours, the engine looking after the maintenance of water feed, steam pressure and lubrication.

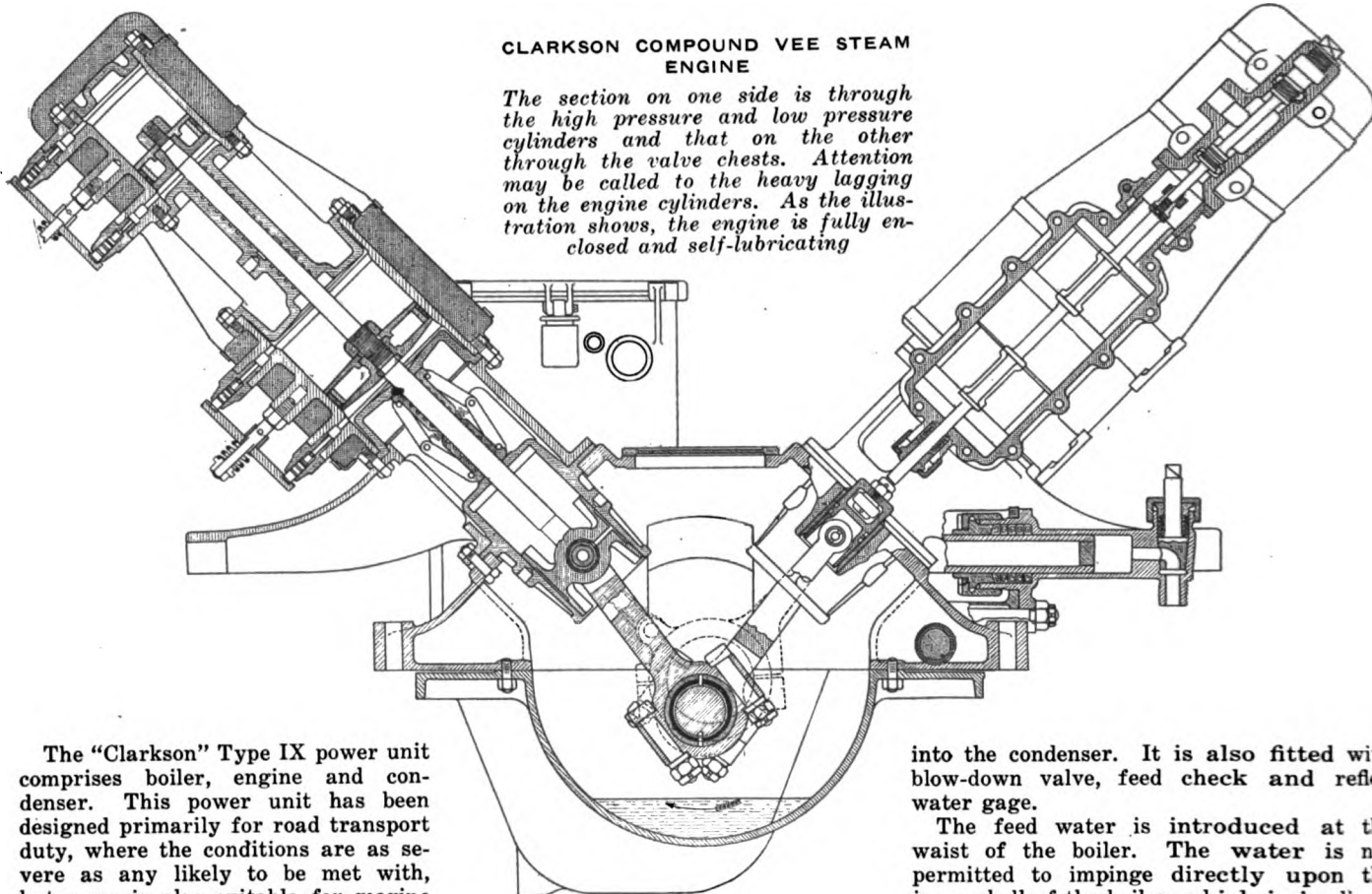
In an actual test this chassis was left with steam up all night, the engine quietly turning round and regulating water feed, lubrication and steam pressure without any attention from the driver. In this condition the vehicle is instantly available for service, and the consumption of coke in turning the engine quietly round in this way is very small.



*View of driver's compartment, showing location of engine and controls*

CLARKSON COMPOUND VEE STEAM  
ENGINE

*The section on one side is through the high pressure and low pressure cylinders and that on the other through the valve chests. Attention may be called to the heavy lagging on the engine cylinders. As the illustration shows, the engine is fully enclosed and self-lubricating*



The "Clarkson" Type IX power unit comprises boiler, engine and condenser. This power unit has been designed primarily for road transport duty, where the conditions are as severe as any likely to be met with, but same is also suitable for marine or portable purposes where a light weight power unit is desirable. The boiler consists of two cylindrical steel shells flanged and bolted together at each end. The shells are each forged and drawn under a hydraulic press, and there is not a single weld or rivet in the boiler. When the two shells of the boiler are unbolted every part becomes accessible for inspection and cleaning.

The outer shell is formed with thickening belts where holes have to be drilled for the attachment of boiler fittings. The inner shell is drilled to receive water tubes which are of the "thimble" type, about 4 in. long and 1 1/4 in. average diameter. These water tubes are not expanded, but pressed into the inner shell and held in position (like the stones of an arch) by the pressure within the boiler. The working pressure is from 300 to 350 lb. per square inch. The maintenance of this pressure is controlled automatically by an oscillating valve which regulates the draft of the fire according to requirements.

**Boiler Fired by Solid or Liquid Fuel**

The boiler is designed to be fired by either solid or liquid fuel. In the case of solid fuel it is fed through the central tube from the top. A superheating coil surrounds the central tube. The temperature of superheat is 620 deg. Fahr.

On a 3-ton coke-fired truck it is necessary to replenish the fire every 12 or 15 miles.

The supply of water to the boiler is by a pump operated by the engine at a reduced speed. The supply of water is controlled automatically by a reciprocating float which acts upon the foot valve of the feed pump in such a manner that as the float rises with the water level it prevents the foot valve returning to its seating. As a result the charge of water drawn into the pump barrel returns to the tank instead of being forced into the boiler until such time as the float descends and allows the foot valve again to become operative. This water control maintains the working level in the boiler without any attention from the driver.

**Boiler Fittings**

The boiler is provided with a safety valve of the dual locomotive type which discharges through a vacuum valve

into the condenser. It is also fitted with blow-down valve, feed check and reflex water gage.

The feed water is introduced at the waist of the boiler. The water is not permitted to impinge directly upon the inner shell of the boiler, which is in direct contact with incandescent fuel, but first strikes a thin steel plate between the inner and outer shell, and any deposit from mineral salts contained in the water takes place on the thin steel plate, from which it is readily detached, and falls by gravity to the lowest part of the boiler, there to be removed by the blow-off valve.

As the vehicle can travel from 30 to 60 miles on one charge of water (the mileage is dependent upon the character of the road and upon the load), it can easily be arranged to obtain supplies of clean water—there being no necessity to pick up supplies at short intervals on the roads from ponds and other doubtful sources.

**Engine**

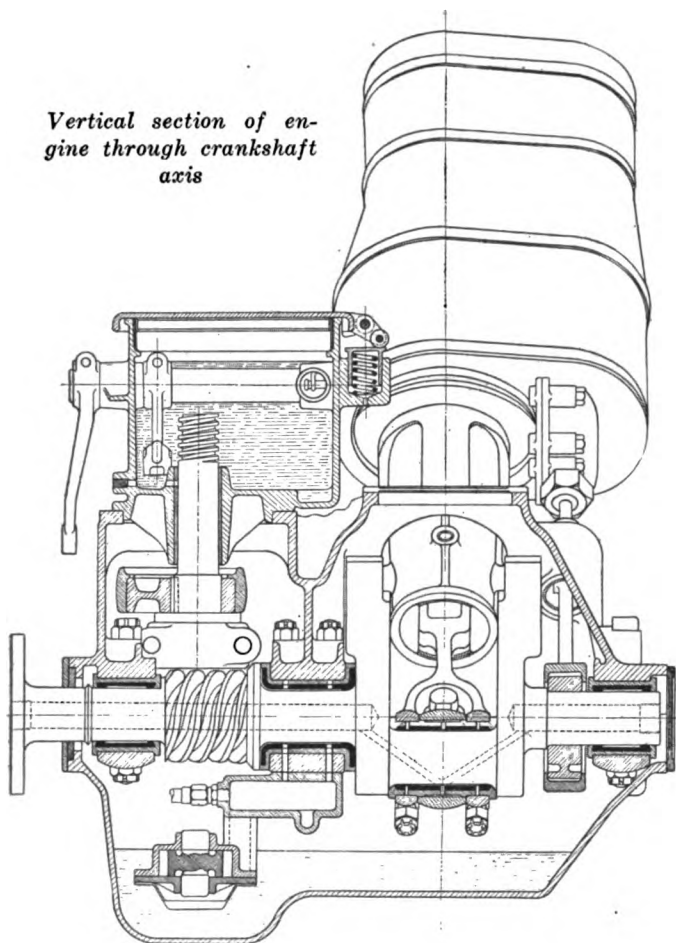
As will be seen from the drawings, the engine is a Vee type tandem compound. Two pairs of high and low pressure cylinders operate upon the same crank at an angle of 90 deg. A very even torque is obtained, as well as a nice balance, insuring smoothness of running and absence of vibration at speeds up to 1500 r.p.m. The engine has the following leading dimensions: High pressure cylinders 3 in. in diameter, low pressure cylinders 5 in. in diameter and a stroke of 3 in. for all cylinders. It is enclosed and self-lubricating. There are two systems of lubrication, cylinder lubrication and general lubrication. For cylinder lubrication a trigger pump is provided which is immersed in a bath of cylinder oil and which forces a drop of oil into the steam pipe every 100 revs., the rule being "little and often" so as to maintain a film of lubricant on the inner surfaces without having an excess.

For the general lubrication of the engine a gear pump is provided, this being submerged in the lowest part of the crankcase and therefore not subjected to air locks. The oil is conveyed under pressure from this pump to all working parts of the engine, including the three journals on the crankshaft, crank pin, eccentric and crosshead guides, this latter being a new development in engine lubrication.

The crossheads are made of steel, casehardened and ground, with about 3/1000 of an inch clearance in a ground cylindrical crosshead guide. At the point of mid-stroke oil is introduced through the crosshead guide on to the working face of the crosshead, and as the length of the crosshead is in excess of the length of the stroke it follows that the hole supplying



Vertical section of engine through crankshaft axis



the lubricant is at no time uncovered by the crosshead.

By suitable channelling in the face of the crosshead and holes leading therefrom to the crosshead pin, this also is placed in communication with the oil pressure feed—an arrangement that has been found to work most satisfactorily.

Piston valves are used on the high pressure cylinders, and flat valves on the low pressure. The operation of all the valves on both lines of cylinders is provided by a single eccentric.

The engine is mounted on the chassis frame in a unique manner, providing for flexibility and stability. One of the illustrations shows how the engine is connected to the frame by two extending arms which terminate in bearings, these bearings embracing trunnions which are securely bolted to the side members of the frame.

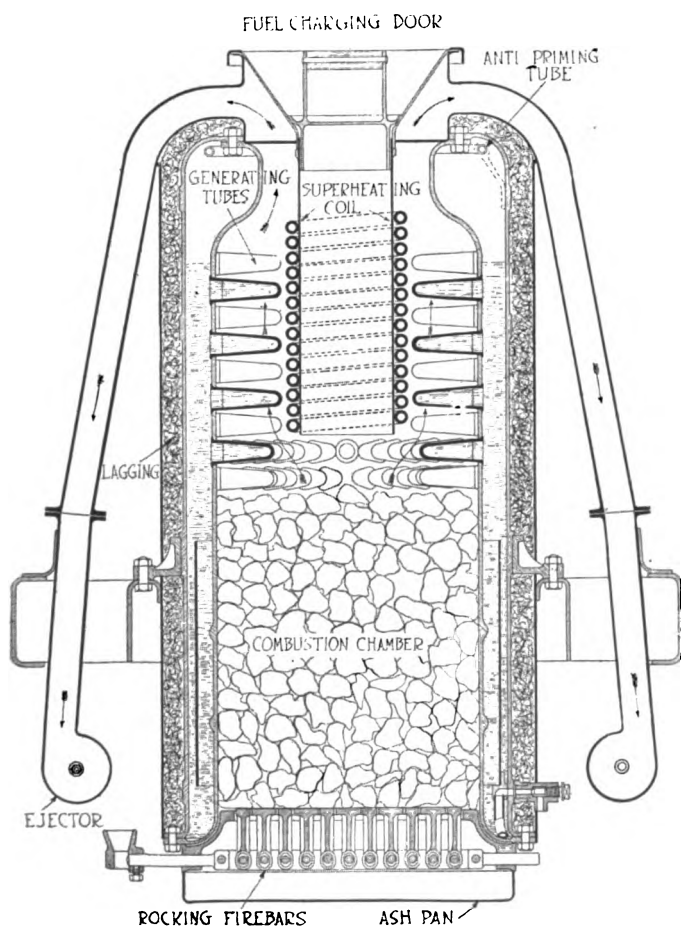
At the rear of the engine a cross member of the frame carries a pin which fits into a hole on the pump case of the engine. The engine is thus carried upon three cylindrical supports and it is free to slide upon them. There is no unnecessary constraint imposed upon the engine, and it has a wide basis of support to resist the torque and to carry the weight of the engine direct to the frame without the employment of a sub-frame.

#### Condenser

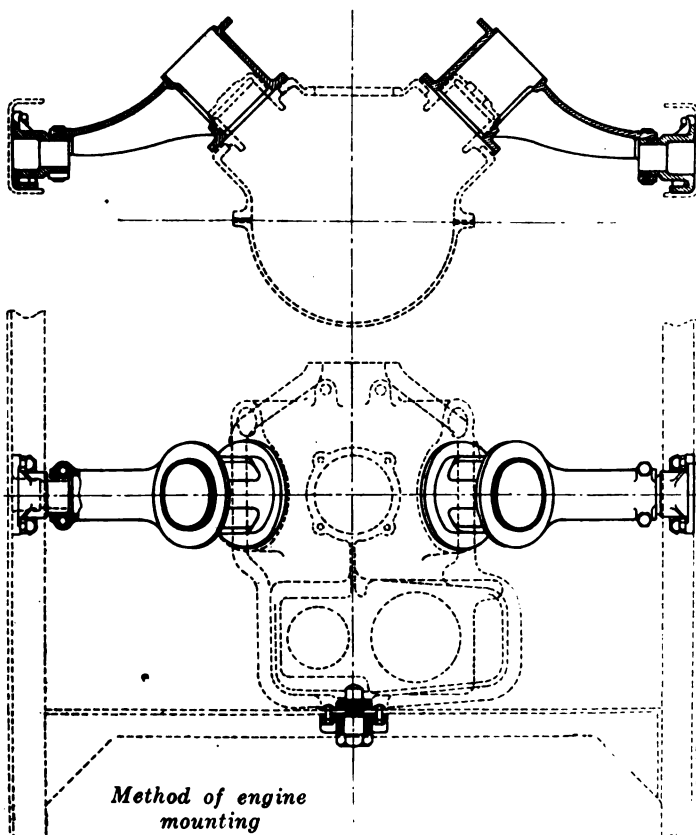
The condenser is situated in the place usually occupied by the radiator and consists of a top and bottom header united by radiating tubes. As trouble has been experienced in the past in keeping the condenser tight under conditions of road vibration, and the strains introduced with the expansion of the radiating tubes due to the passage of steam through them, an improvement has been made in this condenser by allowing the lower tube plate to move up and down within suitable guides as may be necessitated by changes of temperature in the radiating tubes. The lower header is actually hung upon the tubes and is kept in position within the guides by four short, stiff springs.

The back of the condenser is shrouded and furnished with a powerful fan for ventilation. The fan is driven by a belt from a short lay-shaft running along the side of the chassis from the engine.

At the forward end of the lay-shaft is provided a rotary pump which drains the lower header of the condenser and  
(Continued on page 946)



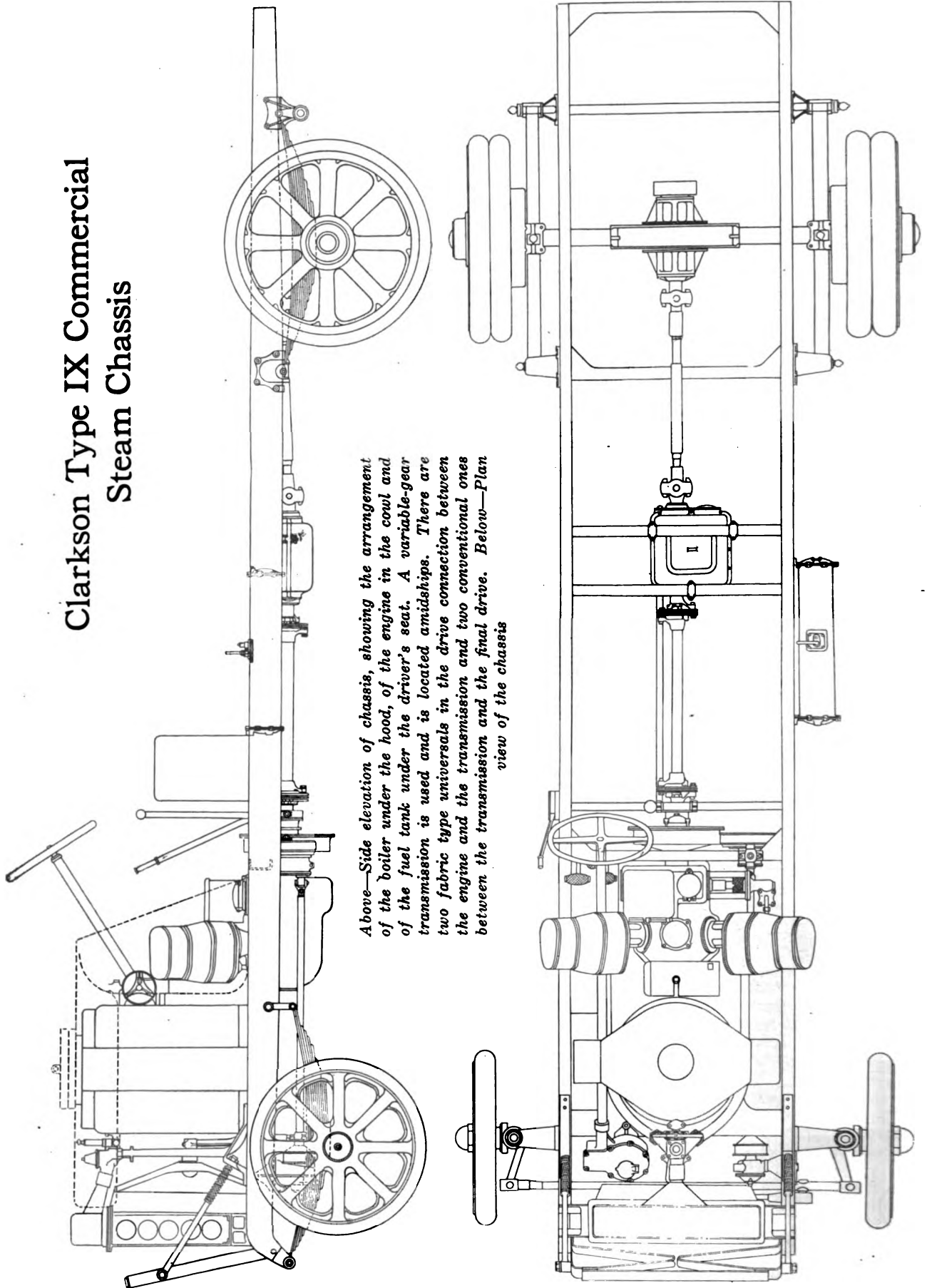
Clarkson water tube boiler



Method of engine mounting



## Clarkson Type IX Commercial Steam Chassis



*Above—Side elevation of chassis, showing the arrangement of the boiler under the hood, of the engine in the cowl and of the fuel tank under the driver's seat. A variable-gear transmission is used and is located amidships. There are two fabric type universals in the drive connection between the engine and the transmission and two conventional ones between the transmission and the final drive. Below—Plan view of the chassis*

# Cultivating Japanese Automobile Field

## PART II

### A Study of Business Methods—How to Make Selling Connections— Considering Distributing Centers—The Arrangement of Selling Prices—Repair Facilities

By Tom O. Jones

Special Agent of the Department of Commerce

**J**APANESE business methods vary so greatly from those in America that they cannot be overlooked as forming a most important factor in the successful retail sale of motor cars.

Practically every large firm in Japan now selling motor vehicles is engaged in importing general merchandise. In some instances the motor business is conducted as a separate department; sometimes new corporations are formed and distinctive names assumed; but in either case the parent company is closely allied with the motor sales.

The foregoing arrangement works to the advantage of the automobile business, for the parent companies have extensive business connections throughout the country, and by far the greater number of cars disposed of in Japan are sold either on a basis of business relations in other lines or on friendship. The reader should bear in mind that there are less than 3000 cars in Japan and the purchase of a vehicle by an influential citizen is known almost immediately by every dealer and every importer.

Friendship without business influence may work for or against the dealer. One representative of a splendid line of American cars outlined the case as follows: "If a friend of mine wishes to buy a car, either of two thoughts run through his mind. One is that I will give him as good a car at as low a price as possible, because we are friendly; the other, that as we are friends, I will feel that he is obligated to buy from me, and therefore I will make the price higher rather than lower because of the friendship." The Japanese dealer requires more than the usual amount of diplomacy in handling his trade. Therefore, as in the United States or in any other part of the world, the financial standing and business connections of the dealer should have most important consideration by the American manufacturer in selecting an agent.

The established large houses generally have branches or representatives in every important city in the country. It is evident, therefore, that the ideal selling agent for Japan is a large Japanese firm operating in general lines,

with its connections already established, and having an organization that is in touch with conditions throughout the country. Such firms are naturally somewhat limited in number and far too few to handle the numerous American cars, were they all to be represented in Japan. In case such a connection cannot be secured, an American firm that has an established reputation should be the choice. According to the manager of one house handling American cars, difficulty is experienced in subdealer selling, the idea being that the subdealer cannot make as low a price as the direct dealer.

Generally there seems no disposition on the part of the Japanese dealer to ask for any unusual financial arrangement. Most of the importers are wealthy firms with an abundance of capital to finance their business on a basis of cash in America against shipping documents. One or two American importing firms stated that they secure better terms on other lines of merchandise and would like to have similar accommodations from American manufacturers of motor vehicles. There is reason to believe that the manufacturers of higher-priced American cars may find it necessary to extend some credit by shipping on 60 or

***E**STABLISHED Japanese general dealers make the best selling agents.*

*As a rule, no unusual arrangements for payment are necessary.*

*Garage equipment is good, and Japanese mechanics are generally efficient.*

*The setting of fixed selling prices in Japan is not recommended. The giving of commissions is a usual practice.*

*American manufacturers should stipulate that the distributor maintains branches or dealer connections in principal cities.*

*Tokyo is the capital, and also the motoring center, having almost one-half of the cars now operating in Japan. The city has several attractive automobile showrooms and efficient repair-shops.*

90 day drafts, if they are to meet European competition after the war. Whether such action will be required on the part of the manufacturer of the lower-priced cars will depend entirely on the competition given by the European manufacturers.

#### Selling Connections for American Manufacturers

An established firm in Tokyo that has branches or representatives in other important cities can secure all the motor-vehicle business available. No company hoping for maximum business should for a moment consider a firm that does not have its home office or a strong branch in the capital.

One or two companies have tried intensified selling in Japan by having one direct dealer in Tokyo for the eastern section and another direct dealer in Osaka or Kobe for the western section. The one American company operating under this plan at the present time is e

periencing difficulties. Its representative in Tokyo is an American house and in Osaka a Japanese house. The American dealers in the capital complain continually that their territory is being infringed upon. The American manufacturer, through his traveling agents, has gone to great pains to investigate many of these complaints and in practically all cases it was found that cars of this make which have come into the eastern territory have been purchased in America and shipped to or by the individual owners. There has been much correspondence, and even with reports from the manufacturer, the Tokyo dealer still feels that some cars are coming into his territory through the other representative, a condition which is not conducive to an enthusiastic promotion of the line.

Within the past few years there has been a great improvement in automobile salesrooms in Japan. Many of the dealers, even the large ones, still confine the display of cars to the garage, but new buildings erected within the last two years or in construction at the present time have showroom facilities that afford window displays on the streets. Generally these rooms are similar to those found in America, but it is seldom that there is more than enough room for the display of two cars on the salesroom floor, although three or four cars are often crowded in.

#### Facilities for Repair Work

Garage equipment in Japan compares favorably with that of the American garage. This is a matter of necessity. A dealer called upon to replace a part that is missing from his stock would require at least six weeks to obtain it from America, even if the part were cabled for. Obviously, it is not good business for him to deprive his customer of the use of the car for six weeks or more, and therefore he finds it necessary to manufacture the part, and for this purpose he must have a fair machine-shop equipment.

Japanese mechanics generally are efficient in their work and when required to make a motor part can copy it quickly and satisfactorily, so that if it will not do permanent duty, it will at least permit the car to be operated until replacements can be secured from America. This must not be taken to mean that Japanese dealers are not disposed to carry parts, for they usually have a good supply, but delays of various kinds may deplete their stocks. In fact, when taking an agency one of their first questions is in regard to what arrangements the American company will make to supply them with parts. Certainly no manufacturer should allow his cars to go into Japan without a plentiful supply of spare parts. While consignment of these parts may be requested, the usual cash basis will not be a very serious obstacle.

While the mechanics learn quickly, the weak point of Japanese organizations is in electrical equipment and finer motor adjustments, but on the whole cars are kept in fair condition by the native garages.

#### Selling on Fixed-Price Basis

The giving of commissions or presents to parties assisting in influencing sales is one that the dealer should consider from every angle. It is one of the older business practices that has crept into the sale of motor cars. In the sale of automobiles the chauffeur is often the intermediary who profits to the extent of \$50 to \$100, handed to him by the dealer when the deal is consummated.

The manager of a company selling one of the low-priced cars in Japan states that many times his company failed to come within three or four parties of the person actually buying the car. By this he meant that a man

about to buy his first car might announce the fact to the steward of his household, who in turn would go to a broker who did business with the motor-car dealer. If it happened that the purchaser lived in some small town and the buying was done from the city dealer, there would be another intermediary.

Under such a system, with constantly varying freight rates, it is difficult to set fixed prices on cars in Japan, and the American manufacturer who insists that the selling be limited to a certain percentage above the landed cost of the cars is imposing a condition which will place a hardship on his representative. Low price alone will not assure the sale of a certain car as against another car of similar type. The commission given to the chauffeur is for his good will and, in the estimation of the Japanese dealer, this is of greater value than a difference in price of equal amount. The dealers claim that practically no Japanese buyer will purchase without the sanction of his chauffeur, and many of them would hesitate to force a sale against the opposition of the chauffeur, because the driver is in position to do them a certain amount of harm by the exploitation of fancied faults in the car.

One dealer interviewed said that he has endeavored to do business on a fixed-price basis and that he refuses commissions to chauffeurs. Taking his word for this, it is a fact that with his line of cars, consisting of three noncompeting types with a wide range in price, he is not getting the business that he should on any one of them. He admits that he is unpopular with chauffeurs, and therein may lie the reason.

European car owners generally recognize this established way of doing business. When one of them remarked one afternoon that he had purchased two new tires, he was asked if he had bought them himself. He said that he had simply sent his chauffeur after them. "I know that he made money on the deal," he added, "but I am perfectly satisfied. He probably bought them as cheaply as I could in any case, and making this extra money adds to his salary and keeps him satisfied. It does not amount to a great deal to me and I get better service and the car gets better attention."

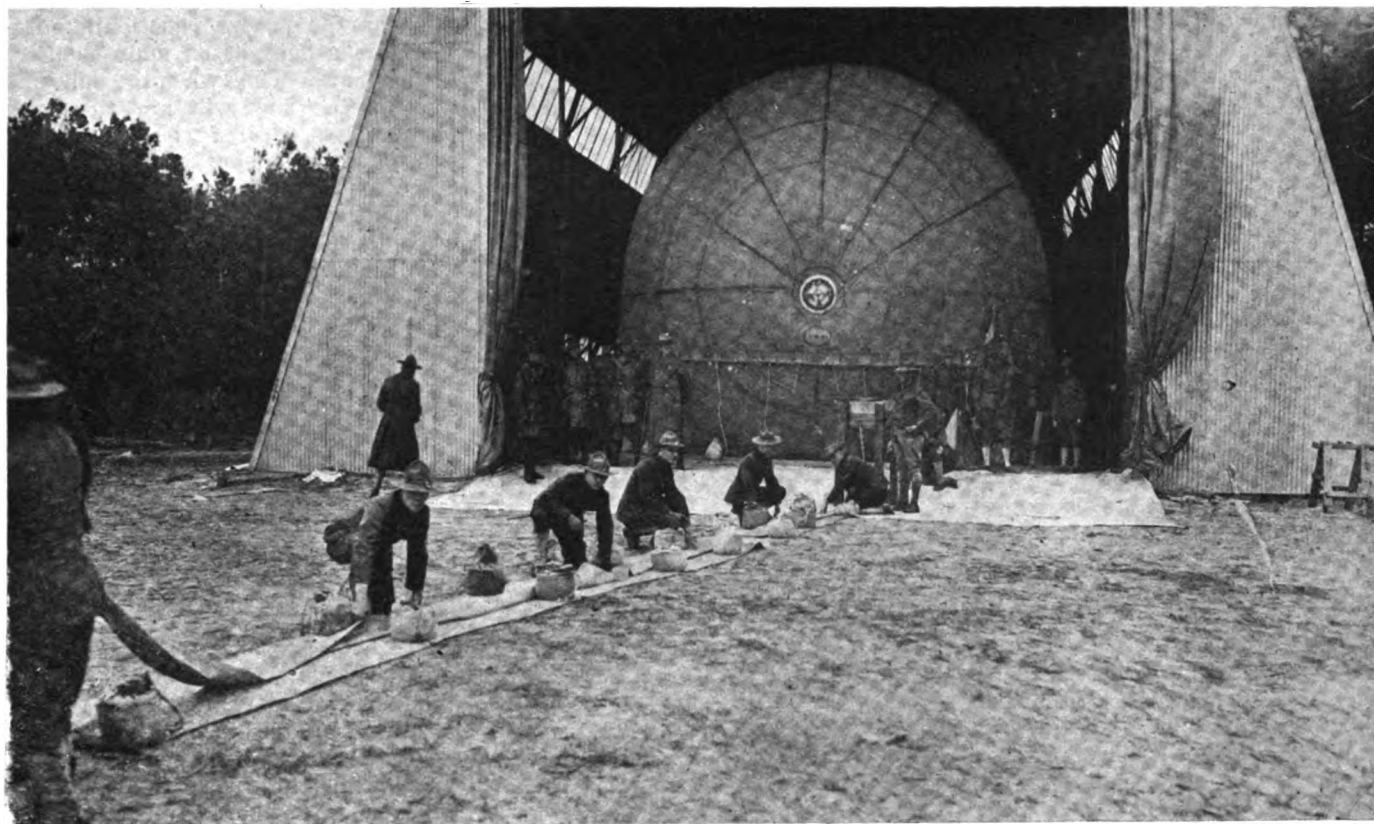
#### Distributing Centers

In making a selling connection in Japan, the American manufacturer who concludes a contract with a Tokyo house should stipulate that branches be maintained or dealer connections of some kind established in Yokohama, Osaka, Kobe, Shimonoseki or Moji, and Nagoya. The relative importance of these largest cities in the motor-car trade is best revealed by the number of cars in operation in each and the character of the districts of which they are trade centers.

Tokyo is the capital and the motoring center. Here are found nearly half the cars now in operation in Japan. Late in August of 1917 license number 1000 was issued in Tokyo, but without doubt there were 100 to 200 other cars in the city that were not registered. The fiscal year for automobile taxation begins on October 1 and cars are operated during the last two or three months of the fiscal year either on a special permit and without a formal license, or use of the old license is permitted on a new car until the end of the year. With additional shipments since August, 1917, the number of cars now in operation in Tokyo can safely be placed at 1400. The city has several attractive automobile showrooms. The dealers' facilities for making repairs and adjustments are good, and a staff of Japanese mechanics and machine-shop equipment is maintained in connection with each of the large garages. Nearly all carry a fair selection of repair parts.

(To be continued)





A war balloon in its hangar

# Manufacture of War Balloons in U. S.\*

Observation Balloons Used by American Army an Adaptation of the French Caquot Type—Made by the Large Tire Manufacturers—  
Industry Developed Rapidly

By Allen Sinsheimer

**S**IXTEEN months ago there was no war balloon industry in the United States. To-day war balloons, made in this country, in sufficient quantities and efficiently equipped and manned, form an important part of the American Expeditionary Forces in France. They are huge contrivances, non-rigid, and use hydrogen gas for sustentation. Highly trained observers operate them. Army offensives frequently depend for their success upon their observations.

The United States Government upon entering the war commenced production by working on a sample balloon from the front. Duplication of the foreign-made article was difficult, especially as quantity production was necessary. Balloon fabric manufacture was new in the United States and the material was scarce. It was found necessary to bring over from France a number of experienced men and women to work with the Americans as instructors. Production was speeded up, and through co-operation of the mills looms were secured and the manufacture of the cloth in quantity was started. In addition to an efficient labor organization it was necessary to have

balloon factories especially constructed with free and open floor space and a complete absence of dust and dirt. These were obtained by sacrificing other lines of business, the tire manufacturers aiding considerably and taking on much of this work. All this required time, but when the balloon schools in this country opened and called for balloons their requirements were met immediately. To-day the United States has not only equipped its own army, but in addition is helping to supply the Allies as well. Equipping an army with balloons means more than the original supply. It includes also the replenishment supplies to keep pace with losses by fire, accidents, enemy airplanes and artillery.

In commencing balloon manufacture the Government revived a dead industry; in fact, it practically created a new industry. The spherical balloons, a few of which had been made in this country for use at circuses, were of no value whatever. These were free balloons, while the army balloons are of a captive type, staked to the earth and shaped like huge legless elephants, from which they take their name.

The American army balloon is an adaptation from the French Caquot type. Some years ago Germany developed a fairly satisfactory but somewhat treacherous bal-

\*This article, by our Washington correspondent, was written before the armistice was signed.—Editor.

loon known as the Drachen type. France and England conducted experiments, but made nothing superior to the Drachen. In 1916, at the Mexican border, the United States Army had but one captive balloon, a gift to a national guard battery. So at the beginning of the present war there were no satisfactory observation balloons, and even the German Drachens, unable to reach a height beyond anti-aircraft gunnery, were useless. At this point Captain Caquot of the French Army developed the Caquot type, which has stood the test of the last two years of the war and which has been copied by the Germans. All the Allied observation balloons followed the construction of Caquot. They are non-rigid and designed to remain steady in varying winds and to reach a satisfactory altitude for necessary observations. The gas bag is larger in diameter at the nose, or forward end, which heads into the wind, than at the tail. It is approximately 93 ft. long, with a maximum diameter of 28 ft. Its capacity for hydrogen gas is 35,000 cu. ft. At the tail of the balloon is the "rudder," created of lobes, which steadies it and prevents rocking and pitching.

The lobes forming the rudder are filled with air by the wind alone, the internal pressure depending entirely on the velocity of the wind at different altitudes and on weather conditions.

A diaphragm extends from the nose to a point close to the tail on the lower side of the balloon. This diaphragm, made of rubberized fabric, the same as the entire envelope, has a capacity for 10,000 cu. ft. of air. Wind inlets are so arranged that as the amount of hydrogen gas in the balloon proper decreases, either through cold or by leakage, the balloonette fills with air and thus keeps the shape of the balloon intact. This is impor-



*View of balloon from below*

tant, as the proper functioning of the balloon depends on maintenance of the shape. Thus when the balloon is completely filled with gas, the diaphragm lays parallel with the lower part of the envelope, but as the gas decreases and the air enters between the diaphragm and the lower lining of the envelope the diaphragm rises, and if sufficient air is taken in to fill the capacity of 10,000 cu. ft., it forms the balloonette inside of the balloon.

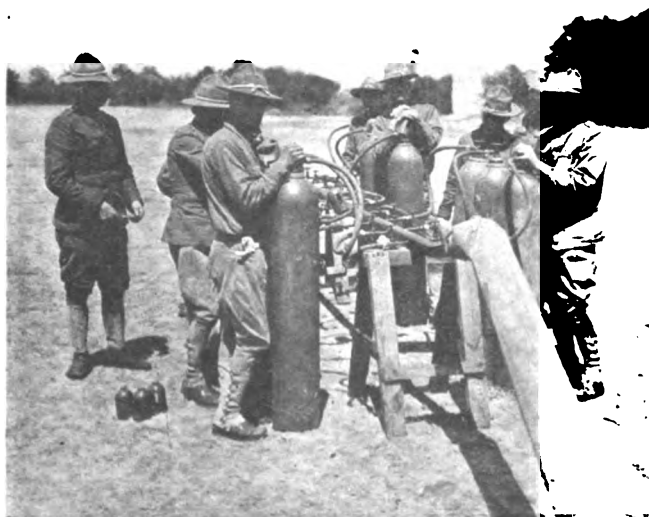
The life of a balloon is from 1 hour to 7 months, depending on weather conditions and the accuracy of enemy airplanes and anti-balloon gunners. In camps in this country the average effective life of a balloon is 5 months.

Communication between the observers in the balloon basket and artillery officers on the ground is maintained by telephone. The telephone wire is sometimes a separate cable, although the latest apparatus is so designed that the telephone wire is contained in the center of the main cable connecting with the balloon, which is a specially stranded 1/4-in. steel cable.

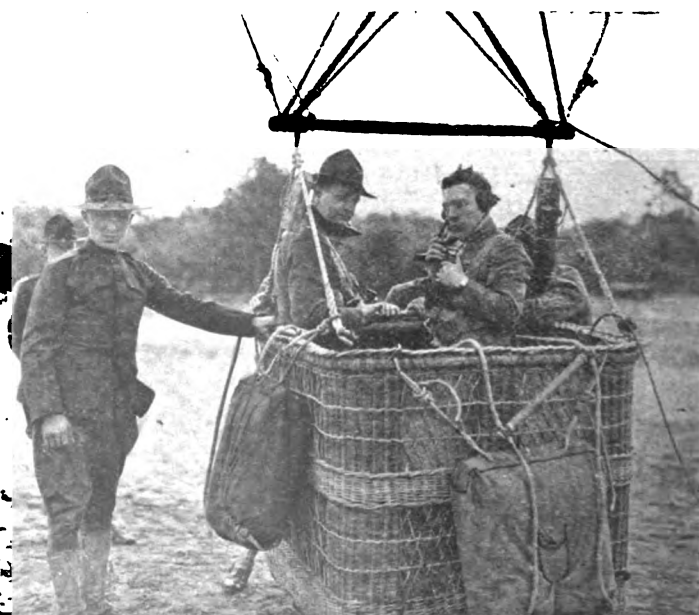
The windlass controlling the balloon, together with the cable, is mounted on a truck which can travel even while the balloon is in the air.

This is an adaptation of a French invention now manufactured by American companies. Observers in the balloon baskets, which are suspended from the balloon by means of special rigging, are equipped with parachutes for use in emergencies, such as explosion of or firing of the balloon by the enemy.

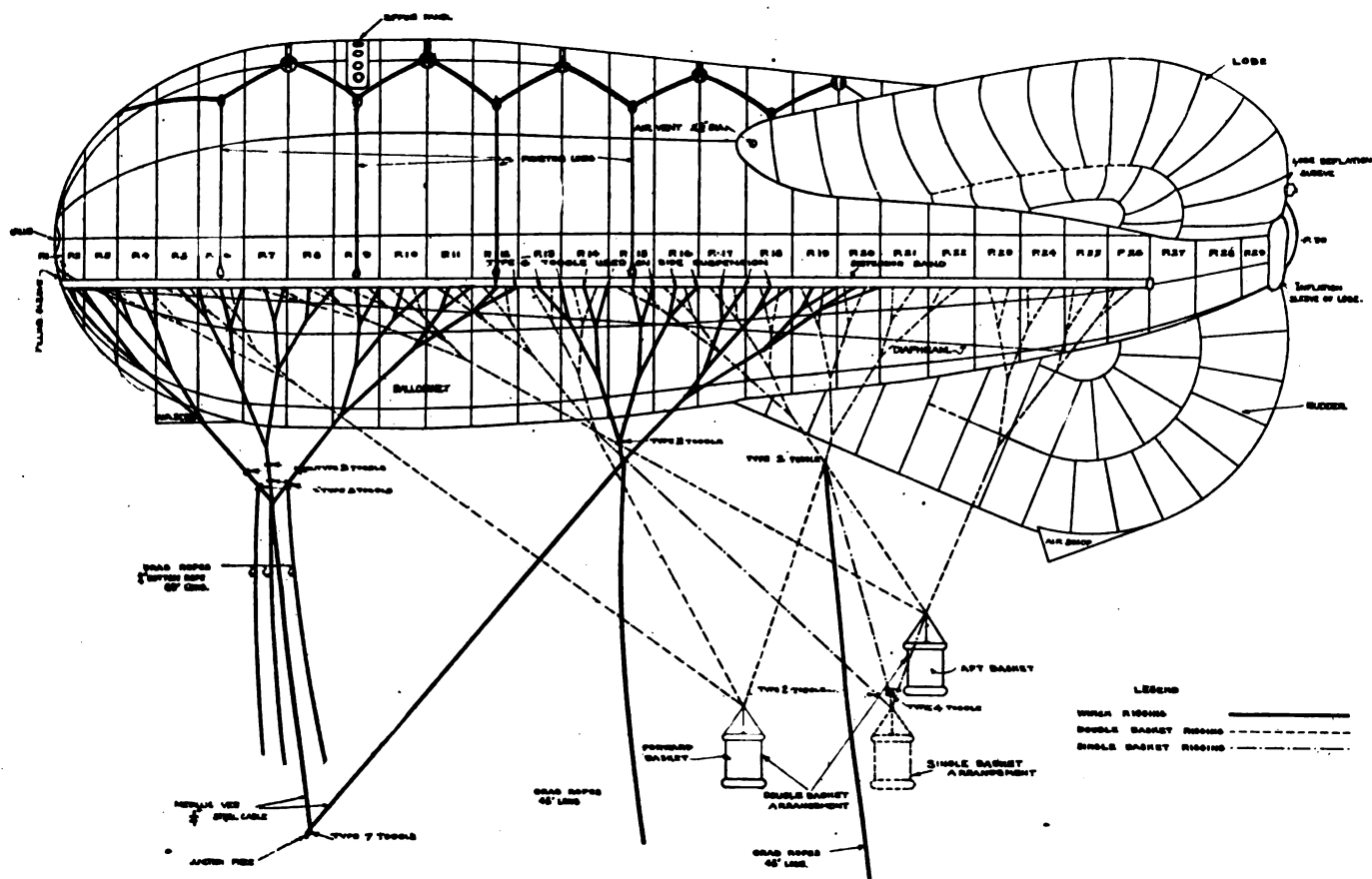
Many other accessories had to be developed for the balloon service. The production of hydrogen was a problem involving much consideration. The equipment, including the field generators and main supply stations, containers for shipping and storage purposes, methods of



*Gas bottles used in inflating balloons*



*Observers in the basket, with parachutes on outside*



Drawing showing construction of balloon and its rigging

transferring the gas from the containers for shipping and storage and from the containers to the balloons, all required individual attention. Each problem has been worked out successfully, and the balloon service is said to be operated so as to meet the full requirements of the army.

### Weight of Internal Combustion Engines

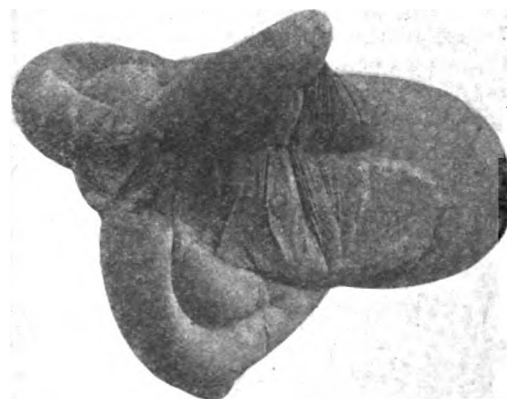
A CORRESPONDENT of *Engineering* discusses the relative weight of aero and submarine engines and the way in which weights of engines vary with linear dimensions.

Consider any given aero engine weighing, say, 3 lb. per brake horsepower, and also an exact model of this engine made to half the scale of the original. A little reflection will show that this model would possess the following properties:

1. It would weigh one-eighth of the original.
2. It would have the same air speeds, bearing pressures, bearing speeds and stresses (including inertia stresses) if run at the same piston speed as the original (i.e., at double the revolutions) and on the same pressure cycle.
3. If it were worked on the same pressure cycle as the original it would develop one-quarter of the power of the original at the same piston speed.
4. Its weight per brake horsepower under the conditions of 2 and 3 would be one-half that of the original; that is, 1.5 lb. per brake horsepower.

Now an average submarine engine cylinder has a bore and stroke roughly three times that of an average aero engine cylinder, so the latter has a 3:1 advantage on dimensional considerations only.

Accepting the figure 10 for the ratio of weight per brake horsepower of Diesel engine to weight per brake horsepower of aero engine, there remains a ratio of 3 1-3:1 to be accounted for by reduced m.e.p. in large engines, additional metal serving as heat ducts, use of cheaper metals of low strength value, and low piston speed.

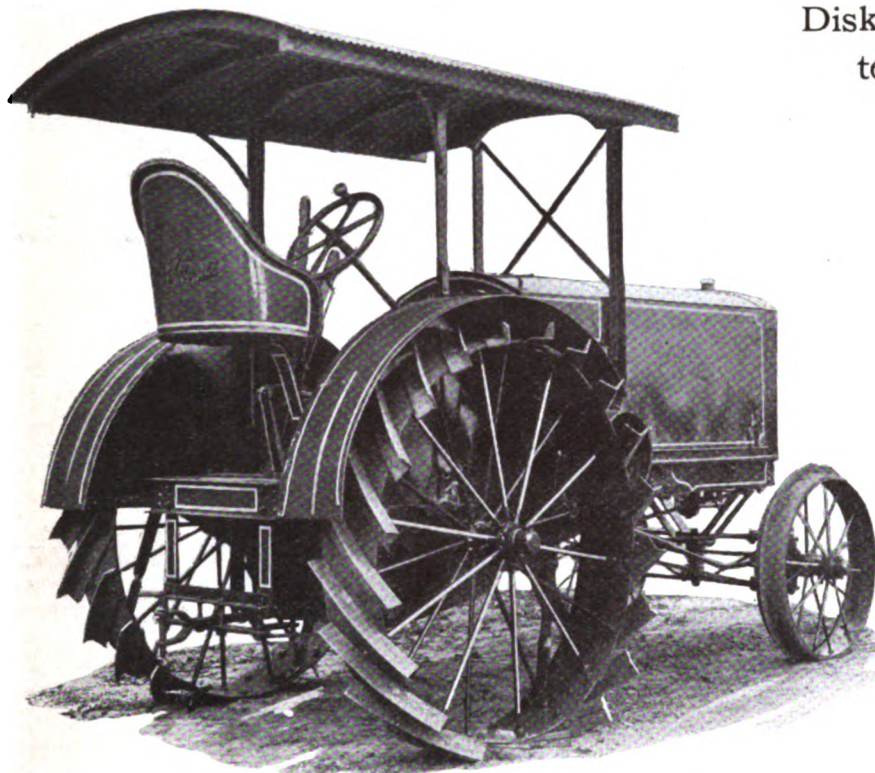


Balloon in ascent



# Port Huron Friction Drive Tractor

Disk Drive Combined With a System of Spur Gearing—Two-Piece Bull Gear Used



*The Port Huron tractor. It is designed for three 14-in. plows and has a drawbar pull of 12 hp.*

**A** COMBINATION of friction disk and spur-gear drive is used in the tractor which is being manufactured by the Port Huron Engine & Thresher Co. of Port Huron, Mich.

The reversible, variable friction-drive system comprises two metal driven disks, mounted on a horizontal cross shaft, which are brought into contact, one for the forward

and the other for the reverse movement of the tractor, by means of a lever, with a fiber wheel which is bolted to the crankshaft of the motor. The cross shaft also carries at one end a belt pulley and at the other the main pinion, which transmits the power to the intermediate spur gears connecting with the gears on the driving axle.

With the exception of the differential gears and pinions, all of the transmission gears are machine cut. They are enclosed in a dustproof casing and run in a bath of oil. The larger gears are made of semi-steel. The bevel gears in the differential and the pinion are of open-hearth cast steel, as are also the bull pinions, intermediate pinion and main pinion, all of which are machine cut.

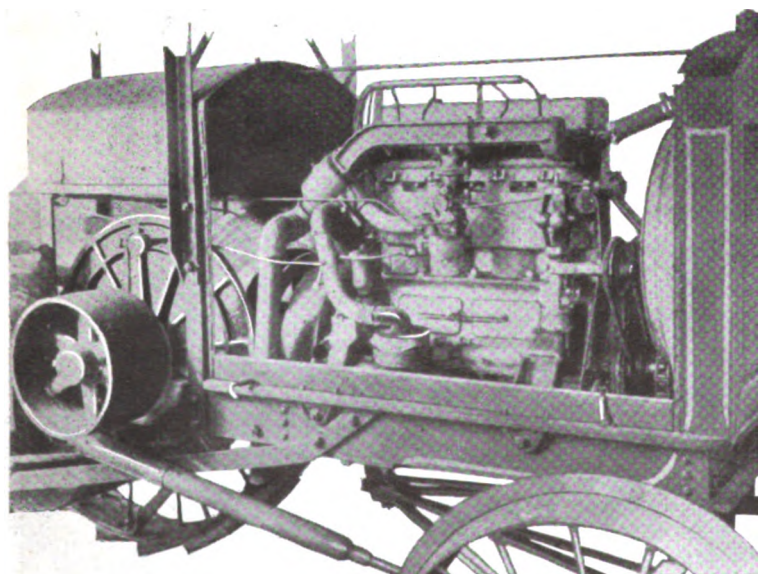
In the construction of the bull gears the hub and spokes are made in one piece, and the rim and gear teeth in another. As a result, when the gear be-

comes worn it is necessary merely to renew the rim, which can be done by removing six bolts.

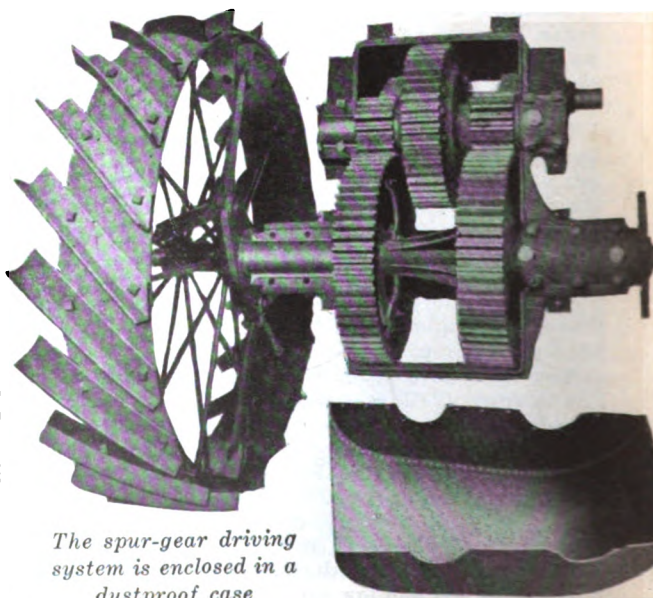
The engine has a rating of 12-25 hp., and is an Erd of the kerosene-burning type, having four cylinders with a bore of 4 in. and a stroke of 6 in. The valves are located in the cylinder heads. The engine is throttle governed by means of a fly-ball governor, and has a normal speed of 900 r.p.m.

Lubrication is effected by means of a double-filtered splash system with circulating pump. A Kingston mag-

*(Continued on page 946)*



*The engine and part of the friction disk transmission of the Port Huron tractor*



*The spur-gear driving system is enclosed in a dustproof case*



# The F O R V M



## Constant Compression Engines

By C. K. Salisbury

ONE type of engine especially well adapted for automobile use has received practically no consideration from automobile engineers, mainly because of the extreme difficulty in carrying out any practical design. This is the adjustable combustion chamber type.

Late developments indicate that the main difficulties of design may be quite easily overcome, and as a close investigation shows very high possible thermal efficiencies on partial charges (which would make it desirable for automobile use), a careful study of the efficiencies will be made.

The distinctive characteristic of this engine is that the compression of a partial charge is the same as that applied to a full charge by proportionately reducing the volume of the combustion chamber. With proper form of combustion chamber it is possible to reduce the area of chamber wall exposed to the burning fuel almost directly as the volume of charge is reduced, over a considerable range of charge variation. The explosive pressures developed by partial charges would consequently be as high as those developed by full charges for the same compression. The effect of this is that the thermal efficiency of a partial charge would be the same as for a full charge, provided the expansion was carried only to the same pressure above atmospheric as the exhaust pressure of the full charge. Under these conditions the efficiency line would remain horizontal. As the partial charge is always expanded to a lower pressure than the full charge in this type of engine, the partial charge will show higher efficiency.

### Gain Due to Extra Expansion

The area added to the card by the extension of the expansion line for any partial charge over the area of the same charge expanded only to the exhaust pressure of a full charge is shown by the curve G-H. This curve gives readings directly proportional to the value of the charge and to the efficiency of the engine exploding full charges.

There are limitations as to the point that it is advisable to carry the reduction of the combustion chamber from the standpoint of efficiency. It is not desirable that the expansion line fall below the atmospheric line, as that would reduce the efficiency. This must be balanced against the effect on lighter charges where the combustion chamber volume would not be varied to correspond to the charge reduction. A greatly increased ratio of chamber wall area to chamber volume will also tend to greatly reduce the efficiency. This can be offset by increasing the compression of small charges, even at low speed, above that for full charges, because of the small crank angle at which the compression reaches a high value. Another thing that has a big effect in keeping up the efficiency of small charges is their high rate of expansion. This is almost twice as rapid for the one-quarter charge as for the full charge.

The diagram shows the effect of a reduction of combustion chamber volume to one-quarter of full-charge volume.

The present type of automobile engine loses efficiency quite rapidly when the charge is reduced. The curve

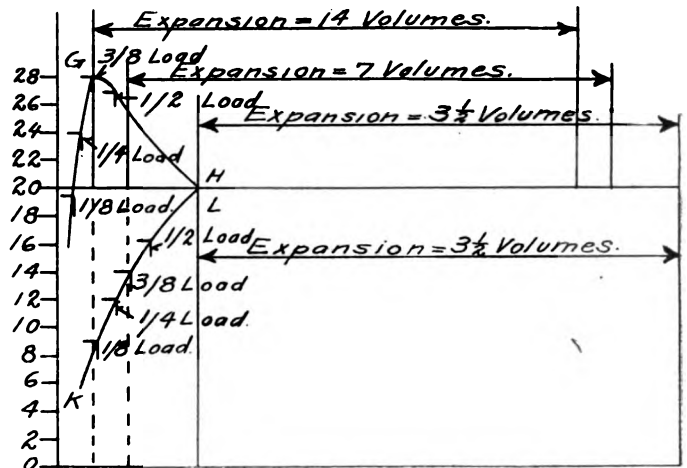


Diagram showing variation of thermal efficiency with load in engines with constant compression (upper curve) and variable compression (lower curve) respectively

K-L directly indicates the thermal efficiency for various charges.

In making a direct comparison between the two types the efficiencies are based on similar engine loads at a fixed engine speed.

The automobile engine of good design is of about 20 per cent thermal efficiency at full load, which will be taken as full load efficiency of the types compared.

At one-half load the regular engine shows an efficiency of about 16 per cent, while the adjustable chamber type would give about 27 per cent. At three-eighths load the regular engine shows about 14 per cent efficiency, while the other type would show about 28 per cent. At one-quarter load the regular engine shows about 12 per cent efficiency, while the other type would show about 24 per cent. At one-eighth load the regular type shows about 9 per cent, while the adjustable type would show about 20 per cent.

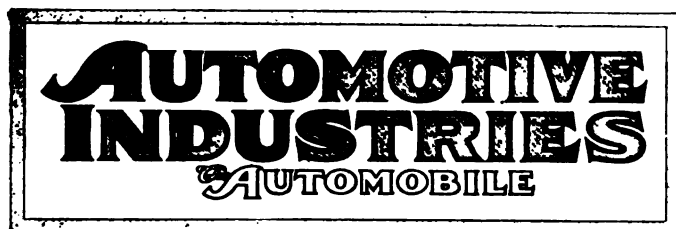
If correctly designed, the thermal efficiencies will be fully twice that of the present type over the power ranges commonly used in automobile work.

### Compression May Be Regulated

One very important point in favor of the type is that the compression of the charge may be regulated to obtain best results according to the engine speed. As the automobile engine should have a comparatively low compression for starting and for low speed, considerable increase of compression may be employed at higher speed with consequent increase in thermal efficiency, but with very little increase in engine weight.

The very important feature of this type is that the efficiency is the highest at partial loads. This permits of employing high-powered engines with high efficiency at normal operating loads. An engine having its efficiency highest at full load means either an underpowered engine or inefficient operation.

As pointed out by AUTOMOTIVE INDUSTRIES, the engine of higher thermal efficiency will materially aid in solving the problem of using kerosene. This, taken with the gasoline situation, warrants most careful consideration of the type.



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## The Abandonment of National Shows

IT was undoubtedly a wise decision on the part of the National Automobile Chamber of Commerce not to hold any national shows this winter. The great problem for the manufacturers will be to get their production back to a peace-time basis as quickly and as economically as possible. For the time being distributing problems are of minor importance compared with production problems.

There has been as yet no great disorganization of automobile sales agencies. Except in the smaller centers, most of the dealers have kept going, despite the difficulty of getting cars to sell. It devolves upon the manufacturers to see that these dealers who "stuck" in times of stress shall from now on get all the cars they can dispose of. Where agencies have been broken up as a result of the draft or because they could get no cars, the gaps will be filled again in the course of the year as our soldiers return from abroad and as industries that have

been devoted to munitions and similar war work are shut down.

If it had been decided to go ahead with the shows, in view of the short time available we could not have expected much new and novel in the exhibits. Since the entrance of the United States into the war and the gradual conversion of the automobile plants into war equipment factories, little development has been carried on in connection with passenger cars. It would have been impossible to start on new designs now and get exhibition models ready by January or, at the latest, February. And to exhibit the same models as at last year's shows would have hardly warranted the trouble and expense, as it might have resulted in a sense of disappointment on the part of visitors, inasmuch as the holding of an industrial show is always taken to imply the creation of new products.

For the present there is no need to stimulate the market by means of innovations in designs. The public has been unable to get nearly as many cars of the present type as it has wanted to buy, and it will readily continue to purchase these machines through the coming season. This will give the manufacturers plenty of time to develop their 1920 models. In these we may expect to see improvements of a more far-reaching nature than have been witnessed for some time, partly because of the engineering experience gained during the past two years and partly because of altered market conditions as a result of the war. Such radical changes in design demand an extended period of try-out, and if designs are started now there will be ample opportunity to submit the experimental models to rigid tests before starting production on them.

## The Post-War Model

WHATEVER thoughts arise in the mind with reference to the post-war automobile, there is one which should be universal. The pre-war car is not good enough.

We have all had a chance to clean house during the war. Manufacturers generally, in shifting from commercial to war work, have been able largely to idealize their factories and methods because the commercial factor did not stand in the way. In getting back to a peace basis the same thought can apply.

The inaccessible, heavy, uneconomical cars of the past must go. The new product must embody the principles of transportation efficiency. Less weight-per-pound of load, higher torque-per-pound of engine weight, per unit of displacement and per cubic inch of underhood space must be incorporated in the newer cars.

It is true that the development of the last 10 years in automobile design and manufacture was all trending in this direction, but now we have the opportunity to start afresh. The engineer has the opportunity which he has been craving for years. He does not have to confine himself in his designs in order to meet the requirements of the material left over from the year before, nor does he have to keep



within the limits of design as laid down by the sales department, on account of a committed policy.

There will be a period during the next few months when the material situation will make it impossible to start production. That is the time that should be occupied by real engineering design. When the time arrives that the Government again releases for commercial use the stores of steel now held for war, we will be off to a fresh start.

Let us take all we knew before, add to it what we learned during the war in the production of airplanes and other highly accurate Government material and come out with cars which from a standpoint of design and workmanship will leave past models as far behind as democracy has left autocracy.

We can be sure that the designers of Europe have learned much and will profit by it.

Let us not remain behind.

## Price Adjustment

LIKE every other industry that has been more or less upset by the war, the automobile industry is bound to meet with considerable difficulty in regaining its stability. Prices of automobiles have been greatly boosted, first by the rising prices of labor and material and then as a result of the action of the War Industries Board in curtailing the delivery of material to automobile manufacturers and thus artificially cutting down the supply of cars. Undoubtedly a readjustment in price will have to come, but whether it will be immediately or only after a considerable period and whether it will substantially equal the price increase since the outbreak of the war or be less drastic are questions which cannot be answered off-hand and concerning which there are wide differences of opinion.

It is tolerably certain that there will not be any appreciable reduction in material and labor cost for a considerable time to come. In the last analysis it all comes down to a matter of labor cost, because a very large percentage of the cost of raw materials is made up of the cost of labor used in producing them. The wages of labor, on the other hand, must of necessity bear some relation to the cost of food-stuffs and other necessities of life. As the supplies of all of these necessities have been depleted by the war and the prices of some of them are guaranteed by the Government for a definite period, their cost is bound to remain high and there is no immediate hope for a general decline toward a pre-war basis all along the line. Materials will remain high, the wages of labor will remain high, and in so far as the present prices of automobiles are based directly upon these two factors their maintenance for some time to come will be fully justified.

On the other hand, there is a likelihood that some of the later advances in price were based not on increased cost, but on the artificial disturbance of the relation between supply and demand. Price increases in passenger cars seemed to be warranted even by patriotic considerations, as the Government had declared that the passenger car was a non-essential in the winning of the war and that its produc-

tion must be curtailed. There was some evidence that manufacturers were acting in accordance with the spirit of this ruling, for in one particular instance a manufacturer increased the price on his passenger model and at the same time lowered the price on his commercial model which had substantially the same specifications. It was therefore obvious that this price revision was not the result of increased manufacturing cost but of a desire to direct automobile production into channels of more importance to the Government.

Where price revisions have been made for such reasons it is only natural that they should be immediately canceled, now that the war is over. In this connection it must be remembered that owing to the unusual conditions in the automobile market during the past year the general price level has been considerably disturbed. That is, the prices asked for cars do not bear the close proportion to the cost of manufacture and the intrinsic value of the machines that we would expect in normal times. For this reason, too, the fact that some few makers have cut their prices is no sign that there will be an immediate general price reduction. In fact, the consensus of opinion in the industry is that conditions are not ripe for such a reduction.

ONE of the greatest problems of the reconstruction period will undoubtedly be the creation of a demand for airplanes for other than war purposes. This is a problem the solution of which dissolves largely upon the Government, for it was the Government that induced the abnormal growth of this industry and held it down to normal profits. To now turn the industry adrift and let it shift for itself as best it may would certainly not be fair. There has never been a commercial demand for airplanes and one cannot be created over night. But if the organizations are to be held together an outlet must be found quickly. The most promising field for the immediate future is in aerial mail services, and it is most encouraging to learn that fifty additional aerial mail lines are in contemplation.

Of course all orders for military airplanes need not necessarily cease with the ending of the war. We certainly have all the army machines we will need for some time, but the suggestion has been made that our coast defenses should be equipped with hydro-aeroplanes or flying boats and if this is considered essential by the responsible authorities, a considerable volume of business would result.

THERE is much talk, privately and officially, of possible "unemployment." It is idle gossip. This nation is short 4,000,000 immigrants from the last four years. It is short 4,000,000 soldiers and sailors taken for the Army and Navy. Immigration will not increase importantly with peace. Europe offers too much opportunity. The Army and Navy will keep 1,000,000 men for European and sea police duty. It will take six months to muster out the 3,000,000 other men. There will be no "unemployment" because of peace. Some shortage of labor will continue.

# □ Latest News of the

## General Price Cut Not Likely

### Manufacturers Not Inclined to Follow G. M. Lead in Reduction—Adjustment Period Necessary First

DETROIT, Nov. 26—Manufacturers generally will not follow the lead of the General Motors Co. and others in cutting prices. In fact, some have already sent out letters to their dealers telling them not to look for a reduction in prices until July "unless the action of some concerns precipitates a price war," in which case, they have assured their dealers they will be protected.

It is pointed out that in general, where prices have been reduced, the reduction is more theoretical than real, as the reduction has been made from prices that never really went into effect because they were announced either recently or when the dealers had no cars to sell.

There is no denying the fact, that as a whole, peace has caught the manufacturer, as well as the ordinary citizen, unawares. The executives have had their minds concentrated on the request of the Government to have their plants on 100 per cent war work by January 1. In the twinkling of an eye, the entire problem has reversed itself, and it is now necessary to get back to a 100 per cent peace basis as rapidly as possible.

In the face of this it is not thought possible that prices can begin to descend on any safe and sane basis until at least the latter part of the coming Spring. Materials are just as high in price as they have been, labor prices are still on the same level and the manufacturing organizations of most automobile and motor parts concerns are on a war basis as regards tools and fixtures.

Selling organizations throughout the country are disrupted, both as regards main dealers and sub-dealers. These will have to be re-established and while this can be carried out fairly rapidly in most cases, it will take time to arrange contracts and get matters lined up on a workable basis.

The manufacturer has been out of touch with the dealer, and the dealer has been out of touch with the manufacturer, and the result is that the dealer does not understand the factory situation. This has already evidenced itself by the letters which have poured in from all parts of the country showing that the ideas of the dealer in regard to what the factory can really do towards

getting back on a pre-war basis are to say the least, very vague.

A question which is paramount in the minds of manufacturers now is, "What does the public really expect?" Former avenues of information, through dealer and sub-dealer organizations, have not been functioning as in the past, and the result is that the manufacturing intelligence department is not as well informed as usual. There is a vague belief in the minds of the public, which has manifested itself in many ways, particularly through the dealer letters, that there are post-war models all ready and waiting for them. This probably would have been the case if the war would have gone another twelve months, but it is not the case now.

There are several tentative cars drawn up on the boards of the manufacturers, but very few of them have gone beyond the outline stage. There has not been time, and the question of getting the plant on a 100 per cent war basis has been so much more pressing, that there has been no time to push engineering designs. Furthermore, the demands of the Government upon the automotive engineering brains of the country have been so heavy that there has not been any talent available.

In Europe, where manufacturers have had four years of war, the situation is different. There are many post war cars designed in Europe, if apparently authentic reports be true. But on the other side of the water the demobilization of industry will be far slower than in this country, because they are far more deeply into it. Furthermore, the departures from pre-war manufacturing methods in Europe have been far more radical.

Orders for materials are being placed very slowly. There is not going to be any overnight turn-over to peace work. It is going to take eight months at least to get back on a solid footing, and during this time all branches of the industry, engineering, sales, manufacturing and purchasing, have a large and delicate task on their hands. It would be a false move at the present time to attempt to educate the public to quick and drastic price reductions, because they cannot logically be followed through.

#### Few Changes in New Maxwell

NEW YORK, Nov. 27—The new Maxwell cars coming through show refinements in detail only, the chassis design remaining practically the same as before. There is no change in price. The gasoline tank has been moved to the rear, the top is Pantasote and the dashboard is mahogany finish. The Johnson carburetor is now furnished as standard equipment.

## 26 Cities Schedule Shows

### Circuit of Local Exhibitions Arranged at Cleveland Meeting of Show Managers

Cleveland.....	Late March, early April
New York.....	Probably February
Chicago.....	Probably March
Philadelphia.....	March
Detroit.....	January
St. Louis.....	Second or third week March
Utica.....	March
Syracuse.....	March
Des Moines.....	Feb. 17-22
Newark, N. J.....	Feb. 15-21
Brooklyn, N. Y {	Cars.....March 22-23
	Trucks.....April 1-5
Indianapolis.....	Not decided
Trenton, N. J.....	Third week March
Boston.....	March
Pittsburgh.....	March
Kansas City.....	Not decided
Louisville.....	Feb. 15-22
Milwaukee.....	January or February
San Francisco.....	March 1-10
Minneapolis.....	Not decided
Harrisburg.....	Not decided
Buffalo.....	First week March
South Bethlehem {	Cars.....Feb. 17-22
	Trucks.....Feb. 24-27
Bridgeport.....	Not decided
Hartford.....	Not decided
Fort Dodge.....	Depends on building

CLEVELAND, Nov. 25—Local dealer shows will be held in 26 cities between January and April, 1919. A definite program of exhibitions was adopted today at a meeting of the National Association of Show Managers in convention at the Hollenden. Many of the dates are tentative, and in several cases the time when the show will be held depends upon the ability to obtain a suitable building.

When the National Automobile Chamber of Commerce last week voted not to hold the national events in New York and Chicago, the dealers all over the country immediately got busy. Plans were set afoot for bigger and better local exhibitions than have been held in previous years and in consequence such exhibitions are to be staged by dealer associations in 26 of the largest cities.

Definite arrangements have not yet been completed for the New York or Chicago shows. The New York dealers plan to stage their exhibition in Madison Square Garden probably in March. Chicago is figuring on the Coliseum, the Municipal Pier or the Siegel-Cooper Building. Minneapolis, which last year put on a truly automotive exhibition, which was bigger than the national shows in New York and Chicago together, will repeat the affair. Several cities have split their show programs into two periods, one for passenger cars and the other for trucks.

# Automotive Industries □

## Substitute for Gasoline Tested by Bureau of Standards

Said to Be More Powerful Than Gasoline, Available in Ample Quantities and Entirely Satisfactory—Invention of Army Officer to Be Known As Liberty Fuel

WASHINGTON, Nov. 26—The Bureau of Standards has recently completed a series of tests of a substitute for gasoline which is said to be satisfactory in every respect, to cost less than gasoline, to be available in ample quantities and to give more power than gasoline.

The fuel is the result of experiments of Capt. E. C. Weisgerber, and the formula is a secret. A deal has been completed to commercialize the product and place it on the market.

### Manufactured by Still Process

AUTOMOTIVE INDUSTRIES, making this announcement exclusively this week, can state further that the substitute is in liquid form manufactured by a still process, composed of commodities which are now a drug on the market and which are plentiful enough to assure supplies to meet the future demands. The formula is a secret in the hands of the General Engineering Depot and the inventor. The cost of manufacture is said to be 40 per cent lower than that of making gasoline.

The substitute, which is known as Liberty fuel, is the direct result of experiments by Capt. E. C. Weisgerber, an oil and gas engineer, who was first connected with the Engineering Corps and has lately been working at the Bureau of Standards. He was ordered to conduct the experiments by his commanding officer for the purpose of securing a fuel other than gasoline and more powerful and economical if possible.

### Inventor an Army Officer

The substitute is described as scentless, tasteless and without gasification scent. It is said that its products of combustion are cooler than gasoline. It is reported to be non-corrosive. It does not give out soot or carbon, according to the reports, and starts easier than gasoline.

The quality and specific gravity are changeable at will, it is stated, and the substitute shows no ill effect on the lubricating oil. It will ignite only from spark or flame. No special apparatus is required either in the engine or carburetor or in the manufacture of the fuel.

Tests were held at the Naval Air Station and at Anacostia Flying Field, D. C., in comparison with special "X" quality of gasoline in which the water used with

the Liberty fuel remained below 160 deg. Fahr. and the oil below 130 deg. Fahr.

In the tests by Army officers, mainly conducted by Captain Weisgerber, the new fuel was used in a passenger car, motorcycle, airplane, tractor and truck in comparison with gasoline. In the tests by the Bureau of Standards at the laboratories it was used in a Class B truck engine and a 150 hp. Hispano-Suiza airplane engine in comparison with gasoline.

Used on a passenger car the fuel drove the car 17½ miles to the gallon as against 9 m.p.g. on gasoline, and increased the speed from 47 m.p.h. to 69 m.p.h.

### Tested in Hydroplane

In a hydroplane with the engine at 1600 r.p.m. the plane remained in the air 22 min. longer on 10 gal. of Liberty fuel than on 10 gal. of gasoline.

A Harley-Davidson motorcycle was driven 23,000 miles in severe tests and showed no corrosive action and no carbon. Weighing 593 lb. with its load the motorcycle journeyed 256 miles without adjustments on 4.66 gal. of Liberty fuel, consuming 1½ qt. lubricating oil, averaging 55 m.p.g. The average speed was 22.5 m.p.h. Used with gasoline over the same route and at the same speed the motorcycle averaged 32.18 m.p.g. and consumed 4 qt. of oil.

### Increases Truck Mileage

A Garford 3-ton truck weighing 7373 lb. with its load averaged 10.4 m.p.g. with Liberty fuel over 232 miles, used 2 gal. of water in the radiator and consumed 2¼ qt. of lubricating oil, or 103.1 miles per quart. The journey was made at a speed from 9 to 12 m.p.h., the lower speed during rain. With gasoline the truck averaged 6.37 m.p.g., consuming 45 gal. of gasoline, used 8½ gal. of water in the radiator and 4¼ qt. of lubricating oil at the rate of 63.5 miles per quart of oil. The truck easily traveled the Cumberland district mountains on high speed on Liberty fuel, and failed to do this with gasoline.

In a report of tests of the Liberty fuel by the Bureau of Standards signed by W. S. Stratton, chief of the bureau, on Nov. 21, it was stated that three grades of the fuel were submitted marked "type A," "type B" and "Liberty fuel," the

first two being for passenger car and truck use and the third for airplane consumption.

The class B standardized truck engine and a 150 hp. Hispano-Suiza airplane engine were used by the Bureau of Standards in making tests. The truck tests were at one-half the maximum power and one-quarter the maximum power with readings taken in each run at a fixed load at 200 r.p.m. from 400 r.p.m. to 1200 r.p.m.

Commercial and special "X" gasoline were used in comparison. A Claudel carburetor was a part of the airplane engine. New spark plugs were used with each change of fuel. The airplane was operated under all conditions and with the throttle wide open.

### Operation Completely Satisfactory

Summarizing in the report Dr. Stratton stated that there was no engine operation trouble, that the exhaust was clean, odorless and generally like gasoline, and that the Liberty fuel gave equal power, giving 3 per cent greater pounds consumed per brake horsepower and with consumption 5 per cent less than gasoline.

The summary further stated that the spark plugs showed slightly more carbon with Liberty fuel, and that the Liberty fuel showed 3 per cent greater horsepower when consuming 10 per cent greater weight of fuel per horsepower per hour though with the thermal efficiency of the engine 2 per cent greater as in contrast with special "X" airplane gasoline.

It was also stated that crystallization occurred at 14 deg. Fahr. and that the fuel could not be cooled much below this without danger of stoppage of fuel lines and the carburetor jet.

The differences between the criticisms above and the claims made by Captain Weisgerber were in the main cleared away. The crystallization, for example, it was agreed, could be eliminated by slight change in the quality of the Liberty fuel.

Following are excerpts of tests by the Bureau of Standards:

	Pounds of Fuel of U. S. Gals. at 60° Fahr.	Heat Value B. T. U. U. S. Gal.
Motor fuel type A.....	7.19	126,300
Motor fuel type B.....	7.20	127,900
Liberty fuel.....	7.07	124,800
Commercial G. S. C. 1918	6.33	119,200
Export airplane gasoline	5.93	113,000

Using motor fuel A versus gasoline in the B truck:

	R.P.M.	Beam. Lb.	Consump- B.H.P. tion	
Gasoline	407	127.75	17.4	.131 } with full
"A" fuel	409	134.63	18.4	.128 } load
Gasoline	401	68.00	8.8	.166 } with half
"A" fuel	408	66.25	9.0	.141 } load
Gasoline	400	32.50	4.3	.191 } with quar-
"A" fuel	411	33.00	4.5	.176 } load

(Continued on page 945)



## Ryan Out as Head of Aircraft

Secretary Baker Accepts Resignation but Sets No Date  
—No Successor

WASHINGTON, Nov. 22—John D. Ryan, Second Assistant Secretary of War in charge of Aircraft Production and Operation, has tendered his resignation. The resignation was accepted by Secretary of War Newton D. Baker, who has requested Mr. Ryan to set his own time for the relinquishment of his duties, and expresses the hope that Mr. Ryan will continue until demobilization and contract cancellation plans are matured.

John D. Ryan prior to assuming charge of aircraft was at the head of Red Cross work in Washington. He has been the president of the Anaconda Copper Co. and a prominent figure in the copper field since 1907. He was appointed to supervise the Bureau of Aircraft Production following the resignation of Howard E. Coffin as chairman of the Aircraft Production Board, and at a later date following the aircraft report by the Senate Military Affairs Committee, Secretary of War Baker appointed Mr. Ryan as Assistant Secretary of War in charge of all aircraft, including not only production but also operations.

Following is the correspondence between Mr. Ryan and Secretary Baker:

Nov. 21, 1918.

DEAR MR. SECRETARY:

With the signing of the Armistice and the consequent reduction in the program of Aircraft Production, I believe my work here has become relatively unimportant. I have not taken over the actual direction of Military Aeronautics and my connection with it has not made any real change in its operations.

I feel strongly that now the war is over, my duty lies in the line of my former work. Labor and industry of the country must be quickly adjusted from a war to a peace basis, and the copper production is one of the most vital of the country's welfare. I believe I can do much in helping to bring about stable conditions, and that I should take up the work immediately.

I therefore resign as Second Assistant Secretary of War and Director of Air Service, to take effect as soon as convenient to you.

I desire to express to you my sincere gratitude for the opportunity given me to serve in the war. I have had at your hands the greatest assistance and encouragement in all the work I have had to do. I shall always prize the association with you and with the War Department.

Sincerely yours,

(Signed) JOHN D. RYAN.

To the Secretary of War,  
Washington, D. C.

JDR/ISD

Nov. 22, 1918.

MY DEAR MR. RYAN:

I have just received your letter of Nov. 21. Realizing the very great importance of the production and distribution of copper in the re-establishment of our national civilian industry, and your own intimate relation to this great business, I reluctantly acquiesce in your desire to return to it and to terminate your relations as Second Assistant Secretary of War and Director of Air Service.

Your unfailing courtesy has been a source of great personal happiness to me, and your services to the country as Director of Air Service have been conspicuous; the sense of sureness and executive efficiency which your advent contributed to the Air Service made from the first a marked improvement in the entire prospect. The armistice of course has interrupted the constructive development of that great program. It had, however, advanced beyond the experimental stages, and in so new an art as the air service

America's contribution within a year and a half was substantial and would, in a short time, have been determinative.

I shall set your own judgment as to the most appropriate time for the termination of your office, expressing only the hope that you will continue until the plans for contract cancellation and demobilization are sufficiently matured to allow those who are to carry them out to have definite and fixed principles for their guidance.

Cordially yours,  
NEWTON D. BAKER,  
Secretary of War.

Honorable John D. Ryan,  
Second Assistant Secretary of War.

### No New Director to Take Ryan's Place

WASHINGTON, Nov. 23—Following the announcement of the resignation of John D. Ryan it is said by the War Department that a new director will not be elected for the present to take his place. There is no longer a production problem to be handled and the airplane operation will now naturally become a military function probably to remain under Major General William Kenly, who is in charge of the Division of Military Aeronautics. It was stated that pending reorganization of the Army and the War Department on a peace basis, recommendations for which will be laid before Congress next month by Secretary Baker, it is not possible to arrange for the permanent aircraft establishment of the Army.

### Five Training Fatalities

WASHINGTON, Nov. 20—For the week ending Nov. 9 there were five fatalities on the flying fields of the United States resulting from training in aviation. One fatality occurred at Dorr Field, Arcadia, Fla.; one at Ellington, Houston, Tex.; one at Langley, Hampton, Va.; one at Payne, West Point, Miss., and one at Wilbur Wright, Fairfield, Ohio. For each fatality reported a total of 4019 hours of flying, or 231,520 miles of air travel, is shown.

### Continue Washington Naval Airplane Base

WASHINGTON, Nov. 22—The naval air station at Anacostia, D. C., will be made permanent and continued by the Navy as a testing field. Hangars have already been constructed, housing nine hydroplanes, and a personnel of 150 men is maintained.

### Post Office Wants Anti-Freeze

WASHINGTON, Nov. 25—The Post Office Department, Office of the Purchasing Agent, has asked for bids as follows, f.o.b. factory, sealed proposals to be made prior to 2 p. m. Dec. 2:

Non-freezing solutions for use in motor truck radiators.

Quote on quantity sufficient for 25 cars.

Quote on quantity sufficient for 50 cars.

Quote on quantity sufficient for 100 cars.

Quote on quantity sufficient for 200 cars.

It is to be understood that samples are to be submitted, if requested by the department, prior to making the award.

## Minerals in Burma Increase 16½%

Petroleum, Most Important,  
Only One to Decrease —  
25% Increase Over 1915

WASHINGTON, Nov. 22—The Government of Burma, according to the American Consul there, increased its mineral product output in 1917 16½ per cent above that of 1916 and 25 per cent higher than in 1915. The figures for the 3 years are as follows:

Minerals	1915	1916	1917
Petroleum	\$6,033,378	\$5,357,534	\$5,119,535
Tungsten ore	1,383,890	2,349,571	2,975,340
Lead	1,538,550	1,567,214	1,984,227
Silver	151,343	430,935	1,154,757
Tin and tin ore	207,142	316,435	461,339
Building material and road metal	320,036	319,554	347,627
Rubies, sapphires and spinels	176,646	172,557	252,236
Jade	61,695	45,330	140,794
Gold	60,028	37,517	20,672
Zinc ore	847	28,354	.....
Iron ore	20,147	20,869	6,151
Clay for pottery	651	3,163	3,597
Molybdenite	.....	445	3,715
Amber	970	766	3,329
Bismuth	.....	.....	735
Antimony ore	33	2,433	742
Platinum	484	226	93
Copper	11,515	.....	.....

Total.....\$9,967,355 \$10,662,903 \$12,424,529

The figures given in the table are said to represent the actual value of the product at the point of production.

The only mineral product of any consequence which showed a diminution in value of production was petroleum. The increase was most marked in silver, tungsten, tin and lead.

Petroleum is the most important mineral product of Burma, and petroleum production and refining is, next to the production and milling of rice, the most important industry of the Rangoon consular district. The value of the crude petroleum as stated in the above table gives little idea of the importance of this industry, for, of the products of the petroleum refineries—kerosene, gasoline, benzene, lubricating oil, paraffin, candles, etc.—after furnishing most of the needs of Burma, about \$20,000,000 worth a year is exported to foreign countries and to other ports of India.

The principal oil fields of Burma are located in the Irrawaddy valley, about 200 to 400 miles from the sea. The most productive fields—Yenangyaung and Singu (Chauk) in the district of Magwe—are located on the left or eastern bank of the river. The field on the western slope—Yenangyat in Pakokku district, Minbu in Minbu district, and Minhla in Thayetmyo district—have never been so successful. The Kyaukpyu and Akyab fields on the Bay of Bengal are almost negligible. About 150 Americans—oil drillers, bosses and superintendents—are employed in the oil fields of the Irrawaddy valley. The production of petroleum is practically in the hands of Americans, and Yenangyaung, Chauk and Yenangyat are to all purposes American towns.

The production in gallons of each of these fields for the years 1915-1917, respectively, was as follows:

Fields	1915 Gal.	1916 Gal.	1917 Gal.
Yenangyaung	198,809,315	240,194,063	176,979,020
Singu	77,005,880	44,105,013	85,639,166
Yenangyat	4,099,345	5,310,740	6,620,908
Minbu	2,316,207	2,043,542	3,468,382
Minhla	25,920	35,000	30,000
Kyaukpyu	23,220	68,843	46,821
Akyab	12,045	11,882	10,894

Total.....282,291,932 291,769,083 272,795,191

The output for 1917 was 19,000,000 gal. less than that of the record year of 1916, and nearly 10,000,000 gal. less than that of 1915. The decline during the past

Tungsten ore (wolframite) and tin ore are obtained in extreme southeastern Burma, in the narrow strip where the mountains, which separate Burma from Siam, slope down toward the coast of the Bay of Bengal, the Gulf of Martaban, and the valley of the Sittang River above the head of the gulf. This region, of which the district of Tavoy is the center, claims to be the chief wolfram-producing region of the world. What promises to be an important field was recently discovered in the district of Yamethin, on the border of the southern Shan States in the upper valley of the Sittang. The production of wolfram and tin for

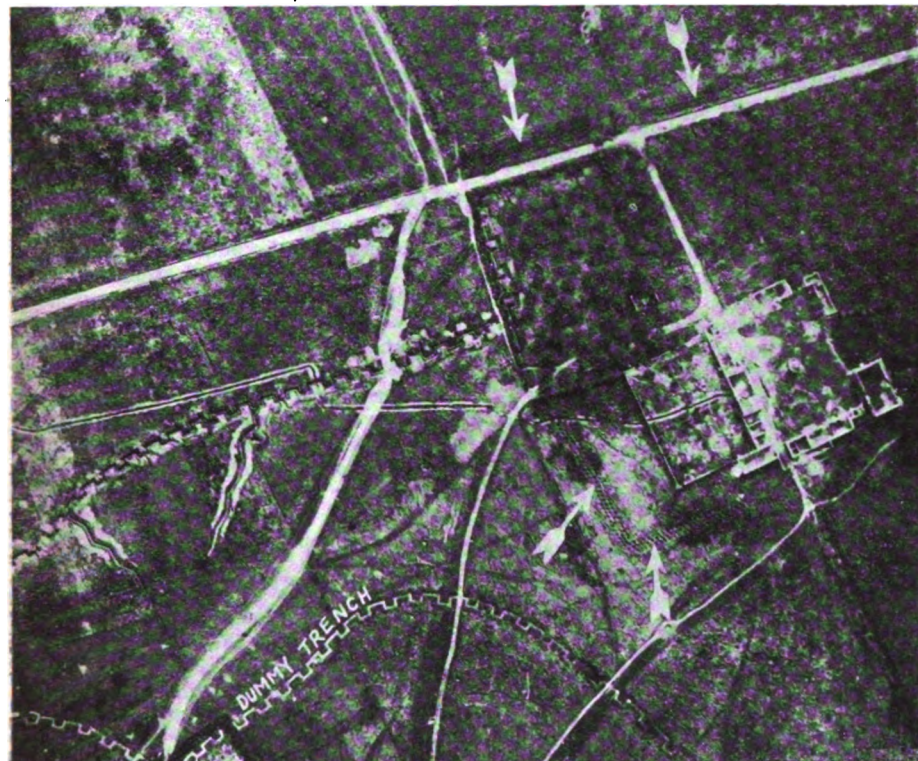
the years 1915-1917 was as follows: In the districts of Tavoy, Mergui, southern Shan States and Thaton, wolfram ore, 11,761 tons; in the same districts, with the addition of Amherst, tin ore, 1385 tons, and in Mergui alone, block tin, 382 tons.

#### Olds Price Advance Rescinded

DETROIT, Nov. 25—The Olds Motors Works, Lansing, Mich., has withdrawn the advanced prices announced about Oct. 1 last. At that time the material and war tax situation apparently justified an advance which, now that peace is here, appears unnecessary. Oldsmobile distributors, therefore, have been advised that the scale of prices in force prior to Oct. 1 last will rule. Present production at the Olds plant consists of coupes and sedans, a limitation on production which likely will persist until after the first of the year.

## Views From an Airplane Camera

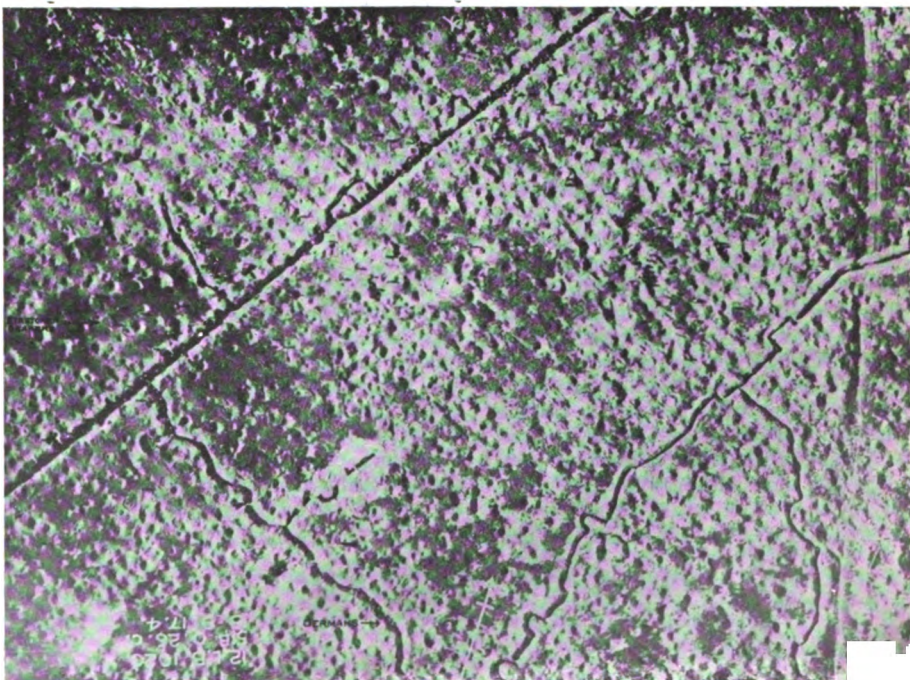
The arrow shows a "Trou de loup" guarding a farm. The true worth of the airplane camera is made plain by this picture, which plainly distinguishes between the real trenches and the dummies. The eye cannot distinguish the difference, but to the camera the dummy throws no shadow



year was in the Yenangyaung field (the Singu, Yenangyat and Minbu fields showed a marked increase) and was due to the lack of tonnage to move the product and to the difficulty in getting piping and other supplies.

The Government of Burma is doing everything possible to encourage the production of tungsten, and its efforts have been attended with good results. The 1917 output of this metal was nearly 25 per cent greater than that of 1916, which, in turn, was nearly 50 per cent greater than that of 1915. The increased production of tungsten ore and the high price of tin, which is found associated with the tungsten, has led to a similar increase in the output of this metal.

*This view was taken while the British were charging to the German second line trenches, having taken the first line. Unfortunately the altitude of the plane was too great to reveal the troops in detail*





## Intelligent Selection Cuts Turnover

Bureau of Labor Reviews Methods of Plant Where Labor Turnover is But 65%

WASHINGTON, Nov. 23—The October issue of the Monthly Review of the United States Bureau of Labor Statistics contains an article by Dr. Boris Emmet, which shows that a large motor-vehicle manufacturing concern in the Middle West has been remarkably successful in keeping labor turnover down by using intelligent methods in selecting and handling its labor force.

Twenty-two plants in the same locality were studied by the Bureau of Labor Statistics, of which only four had a turnover of less than 100 per cent per annum, while a turnover as high as 500 per cent is not unusual. The turnover in the particular plant referred to above has not exceeded 75 per cent per annum since 1915, and for the year ended April 1, 1918, the turnover was less than 65 per cent.

Doctor Emmet found that the company's labor policy had much to do with keeping down the turnover. This company favors hiring married men past 35 years of age and residents of the city where its plant is located, for there is little to draw them away. There is no objection to union membership. Wages are adjusted in accordance with changes in the cost of living, ascertained by studies and records kept by working-men's families.

Committees of workmen are encouraged to get in touch with the management to discuss or forestall grievances. Good working conditions and good treatment of employees are insisted upon, and no scheme of payment that may appear to drive the workers is introduced.

The management realized quickly after the war broke out that living costs must be met by wage increases if labor turnover were to remain low. Late in 1917 it was announced that future wage adjustments would be based on the cost of living. A study of local prices was made, as a result of which it was found, for example, that in November, 1917, a local family of 5 spent on the average \$41 for food, \$22 for rent, \$10 for heat and light, \$10 for clothes and \$7 for miscellaneous purchases, a total of \$90 a month. The wage rate was set high enough to provide a comfortable margin over this figure, and at present initial wage rates are about \$24 a week for adults on the day force. Length of service means increased pay, and considerably more than half the day men make from \$25 to \$35 weekly.

Committees which meet company representatives to adjust or prevent disputes are elected by popular vote, and their personnel changes monthly, thus giving more employees a chance to serve.

Night workers are less likely to remain away from work than those employed during the day. The probability that this condition may hold good generally appears from the facts that night workers can attend to personal business during the day, that because they are better paid they lose more money in staying away, and that because they are, in general, young men they are less liable to sickness than the day workers.

### Ford Leaves Ford Motor

DETROIT, Nov. 25—Henry Ford is withdrawing from active participation in the Ford Motor Co. to become a newspaper publisher and to give more time to Henry Ford & Son's tractor business. The new publication, which is to be issued once a week, will be printed in Dearborn, Mich. It is to be known as Henry Ford's National Weekly. E. G. Pipp, former editor-in-chief of the Detroit News, is editor.

Utilization of the great Ford selling organization to put the publication on the market nationally is planned by the directors of the weekly. Just how this will be done has not been announced, but it is presumed that every Ford car, truck and tractor dealer will be a circulation agent for the paper. The aim of the publishers is to establish a circulation of one million copies within 6 months, and to assure this the Ford organization will be used. Ford's son Edsall will take his father's place in the Ford Motor Co.

### Automobile Agency Wanted

WASHINGTON, Nov. 25—The Department of Commerce reports an individual in the Netherlands desiring an agency for automobiles, motorcycles and oil motors for vessels. Payment will be made in Dutch currency on arrival of the goods. Correspondence can be made in English. Further information can be secured by asking the Bureau of Foreign and Domestic Commerce with regard to "foreign trade opportunity No. 27713."

### Automobiles and Motorcycles in Australia

MELBOURNE, Oct. 24—The following table gives the number of passenger cars and motorcycles in use in the Commonwealth of Australia. Figures for Western Australia are not available at this time, therefore those for New South Wales, Victoria, South Australia and Tasmania only are given. South Australia totals are as of Sept. 30, 1918; the others are as of June 30.

Census of Motor Vehicles in Australia

	Queensland	New South Wales	Victoria	South Australia	Tasmania	Total
Cars .....	2,404	20,645	14,142	8,512	1,890	47,593
Motorcycles .....	688	8,532	9,530	6,968	1,425	27,133
Totals .....	3,092	29,177	23,672	15,470	3,315	74,726

## To Use Army Trucks for Mail

Post Office Makes First Move  
Toward Their General Adoption—Halve Mail Cost

WASHINGTON, Nov. 25 — The first step toward extensive use of Army trucks for mail service with discharged enlisted men as drivers was taken Saturday by the Post Office Department when it requested the War Department to release 7 trucks and 4 men for a 115-mile star route between Helper and Vernal, Utah.

This route now costs the Government \$78,000 a year, and it is estimated that by the use of Army trucks, and payment of \$4 per day to former soldier chauffeurs, the cost can be cut in half.

The Post Office will request 400 additional trucks and men shortly and increase the numbers as Army demobilization proceeds. It plans an interlacing motor truck system with terminals extending from the Atlantic to the Pacific coasts in the form of a U-shaped route with the three points at Portland, Me.; New Orleans, and Portland, Ore.

At present a Portland, Me., and New Orleans route is in operation with a 12-day schedule between the two cities. Motor truck routes have been operating successfully from the financial standpoint, one of 135 miles earning \$16,000 a month with an upkeep cost of \$800.

### 20,000 Army Trucks Available

It is expected that 20,000 motor trucks will be released by the War Department for this rural mail service.

According to the bill proposed by Congress, Army trucks and airplanes can be and are to be turned over to the postal officials by the War Department as they can be used for postal service, following the war, as they are demanded by the Post Office. It is the plan that the Post Office authorities are operating and subjecting to use thousands of motor trucks. The general plan also includes the establishment of mail service by truck, chiefly at points where there is neither rail nor water facilities for hauling the mail matter, and by means of this it is expected that the territory of the United States which is now not enjoying the benefit of first class mail service will be efficiently linked with rail and water transportation, by means of the motor trucks.

### Will Improve Communication

According to Fourth Assistant Postmaster James Blakslee, the introduction of a huge number of motor trucks into the mail service will consequently tend to complete the mail service throughout the nation, make more efficient the rural district life, especially those now suffering from poor means of communication and transportation, and will further tend to increase the importance of many communities which are now out of proper contact with the railroads and waterways.



## Domestic Manganese Supply Doubled

### U. S. Mines Now Produce One-Third of High-Grade Ore Needed by Nation

WASHINGTON, Nov. 25—Domestic mines now supply one-third of the high-grade manganese ore used in the United States. This is an extraordinary increase over the production of 1917 when the domestic mines supplied only one-sixth of the ore needed. During the first 6 months of 1918 shipments of ore contained more than 35 per cent of manganese, total 136,554 tons, and in October this grade of ore was being shipped at a rate of 28,000 tons monthly, or 336,000 tons a year.

#### Estimated Output 324,000 Tons

It is estimated that the total production of high-grade manganese in this country in 1918 will be 324,000 tons. The extraordinary increase in the output in 1918 has fully offset the loss occasioned by the restriction of imports made necessary by the shortage of ships and has established confidence in the capacity of the domestic deposits to supply a considerable part of domestic need, according to the United States Geological Survey, Department of the Interior, which has just completed investigation of the manganese ore industry in this country.

## Zinc Rolled in the United States, 1915-1917

	1915	1916	1917
Zinc sheets:			
Quantity, pounds.....	77,567,096	73,760,938	90,002,569
Value.....	\$10,952,609	\$13,758,613	\$16,465,052
Average value per pound.....	\$0.14	\$0.185	\$0.18
Boiler plates and special sheets:			
Quantity, pounds.....	2,562,856	3,198,693	6,900,293
Value.....	\$345,572	\$564,814	\$1,111,240
Average value per pound.....	\$0.135	\$0.175	\$0.16
Zinc strips:			
Quantity, pounds.....	10,295,859	18,682,653	20,350,089
Value.....	\$1,445,806	\$3,299,386	\$3,190,559
Average value per pound.....	\$0.14	\$0.17	\$0.155
Total rolled zinc, pounds.....	90,425,811	95,642,284	117,252,951
Total value.....	\$12,743,987	\$17,622,813	\$20,766,851
Average value per pound.....	\$0.141	\$0.184	\$0.177
Rolled zinc exported:			
Quantity, pounds.....	•	25,024,182	33,027,991
Value.....	•	\$4,540,146	\$5,730,792
Average value per pound.....	•	\$0.181	\$0.174
Domestic consumption of rolled zinc, pounds.....	•	70,618,102	84,224,960

\*Figures not available.

Imports of manganese ore by all sources in the first half of 1918 were 244,836 tons. The shipments from abroad came from Brazil, Cuba, India, Chile, Costa Rica and several other countries shipping small quantities. Brazil supplied the greatest amount, shipping in all 171,895 tons. Below is the table showing in detail the domestic shipments of manganese for the first 6 months of 1918:

#### Nash Returns to Kenosha.

WASHINGTON, Nov. 26—Charles W. Nash, who has been chief in charge of production and engineering for the Bureau of Aircraft Production, has returned to Kenosha. With both Ryan and Nash out, this bureau is now without a head.

## U. S. Production of Rolled Zinc

### Both Quantity and Price Have Increased Steadily Since 1915

WASHINGTON, Nov. 26—It is a curious fact that although the Geological Survey Department has for many years collected statistics showing the production of zinc, it has not been possible to publish figures showing the production of rolled zinc. The reason is that the output heretofore has been practically in the hands of two companies and publication would have disclosed individual business.

Since the beginning of the war the increased demand for sheet zinc with which to line packing cases for shipment overseas has been so great as to afford inducement to many other companies to engage in the zinc-rolling business and, it is possible to give figures.

#### Modify Truck Order Cancellations

WASHINGTON, Nov. 26—Owing to the fact that some of the manufacturers of commercial trucks who received orders from the Government prior to the signing of the armistice had more fabricated materials on hand than others, the wholesale cancellation of 50 per cent of all commercial truck orders which was announced last week has been slightly modified and readjusted.

In those plants where there was little or no fabricated material found, the cancellations were increased above 50 per cent, while in those where the Government found a larger amount of materials which meant greater waste of materials with the 50 per cent cancellation, the cancellations were readjusted.

The amounts of regulations or increase of the cancellations was not made public by the Government. An official stated, however, that the changes were not due to demands from General Pershing, and were not important changes numerically. They were merely the readjustment that is being made by each department which following cancellations investigates the materials on hand and then readjusts the contracts.

MANGANESE AND MANGANIFEROUS ORE (GROSS TONS) SHIPPED, JANUARY 1 TO JUNE 30, 1918, AND UNITED STATES GEOLOGICAL SURVEY'S ESTIMATE OF SHIPMENTS DURING THE YEAR 1918

State	ORE CONTAINING 35 PER CENT OF MANGANESE OR MORE			ORE CONTAINING 10 TO 35 PER CENT OF MANGANESE			ORE CONTAINING LESS THAN 10 PER CENT OF MANGANESE		
	JAN. 1 TO JUNE 30		U.S.G.S. Estimate for Year	JAN. 1 TO JUNE 30		U.S.G.S. Estimate for Year	JAN. 1 TO JUNE 30		U.S.G.S. Estimate for Year
	Number of Shippers	Quantity of Ore		Number of Shippers	Quantity of Ore		Number of Shippers	Quantity of Ore	
Alabama.....	1	53	600	2	85	630	•	•	•
Arizona:									
Bisbee district.....	6	7,159	13,290	•	•	•	•	•	•
Other districts.....	11	2,708	5,572	2	4,609	6,237	1	6,082	6,250
Arkansas: Batesville district.....	10	4,089	11,000	10	3,534	8,500	•	•	•
California.....	31	10,601	22,158	1	31	100	•	•	•
Colorado:									
Leadville district.....	•	•	•	11	*60,804	*126,000	•	•	•
Other districts.....	1	67	180	•	•	•	•	•	•
Georgia.....	8	1,963	5,860	5	5,151	10,520	1	800	1,000
Michigan.....	•	•	•	1	5,534	22,500	•	•	•
Minnesota: Cuyuna district.....	•	•	•	9	223,332	635,000	2	53,300	325,000
Montana:									
Butte district.....	5	28,986	78,500	•	•	•	•	•	•
Phillipsburg district.....	18	58,312	133,700	•	•	•	•	•	•
Other districts.....	1	40	500	•	•	•	•	•	•
Nevada.....	11	12,586	26,870	2	40,327	85,080	•	•	•
New Jersey.....	•	•	100	•	•	•	•	•	•
New Mexico:									
Silver City district.....	1	120	250	2	6,978	21,050	•	•	•
Other districts.....	2	312	500	1	1,609	1,609	•	•	•
North Carolina.....	1	244	250	•	•	•	•	•	•
Oregon.....	1	150	500	•	•	•	•	•	•
South Carolina.....	1	100	250	1	850	850	•	•	•
South Dakota.....	1	31	31	•	•	•	•	•	•
Tennessee.....	11	840	3,600	4	959	2,350	•	•	•
Texas.....	1	207	800	•	•	•	•	•	•
Utah.....	7	3,701	6,305	•	•	•	•	•	•
Virginia.....	13	4,280	13,800	12	5,206	14,440	2	3,624	7,700
Wisconsin.....	•	•	•	•	•	•	1	93,741	200,000
	142	136,554	324,576	103	314,137	832,866	7	186,233	1,333,700

\*Fluxing ore not included or not reported.

†Shippers of residuum and quantity of residuum shipped not reported.

‡The part of the ore from Arizona and Nevada that was used for fluxing is not included in total for United States.

§Ore from Wisconsin, containing approximately 5 per cent manganese, not included in total.

## Export Regulations Modified

### Import Rules, Too, Altered Following Signing of Armistice—Bars Let Down

WASHINGTON, Nov. 22—The signing of the armistice has allowed the War Trade Board to modify some of its regulations governing the exportation and importation of commodities, the changes including an additional import of rubber of 7500 tons up to Jan. 1, 1919, and the export of Sea Island and Egyptian cotton. Any hides and skins, not including fur skins, can also be imported hereafter provided that such skins were all contracted for by the American importer prior to Jan. 15, 1918.

The War Trade Board will, it announced, also grant export licenses more freely than heretofore on various commodities. It will not specify the number of licenses nor the commodities, but asks the exporters and importers to make their requests and state explicitly if the licenses are required for business which is actually in need, together with the dates of the orders.

The strictest regulations on exports will be confined hereafter to Europe and Siberia, which will require regulations inductive to the rehabilitation of those sections of the globe. Restrictions will also be placed to some extent on the exportation of bulky commodities by reason of the scarcity of tonnage.

The return of troops, carriage of supplies for troops not yet returned, and carriage of commodities necessary for the relief and construction abroad oblige the War Trade Board to continue its supervision and limit the increase in tonnage engaged in non-regulated trade.

The War Trade Board also calls the attention of exporters to the fact that the Trading with the Enemy Act still remains in force and effect.

#### All Building Construction Permitted

WASHINGTON, Nov. 22—All remaining restrictions on non-war construction throughout the United States were officially removed to-day by the War Industries Board. This permits all building operations of whatever character to proceed. No further permits will be required from the War Industries Board or the State councils.

#### Exports of Oil from Tampico

WASHINGTON, Nov. 23—Declared exports of crude oil and petroleum products from the Tampico district, Mexico, to the United States in September, 1918, amounted to 4,038,167 bbl., according to a report by Vice-Consul D. A. Willson. The movement from Tampico was 2,785,935 bbl.; from Tuxpam, 842,774 bbl., and from the new loading station at Port Lobos, 409,458 bbl.

Shipments to points other than the United States during the same period

were reported as 1,047,554 bbl.; the movement from Tampico was 540,807 bbl.; from Tuxpam, 442,212 bbl., and 64,535 bbl. from Port Lobos. The gross shipments, therefore, reached a total of 5,085,721 bbl., or a greater amount than ever shipped from this consular district. The above shipments included refined products as follows:

Products	From Tampico Barrels	From Tuxpam Barrels
Reduced, crude .....	732,500	.....
Distillate .....	187,000	18,515
Topped crude .....	138,000	18,080
Gasoline .....	179	.....
Naphtha .....	121,000	.....

The destination of oil shipments during the month was as follows:

Destination	From Tampico Barrels	From Tuxpam Barrels	From Port Lobos Barrels
United States .....	2,785,935	842,774	409,458
Dominican Republic .....	10,128	.....	.....
Chile .....	213,329	100,310	64,535
Cuba .....	38,864	.....	.....
Canada .....	.....	26,326	.....
England .....	246,466	.....	.....
Guatemala .....	32,020	.....	.....
Mexico .....	.....	315,076	.....
Total .....	3,326,742	1,284,986	473,993

#### Increase Rubber Import Permits

WASHINGTON, Nov. 22—The import restrictions on rubber have been modified so that the total imports of 25,000 tons which was to be permitted during the last three months of 1918 has been increased to permit the licensing of an additional 7500 tons prior to Jan. 1, 1919. The 32,400 tons will be allocated by the War Trade Board.

#### Fulton Cuts Price \$150

FARMINGDALE, L. I., Nov. 25—The Fulton Motor Truck Co. has reduced the price of its standard chassis by \$150. The old price was \$2,000 and the new price is \$1,850.

#### Airplane Contracts Canceled

WASHINGTON, Nov. 22—Two hundred and twenty-five million dollars worth of orders for airplanes, engines, parts and instruments have been canceled by the Bureau of Aircraft Production, according to a statement by Secretary of War Newton D. Baker. These orders were largely those on which production had not yet started.

#### Start Navy Air Mail Service

WASHINGTON, Nov. 25—An aerial mail service between the Aero Station at Anacostia, D. C., and Norfolk, Va., naval base will be inaugurated shortly by the Navy Department. It will carry official mail only and will in no way conflict with the postal air service.

#### Cancel South Carolina Hangar Project

WASHINGTON, Nov. 22—The War Department has canceled the contract for the construction of a steel hangar at North Camp Jackson, South Carolina.

## Cut All Production Restrictions

### No Official Word from W. I. B. But N. A. C. C. Assumes Such Will Be True Jan. 1

WASHINGTON, Nov. 25—It seems probable that definite word removing all restrictions on the manufacture of passenger cars and trucks will be forthcoming in the very near future. The National Automobile Chamber of Commerce already has come to this conclusion and has announced in a circular to its members that "after Jan. 1 there will be no limitation of any kind on the manufacture of passenger cars or trucks."

Actually no word of authority has come from the War Industries Board. Charles C. Hanch, chairman of the Automotive Products Section of this board, has officially told manufacturers that their pledges to the board will be canceled after Jan. 1. In view of this fact, and after consultation with Hanch and other members of the Priorities Board, the N. A. C. C. has come to the conclusion that all restrictions are to be lifted Jan. 1.

Rhodes Baker, of the Priorities Board, who has been the official point of contact between this board and the manufacturers, has resigned and left the national capital.

#### Siam's Output of Tin and Tungsten

WASHINGTON, Nov. 22—According to an official estimate received from the Vice-Consul at Siam, the output of metallic tin in 1917 was 9466 short tons as compared with 10,078 short tons in 1916. Tungsten ore recovered in 1917 amounted to 800 short tons as against 584 short tons in the previous year.

The Siamese Government collects a royalty on tin and tin ore amounting to 25 per cent of the market price in Singapore, the fluctuation in value at the latter place being adjusted and the rate reckoned according to a "royalty scale" published in the Siamese Government Gazette from time to time. A recent issue of this Gazette notified an extension of the "royalty curve" to meet the increased price of tin. According to telegraphic advice from Singapore the price of tin on Aug. 29 was \$162 per picul, which is approximately 7 per cent of a ton, and at that figure 50 tons had been sold.

A recent order in the Government Gazette announced that the royalty on tungsten ore, which was previously collected at the same rates as in force on tin ore, had been reduced to 10 per cent ad valorem.

#### New Joints for Templar

CLEVELAND, Nov. 25—The Templar Motors Corp. has adopted Thermoid universal joints for use in its latest model.

# Gasoline Production Drops Slightly

Nine Months' Totals Are Satisfactory—Stocks Show a Decrease

## PRODUCTION

	September, 1918	August, 1918
Crude oil (bbl.)	28,390,431	28,534,275
Gasoline (gal.)	314,595,959	330,335,046
(Stocks on Hand—Sept. 30, 1918; Aug. 31, 1918)		
Crude oil (bbl.)	14,462,100	13,946,595
Oils purchased to be re-run (bbl.)	1,312,275	1,082,892
Gasoline (gal.)	269,772,723	285,446,538
Kerosene (gal.)	436,628,907	424,281,481
Gas and fuel (gal.)	583,407,769	569,016,413
Lube. (gal.)	147,425,556	137,496,986
Wax (lb.)	181,044,508	176,197,680
Coke (ton)	16,866	19,912
Asphaltum (ton)	79,424	88,446
Miscellaneous (gal.)	444,353,139	459,891,496

NEW YORK, Nov. 25—Production of both crude oil and gasoline dropped slightly during September as compared with August, but the total production for the first nine months of 1918 is well ahead of that for a similar period in 1917. Stocks of both gasoline and crude have again decreased slightly.

During September the daily average production of gasoline was 10,486,532 gal., as against 10,655,969 gal. in August. When considering these average figures it should be remembered that September has one day less than August.

Stocks of gasoline on hand as of Sept. 30 are 60,562,323 gal. less than the quantity on hand Aug. 31. During September the production of crude oil dropped 143,844 bbl., and stocks of crude increased 515,505 bbl.

Taking to nine months' totals it will be found that the production of both crude and gasoline have increased by 6,355,687 bbl. and 586,428,698 gal. respectively. The stock of kerosene shows

a slight decrease, but, on the other hand, that of fuel oil shows an appreciable gain.

## Eliminate Gasoline Tax

WASHINGTON, Nov. 25—The Senate Finance Committee, which is revising the new War Revenue Bill, has cut out of it the proposed tax of 2 cents a gallon on gasoline.

## Bituminous Storage Limit Off

WASHINGTON, Nov. 25—All storage restrictions on bituminous coal have been removed by the United States Fuel Administration in conformity to the action of the War Industries Board in canceling its preferential industries list. Anthracite coal is not affected, however, by the ruling of the Fuel Administration.

Every industry in the country now may store as much bituminous coal as desired or obtainable, as the action of the War Industries Board removes the necessity for the Fuel Administration to distinguish longer among different classes of industrial plants.

## Boston Dealers After Business

BOSTON, Nov. 23—The armistice and proposed peace has rejuvenated dealers in this city. Now they are planning to go after business again. And in order to get facts at first hand they have journeyed to the factories to learn things. On one train from Boston last week there were enough dealers to nearly fill an entire Pullman sleeper. They were heading for Cleveland, Detroit and Toledo.

## Portland Cement Association's Dinner

CHICAGO, Nov. 20—The annual dinner of the Portland Cement Association will be held at the Biltmore, New York, on Wednesday, Dec. 11.

# New Samson Tractor at \$650

General Motors Develops 2-plow Machine to Compete With Fordson—Out Soon

NEW YORK, Nov. 25—The General Motors Corp. is shortly to enter the market with a new small farm tractor in a price field to compete with the Ford. This will be known as the Model M Samson and will sell for \$650. It is to be a 2-3-plow machine designed to pull two 14-in. plows under all conditions and three plows under favorable conditions.

It is understood that this model is to be in addition to the present Samson model, which is somewhat larger and sells for in the neighborhood of \$1,750. The new machine is to be built in the Janesville, Wis., plant which the company recently acquired and which is now actively being placed in condition for production. It is stated that the machine will be sold by the tractor selling division of the General Motors Corp.

## Investigate Labor Conditions

WASHINGTON, Nov. 22—The United States Employment Service is making an analysis of the labor conditions in industrial centers throughout the country in co-operation with the War Department and the War Industries Board. Approximately 100 industrial centers and 100 industries will be covered by the investigation. The inquiry will be conducted by the community labor boards of the service, which will secure their information by means of personal contact and telephone communication with employers, plant managers, employment managers, labor organizations, commercial bodies, the local employment offices of the service and other sources.

## Total Output of Refineries in the United States for 1917

	Crude (bbl.)	Other Oils (bbl.)	Gasoline (gallons)	Kerosene (gallons)	Gas and Fuel (gallons)	Lubricating (gallons)	Wax (pounds)	Coke (tons)	Asphaltum (tons)	Miscellaneous (gallons)	Losses (bbls.)
1917											
January	24,839,772	no account	203,618,724	137,248,370	469,596,208	60,941,062	39,558,627	44,627	49,894	27,331,019	941,924
February	23,083,433		184,602,595	129,074,504	446,964,925	54,631,765	36,370,297	42,047	40,619	23,685,686	941,110
March	26,230,138	1st 6 mo.	220,523,571	159,028,978	494,855,838	64,345,221	40,868,930	48,839	52,823	26,977,334	870,380
April	25,994,938	1917	228,945,164	157,826,945	462,846,339	63,218,215	41,037,511	46,099	52,849	30,959,901	957,533
May	27,253,391		238,816,209	147,894,846	504,859,695	65,926,007	38,686,364	43,535	67,612	31,086,377	979,245
June	26,453,210		233,671,746	151,477,333	496,742,434	61,045,757	38,075,280	42,513	67,931	30,205,172	1,011,568
July	26,776,856	2,435,533	244,145,292	161,679,053	599,454,966	64,335,905	40,158,033	42,641	65,272	32,359,401	1,111,511
August	27,900,623	2,376,580	254,464,491	149,528,513	632,151,971	64,107,817	38,999,341	46,240	73,878	32,708,312	1,286,141
September	27,529,022	2,632,988	256,132,050	143,203,644	629,914,572	60,757,049	48,300,033	42,986	62,520	30,386,471	1,182,560
Total first nine months	236,061,383	7,445,101	2,064,919,842	1,336,962,186	4,737,386,948	559,308,798	362,054,416	399,527	533,398	435,699,673	9,281,972
October	27,698,023	2,863,518	271,891,234	140,559,542	621,492,374	68,516,071	41,181,400	48,849	73,886	31,804,160	1,355,219
November	26,215,979	2,519,700	264,888,709	125,893,202	592,490,037	64,861,375	39,694,595	45,815	73,289	27,115,002	1,203,110
December	25,155,996	2,069,351	248,846,638	123,354,046	561,954,921	61,090,596	38,269,670	45,175	58,852	27,548,408	1,233,528
Total	315,131,681	14,897,670	2,850,546,423	1,726,768,976	6,513,324,280	753,776,840	481,200,081	539,366	739,425	702,167,243	13,073,829

## Total Output of Refineries in U. S. for First Nine Months of 1918

1918	Crude (bbl.)	Other Oils (bbl.)	Gasoline (gallons)	Kerosene (gallons)	Gas and Fuel (gallons)	Lubricating (gallons)	Wax (pounds)	Coke (tons)	Asphaltum (tons)	Miscellaneous (gallons)	Losses (bbls.)
January	23,842,587	2,300,334	242,632,044	119,358,184	547,866,248	56,625,425	39,238,858	41,216	54,854	70,995,829	1,078,181
February	23,386,676	2,298,333	234,324,619	121,218,320	510,165,397	58,300,914	35,087,337	42,371	42,033	76,134,088	983,992
March	26,239,662	3,696,872	269,647,968	151,228,007	587,985,804	69,308,351	43,597,019	44,248	56,901	94,865,148	1,097,489
April	26,201,544	3,956,244	293,396,162	153,703,682	578,255,341	71,022,204	40,173,524	45,674	51,242	89,242,012	1,182,020
May	23,510,698	4,112,023	319,391,202	160,590,760	631,586,209	79,589,755	42,544,633	48,864	60,449	88,627,491	1,269,281
June	28,140,479	3,483,270	315,023,445	151,840,252	628,842,033	74,420,996	41,317,794	46,605	50,321	81,110,922	1,269,281
July	29,170,718	5,951,537	332,022,095	156,828,826	658,439,682	79,303,107	41,691,551	48,914	58,433	159,374,139	1,269,281
August	28,534,275	6,376,353	330,335,046	149,678,850	671,113,871	72,892,879	41,829,516	51,759	59,715	163,355,034	1,269,281
September	28,390,431	5,485,747	314,595,959	146,963,798	653,085,050	70,593,079	42,704,894	48,052	49,157	138,201,936	1,269,281
Total	242,417,070	37,660,713	2,651,348,540	1,329,410,679	5,467,339,635	632,054,690	368,185,126	417,703	483,105	960,896	13,073,829



## Suggests War Automotive Exhibition

Such An Event, Arranged on an Elaborate Scale, Would Bring Home the Importance of Cars, Trucks, Tractors and Airplanes in Winning the War

By W. F. Bradley\*

PARIS, Nov. 1—Special Correspondence—Several million Americans deeply interested in all that pertains to the automobile will hail the end of the war without having had an opportunity of fully appreciating the work that gasoline has done toward securing a victorious peace. The story of the automobile in the war never has been fully told.

The probabilities are that it never will receive justice in written word. In European war circles there always has been a fear of giving too much credit to the automobile services of the Army. When I wrote the story of how automobiles held at bay the Crown Prince's forces at Verdun, the French military censor objected to the opening sentence, "Automobiles saved Verdun." He did not question the accuracy of the assertion, but he was afraid of slighting the infantry and artillery services.

Yet it is on official record that automobiles were the decisive factor in three great battles. Also, now that Austria has ceased to be an enemy, it can be stated that the only reason the Italians did not follow up the first victory on the Piave River was owing to lack of adequate automobile transportation. Had there been a big reserve of trucks, the Caporetto disaster could have been relieved immediately.

### Huge Automotive Demonstration

The American automobile industry should organize on an elaborate scale, and as soon after the declaration of peace as practicable, a huge demonstration of the automobile at the war. By the term "automobile" is meant everything which employs gasoline as its motive power. This naturally brings in the airplane.

No lifeless, inanimate exhibition will satisfy full-blooded Americans who have had the unappreciated good fortune to follow the war across three thousand miles of sea water. What is required, and what is proposed, is a practical open-air exhibition, as closely approaching natural conditions as possible, of what the automobile has done to help win the war. This is a big program; it is an elaborate job. But the American automobile industry can handle it, and should handle it.

In this exhibition we want to see the various Allied and enemy airplanes which have been in service on the front. For instance, what American would not travel halfway across the continent to see Eddie Rickenbacher's Spad scout plane, at this moment riddled with more than forty bullets, in actual combat with a real German plane piloted by somebody

who had consented, for the time being, to play the role of the Boche?

How many Americans have seen a chasse squadron in battle formation? How many have seen a bombing group take the air with chasse planes as a protecting escort? How many have seen anti-aircraft guns in action against a number of planes high up in a clear sky, and have watched the efforts of the pilots to escape that deadly fire? How many have seen an airplane attack a captive balloon, fly low over trenches with machine guns going, or "pancake" down with a dead motor on shell torn ground? All this should be a part of the program of the automobile exhibition.

### Would Show Everything

Readers of war news picture airplanes operating from a prepared ground and flying away to a new place whenever it becomes necessary to change location. It is not generally realized that with every squadron of 18 airplanes there are in direct attendance from 16 to 18 trucks or touring cars and nearly as many trailers, without which the planes could not remain in the field for a single day. The airplane, the most mobile of all units, is the one most dependent on automobile transportation. The airplane trucks and trailers should be shown in actual operation just as they performed in the Argonne, the Somme and the Marne.

It should be shown how an observation balloon squadron works. The "sausages" should be sent up from the mobile automobile winches, brought down hurriedly when an enemy attack is pending, covered and camouflaged to hide them from spying eyes, and shown packed up ready for transportation. There should be telephone cars in communication with the men up aloft, and motorcycle dispatch riders ready to carry urgent messages to commanding officers.

The work of the automobile in connection with artillery is itself sufficient to form an exhibition of more than ordinary interest. There should be shown the French four-wheel drive tractors, the Italian mountain tractors, the special British machines and the American self-track layers specially designed for hauling guns.

Machines and men who have had actual service on the front should show how guns are brought into position, dropped into gullies, hauled up hill sides, supplied with shells, all without the use of horses. The special gun carriages, designed on automobiles lines, and made to be towed by automobiles, should be given a prominent place. There is need, too, for automobile trucks—many of which never even have been described—

which carry guns on and fire from their own platform.

Tanks and armored cars constitute the most spectacular feature of any exhibition. Not only should all of them be shown, but they should operate as nearly as possible under conditions approaching actual warfare. Army searchlights are nearly all of the automobile type. Here there is a wonderful opportunity for a spectacular display comprising night flying and infantry attacks with the use of searchlights.

A war automobile exhibition could best be combined with a series of track races, for the war has had a most direct influence on speed. Indianapolis, for instance, is well placed for staging such a show. The world's short-distance speed record officially belongs to Germany for, although Arthur Duray and his 300-hp. Italian Fiat put up much faster time, official recognition was never given this performance.

In a conversation the other day one of the Fiat engineers stated, "As soon as the war is over we can put a 400-hp. aviation motor in a chassis weighing less than 2000 lb., and I believe we can establish a record of 3 miles a minute." A few days later the engineer of a French firm indicated his intention of trying to put up the same record in a similar manner. There are three European firms with a program and racing cars ready for after the war, and there are a dozen others ready to make a start. There will be no lack of racing interest.

It will take time, money and hard work to organize a creditable war automobile exhibition. But the job is worth while.

### More Post Office Trucks

NEW YORK, Nov. 26—The motor truck service of the New York Post office Department is soon to be very considerably expanded. At the present time, there are less than 100 trucks in service, and this is to be increased to 270. It is proposed to put in service in the very near future, the following vehicles:

10—1½-ton	White
90—1½-ton	Packard
99—¾-ton	White
43—3-ton	White
28	Ford

### 5000th Packard-Liberty Shipped

DETROIT, Nov. 26—The Packard Motor Car Co. shipped its 5000th Liberty engine on Nov. 21, practically one year after the first engine of this kind to be produced by the company. It was on Thanksgiving Day, 1917, that actual production was started. Production on the original order for 6,000 will be completed in less than 30 days at the present rate of output.

### Peterson Joins Koehler

NEWARK, N. J., Nov. 26—Carl D. Peterson has become affiliated with the H. J. Koehler Motors Corp. in the capacity of engineer. He will have charge of the design and production of the new 3½- and 5-ton trucks and 7- and 10-ton road tractors which the company is shortly to place on the market.

\*This article was written prior to the signing of the armistice.—EDITOR.

# AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

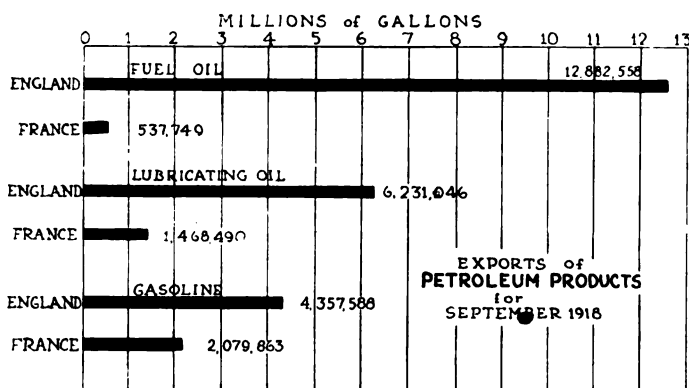
<b>Acids:</b>		<b>Leather:</b>	
Muriatic, lb. ....	.02 -.03	Hides, lb. ....	.18 -.35%
Phosphoric (85%) ..	.35 -.39	Nickel, lb. ....	.40
Sulphuric (60), lb. .	.006	<b>Oil:</b>	
<b>Aluminum:</b>		Gasoline:	
Ingot, lb. ....	.33	Auto., gal. ....	.24%
Sheets (18 gage or		68 to 70 gal. ....	.30%
more), lb. ....	.42	<b>Lard:</b>	
Antimony, lb. ....	.13%-.13%	Prime City, gal. .	2.30-2.35
<b>Burlap:</b>		Ex. No. 1, gal. .	1.62
8 oz., yd. ....	.17%-.17%	Linseed, gal. ....	1.63-1.65
10 1/2 oz., yd. ....	.21%-.22	Menhaden (Brown)	
<b>Copper:</b>		gal. ....	1.35-1.36
Elec., lb. ....	.26	Petroleum (crude),	
Lake, lb. ....	.26	Kansas, bbl. ....	2.25
<b>Fabric, Tire (17 1/2 oz.):</b>		Pennsylvania, bbl.	4.00
Sea Is., combed, lb.	1.65-1.70	<b>Rubber:</b>	
Egypt, combed, lb.	1.25-1.35	Ceylon:	
Egypt, carded, lb.	1.20-1.30	First latex pale	
Peelers, combed, lb.	1.05-1.20	crepe, lb. ....	.63
Peelers, carded, lb.	.95-1.05	Brown, crepe, thin,	
<b>Fibre (1/4 in. sheet</b>		clear, lb. ....	.60
<b>base), lb. ....</b>	.50	Smoked, ribbed	
<b>Graphite:</b>		sheets, lb. ....	.61 1/2
Ceylon, lb. ....	.09 -.22	<b>Para:</b>	
Madagascar, lb. .	.10 -.15	Up River, fine, lb.	.68
Mexico, lb. ....	.03%	Up River, coarse,	
<b>Lead, lb. ....</b>	.08 -.09	lb. ....	.40
		Island, fine, lb. .	.59

Shellac (orange), lb. .	.74 -.75	Cold rolled, lb. ....	.06 1/2
Spelter .....	.08 1/2-.08%	Hot rolled, lb. ....	.03 1/2
<b>Steel:</b>		Tin .....	.71 -.72
Angle beams and		<b>Tungsten, lb. ....</b>	2.45-2.50
channels, lb. ....	.03	<b>Waste (cotton), lb. .</b>	.12%-.17
Automobile sheet			
(see sp. table).			

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only per 100 lbs.	Primes when seconds up to 15 per cent are taken per 100 lbs.
Automobile body stock .....	\$5.95	\$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping .....	6.45	6.35
Hood, flat, fender, door and apron, or splash guard stock .....	6.05	5.95
Crown fender, cowl and radiator casing, extra deep stamping .....	6.55	6.45
Crown fender, cowl and radiator casing, deep stamping .....	6.30	6.20
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
Black Sheet extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

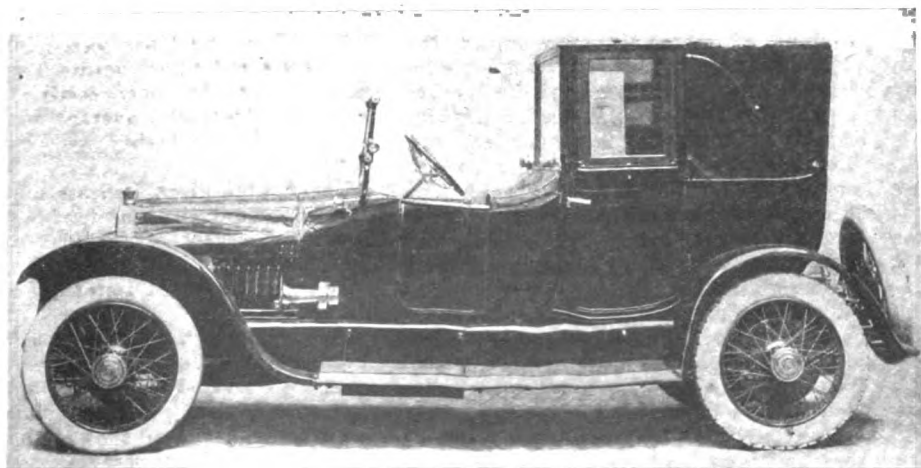


During September last our Allies' share of exported petroleum products was 72 per cent of the total. The share of England and France was valued at nearly \$7,000,000

Renewed attention is being given in England to the subject of the use of alcohol as motor fuel. A committee to investigate the available sources of supply of industrial alcohol, with particular reference to its manufacture from materials other than those which can be used for food purposes, has recently been appointed by Walter Long. The committee is to investigate the method and cost of such manufacture, and the manner in which alcohol should be used for power purposes. Sir Boverton Redwood, Bart., is chairman of the committee.

The London Commissioner of Police has issued a license to the London General Omnibus Co., for 20 motor omnibuses to be operated on compressed coal gas. The omnibuses will be run under the supervision of the Gas Traction Committee.

## An Example of South American Body Building



A cabriolet body built on a Cadillac chassis by Fehling Bros., Buenos Aires. This firm found it necessary to develop body building on account of difficulty and delay in obtaining bodies from the United States

# New York State Investigates Its Tractors

Department of Agriculture Finds They Increase Crop Yields  
But Do Not Materially Decrease Cost of Farm Operations  
—Reports from 250 Farmers Classified

WASHINGTON, Nov. 23—"Judging by the experience of tractor users, it is not safe to expect any material reduction in the cost of farm operations per acre through the use of the tractor, but it is safe to expect to be able to increase the crop acreage to a very considerable extent and at the same time the amount of crops which one man can raise."

This is the summary of tractor experience in New York State given in a bulletin issued by the United States Department of Agriculture following investigations. Tractors using gasoline or kerosene, says the bulletin, are increasing in numbers on Eastern farms. More than 250 New York State farmers provided the detailed reports of their experiences with tractors during 1917 and the spring of 1918 as the basis for the bulletin, which points out both the advantages and disadvantages of the tractor, the farm conditions, economy of the tractor, and shows that not every farmer will find the tractor profitable.

## Farms Are Diversified

The surface of New York State, according to the bulletin, is rolling. The soil is a comparatively heavy loam with heavy clay sub-soil and large and small stones numerous. Some of the larger stones can cause a breakage of the plow or hitch. The farms are diversified, many of them growing at least half a dozen different field crops. Most of the farms it was found grow hay, oats, wheat, corn, barley and beans, with the largest acreage devoted to the first named and decreasing respectively. A small percentage of tractors were found used on farms where more than 40 per cent of the crop acreage was devoted to fruit.

Tractor owners were asked to state the advantages and disadvantages of tractors and the replies show that tractors:

**Work more rapidly**—More than 50 per cent of the owners pointed out that the tractor performs its work more quickly than horses and that even the 2-plow tractor results in a considerable increase in the plowing rate.

**Saves man labor.**

**Does better work**—More than 50 per cent of the farmers replied placing the ability to do better work third in the list of advantages, mentioning also that the best work was evident, and emphasized under hot weather conditions.

**Inability to use the tractor satisfactorily until top soil is well dried out was the first disadvantage named.**

**Packs moist soil**—It was found that on the comparatively heavy soil packing was injurious in those spots and there was likelihood of the tractor miring in such places.

**Efficient operators**—The difficulty of

securing efficient tractor operators was named.

**Breakdowns**—This was mentioned but is often due to inefficient operation.

**Unsatisfactory on rough land.**

**Unsuitable for small fields.**

Lack of power was mentioned by a few, but it is said this is usually the result of error in choosing a machine too small for the work required of it.

Discussing the size of the farm and the tractor the bulletin points out that a farm business must be of sufficient size to justify the tractor. Eighty-four per cent of the tractor owners reported that the tractors have proved profitable investments. Of these more than one-third increase their acreage with tractors. On the other hand, of the men who found the tractors unprofitable only one-tenth increased their acreage.

The comparatively high percentage of tractor owners who have enlarged their farms, says the bulletin, is significant, for although farms have increased in recent years due to improved farm equipment the increase is not so pronounced on farms where tractors are not used.

## Tractor Selection Important

A suitable size should be selected for a given acreage, says the bulletin. In New York State the number of 3-plow machines sold in 1916 was less than one-third of the total of 2-plow outfits. In 1917 the 3-plow machines increased and amounted to two-thirds the number of 2-plow rigs, which proves that the 2-plow tractor is showing itself too small. Out of 237 farmers 118 reported 3-plow outfits were more suitable and only 110 recommended the 2-plow size. Nine stated that 4-plow tractors were the best. More than two-thirds of the entire number reporting originally bought 2-plow outfits.

The 2-plow machine is recommended by a majority of farm owners of 150 or fewer crop acres, but a considerable percentage of these also recommend the 2-plow machines which, says the bulletin, leads to the conclusion that in general 2-plow tractors do not sufficiently increase the amount of work one man can do, and do not ordinarily develop enough power for operating separators, etc. The 3-plow tractor was distinctly the favorite among farmers operating 150 or more crop acres.

Considering the cost of tractors, the bulletin points out, the price the farmer can pay depends on the amount and value of the work which the machine will perform annually, the value of horses displaced, value of man labor saved and the amount of increased returns which can reasonably be expected from its use. Prices paid in New York State in 1917 averaged \$775 for the 2-plow and \$1,050 for the 3-plow machines, while plow

prices averaged \$120 and \$145 respectively.

The average length of life expected from tractors was reported by the farmers at 9 years, those whose machines had proved profitable estimating 9½ years, while those which had unprofitable investments gave an average of 5½ years.

Farm tractors in New York are used on a daily average of 54 days annually, including both home and custom work. On farms of 100 acres or less (average 81) average days used on the home farm totaled 33, while on farms of 151 to 250 crop acres (average 193) the outfits were used on the home farm 47 days. The tractors owned by the smaller farms were used considerably more, it was found, for custom work than the larger farm outfits. While these figures appear low, says the bulletin, it must be remembered that on farms where horses do all the work they only average 100 days annually, and where both horses and tractors are used the machine need not be expected to have employment for as many days annually, and even if the machine were to do all the work formerly done by horses it would not be employed 100 days per year because it works more rapidly than horses.

Repairs are needed according to the efficiency of the operator and the care he gives the outfit when in use or idle, the conditions under which the outfit is used, the load it is required to pull and the quality of the machine itself. Many tractors are kept in repair by the makers during the first year and the owners therefore do not bear the full expenses until the second year.

## Cost of Repairs

Of 86 tractor owners in New York who have used their outfits one season or less (average 9 months) 31 reported nothing spent for repairs. The others have repair bills varying from a few cents to \$100, the average being \$17, making the average repairs for the entire group about \$11.

Comparatively few machines go through their second season without repair charges. The average repairs for 102 outfits averaging 18 months old was \$34. For 30 machines averaging 30 months the average repairs amounted to \$101. These machines were almost exclusively 2 and 3-plow outfits. The 3-plow outfits were the more costly, but the larger machines also average more days' use annually since they were on larger farms.

The figures given indicate annual repair charges during the first 3 years of about 4 per cent of the first cost, but this, says the bulletin, would undoubtedly increase in the latter years of its life.

According to the figures used by the tractor owners 2-plow outfits plowed 4½ acres per day (10 net working hours) and the 3-plow machines plowed 6½ acres. Replies also showed that large gang plows will not cover as many acres per day as smaller ones when used under unfavorable plowing conditions.

Only 7 per cent of the tractor owners



in New York State reported doing hauling with their outfits—the small percentage being due to the restrictions against the use of tractors on New York highways.

The cost of operating a tractor, it is pointed out, is made up of operating expenses, including fuel oil and grease, repairs, depreciation and cost of man labor. In addition there are less important charges, such as interest on the investment and housing.

The New York farmers reported an average cost per acre plowed for gasoline, oil and grease of 99½ cents where gasoline is used and 49 cents where kerosene is used, with an allowance of 2 cents per acre for gasoline used in warming up.

About 3¼ gallons of either gasoline or kerosene were consumed per acre in plowing for all tractors reported. Less difficulty was also reported by owners of kerosene tractors as compared with a few years ago. Seventy-five per cent of the tractor owners reported that they were operating on kerosene.

#### One Quart Oil Per Acre

The average quantity of oil per acre used in plowing was nearly one quart which, with oil at 40 cents per gallon, amounted to 10 cents per acre. Some reported using a gallon of lubricating oil per acre and others less than one quart per acre with the 3-plow machines slightly more economical than the 2-plow. Grease cost amounted to 2 cents per acre.

The average annual repair charges for the 2 and 3-plow outfits was 57½ cents and 78 cents per day respectively, making the repair charge per acre 12¼ and 12½ cents respectively.

The average annual depreciation on the 2 and 3-plow outfits amounted to \$91.18 and \$123.54 respectively. The depreciation cost per acre was 37½ cents for the 2-plow and 36¼ cents for the 3-plow.

Eighteen per cent of the tractor owners reported hired operators. Some entrusted their machines to ordinary hired hands at low wages and others secured first class operators at fairly high wages. The cost per acre for man labor with 2 and 3-plow outfits averaged 67 cents and 48 cents respectively, showing that the higher the wages paid the greater were the advantages derived from the larger tractors.

Estimating interest at 6 per cent on the average investment the average interest charged per day for the 2 and 3-plow outfits amounted to 43 and 58¼ cents respectively, or the average charged per acre amounted to 9¼ and 4¼ cents respectively. The number of days a tractor is used annually, the bulletin reminds, the less the interest charge is per unit of work.

The approximate total cost for plowing an acre with a tractor under normal conditions is shown to be as follows:

#### Tractor Beats Horses

In discussing economy of the tractor 185 of the 217 owners, or 85 per cent, reported a saving in the amount of hired help. Fifty-seven reported of saving

Approximate cost of plowing an acre with 2 and 3-plow tractors, based on average cost of \$775 and \$1,050 respectively, and a life of 8½ years of 54 working days per year:

Size of tractor	Gasoline	Kerosene	Oil	Grease	Repairs	Depreciation	Man Labor	Interest
Two-plow .....	\$0.87½	\$0.37	\$0.10	\$0.02	\$0.12½	\$0.37½	\$0.67	\$0.09½
Three-plow .....	0.87½	0.37	0.10	0.02	0.12½	0.36½	0.48	0.09½

wages of \$213 annually, the equivalent of one man for 71 days at \$3 per day. Other savings which were overlooked in the reports were the use of the power for threshing, silo filling, shredding, etc.

More than 50 per cent of the tractor owners reported the quality of the work done by the tractor as better than that done by horses, while only 6 per cent said it was poorer. The quality of the work done, the bulletin points out, depends more on the plow and its adjustment than on the tractor. The average depth of plowing done by tractors in New York was over 7½ in., while the average depth previously plowed by horses was slightly less than 6½ in.

Many owners reported difficulty in securing capable tractor operators. Although no figures were made available the answers showed definitely that it paid to secure first class operators at higher wages.

Forty-eight per cent of the 217 owners reported that their outfits were not disabled a single day when needed during the past season, and of the remaining 52 per cent the average number of days their tractors were out of commission when needed was 6¼, not including four men, who stated that their machines were out of commission a large part of the time. About 82 per cent of the tractors were operated by the owner or some member of his family, best results usually being obtained by this class of operators. Twenty-eight per cent reported no time lost in the field on account of trouble and the average time lost per day by the 72 per cent reporting trouble was a little less than one hour.

That tractors do not entirely displace horses was shown by the fact that in two-thirds of the cases the tractor was used only on the same number of acres as was previously farmed, in these instances displacing horses on an average of about two and one-half.

Many tractor owners used their outfits for custom work, 42 per cent reporting custom work with the average number of days used annually for this purpose amounting to 24.

In summarizing, the bulletin states that the replies from the farmers do not indicate a considerable effect on the crop yields as a result of the use of tractors in the place of horses. It points out that it is obviously impossible to obtain maximum results with a tractor when it is used with implements designed for use with horses and that the plows used with it must be especially designed for the purpose.

#### Texas Has 4144 Tractors

FORT WORTH, Nov. 25—Although the lands of Texas, particularly the level prairie country of the western portion of the State, are specially adapted to the

most economic and satisfactory use of the farm tractor in plowing and other farm work there are at this time only 4144 of these machines in use upon Texas farms, according to statistics just compiled by the Chamber of Commerce of Fort Worth. These figures show that there is an average of one tractor to every 30,000 acres of farm land and one tractor to every 102 farms. Sixty-seven Texas counties are without a single tractor and 100 counties have less than 10 each, while only 27 counties in the State have 50 or more tractors.

It is reliably estimated that Texas has only 5 per cent of the necessary number of farm tractors, and it is generally conceded that there is an immediate demand in this State for 50,000 of these machines. To purchase this number will require a minimum investment of \$50,000,000.

#### Buyers Holding Off

BOSTON, Nov. 23—Sales in Boston showed a tendency to slump a bit following the declaration that the ban would be lifted on the production of motor cars. A number of the dealers report that prospective buyers are holding off because they look for a drop in prices in the spring or before that time. Even some of the sub-dealers are refusing now to take cars from distributors because they want to be protected against a drop in price, and this assurance the dealers cannot give. The fact that Cadillac has announced a \$300 cut, and another is expected to make a similar announcement about Dec. 1, has led buyers and some dealers to expect this reduction will be general. Until a few of the other big dealers come out and state that present prices will hold good for some time there will be a fluctuation in sales, caused by the uncertainty.

#### Oil Exports from Mexico

NEW YORK, Nov. 25—Exports of crude oil from Tampico, Mexico, to the United States during September amounted to 4,038,167 bbl. Of this quantity 2,785,935 bbl. were from Tampico itself, 842,744 bbl. were from Tuxpam and 409,458 bbl. from the new loading station at Port Lobos.

#### Overseas Gasoline Demand Increases

WASHINGTON, Nov. 25—The overseas demand for the motor transport grade of gasoline has increased rather than diminished since the signing of the armistice, the Fuel Administration announced yesterday. This fact, as well as domestic requirements, will have a considerable bearing, the announcement said, on any decision whether it is desirable to fix a standard of quality for domestic motor gasoline, which now is under consideration.

### Allison Leaves Chicago Packard

CHICAGO, Nov. 23—H. M. Allison, who has been in charge of Packard distribution in this territory twelve years, has resigned as president and general manager of the Packard Motor Car Co. of Chicago. Mr. Allison has been identified with Packard here and in Detroit for nearly fifteen years. For two years he was president of the Chicago Automobile Trade Association. Much of the credit for the establishment of the National Used Car Market Report by Chicago dealers is given to him. A member of the Packard executive staff at Detroit is expected to succeed Mr. Allison. No information as to Mr. Allison's own future plans is available just now.

### W. C. Potter Resigns

WASHINGTON, Nov. 23—William C. Potter, Chief Assistant Director of Air Service under John D. Ryan, has resigned his position. Mr. Potter served as chief of the equipment division of the Signal Corps when that department controlled airplanes. With the reorganization he entered as the assistant to Mr. Ryan. Mr. Potter was associated with the Guggenheim mining interest as general manager of the American Smelting & Refining Co. prior to his connection with the Signal Corps, and will return to that work.

I. H. Mills, who has been associated with the Westinghouse Electric & Mfg. Co., East Pittsburgh, for the past 23 years, has resigned to become superintendent of the Sperry Gyroscope Co., Brooklyn, N. Y. Mr. Mills began his career with the Westinghouse as a machine operator, and finally became superintendent of the small industrial motor department.

Frank A. Sharpe has been made district manager for the Thermoid Rubber Co., Trenton, N. J., with offices located in the Kresge Building, Detroit.

Capt. Charles E. Speaks has been promoted Major in the Quartermaster Department. He is at present in France.

### Saloniki Good Distributing Center

WASHINGTON, Nov. 25—Although Saloniki, Greece, has suffered considerably from the war and also from a huge fire in 1917 and trade conditions temporarily are unfavorable, the American Consul General there reports that its future as a distributing center is a positive one, and manufacturers will find it worth consideration as a distributing point for trade with Serbia, Bulgaria and Rumania. It is now proposed to have a free customs zone at those ports which will further increase its distributing value. The Standard Oil Co. has a huge floating pipe line system at Saloniki and carries great stocks of petroleum and petroleum products at this point.

## Men of the Industry

*Changes in Personnel and  
Position*

### McLaughlin a G.-M. Director

TORONTO, Nov. 25—R. S. McLaughlin, of Oshawa, Ont., president of the McLaughlin Motor Car Co., Limited, has been elected a director and member of the executive committee of the General Motors Corp.

### Adams Heads Peterson-Culp

DENVER, Nov. 26—J. P. Adams was re-elected president of the Peterson-Culp Gearless Steam Auto Co. at the annual meeting of the company recently. L. Leitner, formerly consulting engineer, was elected secretary and treasurer. The company proposes to build a factory in Denver and to produce both passenger cars and trucks.

### Highways War Service Committee

WASHINGTON, Nov. 26—The Highway Industries Association has formed a War Service and Reconstruction Committee of the Highway Industries with the co-operation of the Chamber of Commerce of the United States.

This new War Service and Reconstruction Committee will take part in the general conference of War Service and Reconstruction Committees of American Industry, to be held at Atlantic City, N. J., beginning Dec. 3, under the auspices of the National Chamber, the week preceding the great highway convention in Chicago.

Representing the Highway Industries Association: W. T. White, Cleveland; A. N. Johnson, Chicago; W. P. Blair, Cleveland; A. P. Sandles, Columbus; A. R. Hirst, Madison, Wis.; E. J. Mehren, New York; S. T. Henry, Washington; H. G. Shirley, Washington.

Representing the American Association of State Highway Officials: Lieut.-Col. W. D. Uhler, Washington; G. P. Coleman, Richmond; W. G. Thompson, Trenton; J. N. Mackall, Baltimore; C. F. Stern, Sacramento; P. D. Sargent, Augusta; W. S. Keller, Birmingham; Ira L. Browning, Salt Lake City; E. A. Duffey, Albany; Max L. Cunningham, Oklahoma City.

Representing the American Automobile Association: David Jameson, president, New Castle, Pa.; A. E. Batchelder, executive chairman, Washington; Carl J. Fisher, chairman Touring Board, Indianapolis; Geo. C. Deihl, chairman Good Roads Board, Buffalo; Eugene Burton, chairman Legislative Committee, Newark.

Representing Highway Transport Committee: Roy D. Chapin, chairman Highway Transport Committee, Washington.

Representing the Office of Public Roads, L. W. Page, director Office of Public Roads, Washington, D. C.

### Gilmore Heads Packard Branch

NEW YORK, Nov. 25—Roger J. Gilmore has been elected president of the Packard Motor Car Co. of New York. Gilmore, who has been vice-president of the company, has been in charge of its affairs since former President Hare was made executive vice-president of the parent company.

### Jamieson in Charge of Equipment Disposition

WASHINGTON, Nov. 23—Disposition of all manufacturing materials, equipment and buildings which will now or later become the property of the United States as a result of contract cancellations by the Ordnance Department will be in charge of a board headed by Brig.-Gen. C. C. Jamieson, which will decide their sale or storage.

F. E. Pierce, formerly advertising manager of the Anderson Electric Car Co., Detroit, has been appointed district manager for the Elwell-Parker Electric Co., manufacturer of industrial trucks and tractors, with headquarters in Detroit, and with factories in both Detroit and Cleveland.

L. C. Reynolds, formerly associated with the Oakland Motor Car Co., Pontiac, Mich., has been appointed manager of the motor factory of the General Motors Co. in Detroit.

H. W. Simpson, formerly inspector of aviation engines, Signal Corps, Detroit, has been appointed assistant engineer with Henry Ford & Son, Dearborn, Mich.

H. L. Dunn, assistant purchasing agent of the Willys-Overland Co., Toledo, has been transferred to Moline, Ill., where he will become identified with the Moline Tractor Co., recently acquired by John N. Willys.

### Propose Southern Air Mail Route

WASHINGTON, Nov. 25—The Birmingham, Alabama, Chamber of Commerce has requested Congress to place Birmingham on an air mail route between the Atlantic and Pacific Coasts. An aerial route is proposed to start at New York and go through Philadelphia, Baltimore, Washington, Virginia, the Carolinas, Charlotte and Atlanta, Ga., Birmingham, Ala., Vicksburg, Miss., Shreveport, La., Dallas, Fort Worth, Tex., Arizona and New Mexico and then to San Diego. There is already an aviation field constructed according to Government specifications at Birmingham. Senator Miles Poindexter will ask Congress for an appropriation to inaugurate this route and two others which will traverse the central and northern portions of the country.

### N. A. A. J. Directors to Meet

NEW YORK, Nov. 26—Directors of the National Association of Automobile Accessory Jobbers are to meet at the La Salle, Chicago, Nov. 16 and 17.

## Canadian Plant for Denby

CHATHAM, ONT., Nov. 25—At a special meeting of the Chatham City Council an agreement was signed between the city and the Denby Motor Truck Co. calling for the erection of a \$20,000 plant here, to be ready for occupancy by March 1. The company is newly incorporated in Canada, with a capital stock of \$200,000. The city will vote on giving the company three acres of land now, and an additional acreage will be made available if the company needs it within 4 years. The plant of the Chatham Brass Works here has been purchased by the Denby company, which plans to use it for the manufacture of axles and transmissions.

## Recall Aero Training Squadrons

WASHINGTON, Nov. 26—Thirty-one aero squadrons training in England have been recalled to this country and sailed from Liverpool Nov. 22. They included 5,000 enlisted men and 110 officers, besides a complete Handley-Page training section of 126 officers and 449 enlisted men.

## Federal Tax on Cars Dropped

WASHINGTON, Nov. 26—The Senate Finance Committee today entirely struck out the proposed federal license tax on the use of automobiles and motorcycles which ranges from \$10 to \$50 annually, according to horsepower, in the House Bill, and from \$5 to \$25 under the plan previously adopted by the Senate Committee. The National Automobile Chamber of Commerce plans to ask that the tax against parts sold by truck and passenger car makers also be stricken from the bill. It is believed that this tax is eventually and actually upon the consumer, the user of a passenger car or truck.

## Contracts for 300 Hydroplanes Cancelled

WASHINGTON, Nov. 26—Contracts for 300 hydroplanes have been cancelled by the Navy Department since the signing of the armistice. The Navy aviation appropriations for 1920 will be reduced as a result by \$133,770,700. These figures were presented to the House Naval Committee by Rear Admiral Peoples yesterday.

## Quartermaster Contracts

WASHINGTON, Nov. 25—The following contracts, placed prior to the armistice, have just been announced by the Quartermaster Department:

Timken-Detroit Axle Co., Detroit, axles, \$8,391.  
The Studebaker Corp. of America, South Bend, wagons, \$6,408.56.  
B. F. Goodrich Co., Akron, tires, \$19,041.50.  
The Atlantic Refining Co., Philadelphia, fuel oil, \$7,753.20.

## Tank Plant for Tractors

DETROIT, Nov. 25—Work will be pushed rapidly on the uncompleted plant which Henry Ford has been building at Dearborn for the manufacture of small tanks.

Current News of  
Factories

Notes of New Plants—Old  
Ones Enlarged

## Substitute for Gasoline Tested

(Continued from page 933)

The type B fuel at full throttle resulted as follows:

	R.P.M.	Beam, Lb.	Consump- tion B.H.P.
Gasoline	523	125.5	21.9 0.13
"B" fuel	529	129.5	22.8 0.115

The airplane engine tests using 150 hp. Hispano-Suiza engine resulted as follows:

R.P.M.	Lb. Torque	Oil Inlet Fahr.	Water Inlet Fahr.	Air Intake Fahr.	Lb. Fuel
Liberty Fuel					
1583	335.0	154°	154°	91.4°	5
1389	326.0	158°	145°	87.8°	10
1194	332.5	148°	141°	86.0°	5

## Export Airplane Gasoline

1588	326.5	145°	162.5°	89.6°	5
1390	324.7	152°	161.0°	87.8°	10
1188	321.0	149°	158.0°	86.0°	5

## Export Airplane Gasoline

1600	330.0	125.6°	158.0°	85.0°	5
1400	326.0	134.0°	154.0°	89.0°	10
1200	322.0	141.0°	157.0°	85.0°	5

## Liberty Fuel

1600	340.0	146.0°	161.0°	89.0°	5
1400	340.0	152.0°	161.0°	87.0°	10
1200	332.0	146.0°	163.0°	86.0°	5

Following is the analysis made by the Bureau of Standards of the Liberty fuel submitted under Laboratory Tests Nos. 49,082 and 24,439:

Distillation, Per Cent	Fahr.
10.....	174.2°
20.....	176.0°
30.....	177.8°
40.....	179.6°
50.....	179.6°
60.....	181.4°
70.....	183.2°
80.....	194.0°
90.....	342.5°
95.....	388.4°
97 (dry point).....	405.0°

Following are reports made on two other samples of Liberty fuel which were tested by the Bureau of Standards on Sept. 10, test numbers being 45,962-3 and 24,135:

Fuel Appearance Odor	G Clear White Normal	F Clear White Normal
Specific Gravity at 60° Fahr.	.751	.730
Distillation	Fahr.	Fahr.
10	183.0°	161.0°
20	219.2°	183.2°
30	235.4°	203.0°
40	257.0°	221.0°
50	273.2°	237.2°
60	305.6°	249.8°
70	320.0°	262.4°
80	340.0°	280.4°
90	363.2°	309.2°
95	401.0°	341.6°
97 (dry point)	425.0°	
95.5 " "		360.0°
Residue	1.5%	1.2%
Loss	1.5%	1.3%

The future of this gasoline substitute is as yet undecided—that is, it is not known at this time just how the formula will be given out or sold or in what way it will be commercialized.

## Wright-Martin Working Three Shifts

NEW YORK, Nov. 21—Up to the present time the Wright-Martin Aircraft Corp., New Brunswick, has not received any cancellations of Government orders. The company is operating three shifts as usual and is producing nothing but Hispano-Suiza engines. Production is to be at a scheduled rate and will continue practically until the end of 1919. The only change which has been made in schedules has been the elimination of overtime work.

## Another G.-M. Canadian Plant

WINDSOR, ONT., Nov. 25—A site has been purchased and building may start shortly for a motor truck factory costing \$50,000 for the General Motors Corp., Detroit.

## Franklin Reduces Prices

SYRACUSE, Nov. 26—The Franklin Automobile Co. has reduced its passenger car prices. New and former prices follow:

Model	New Price	Old Price
2-Passenger	\$2,400	\$2,850
4-Passenger	2,450	2,900
5-Passenger	2,450	2,900
Sedan	3,350	3,900
Limousine	3,400	4,000
Brougham	3,300	3,850

## Probable Effects of War Motor Apparatus on Commercial Design

(Continued from page 906)

axles and lanterns. This car is also mounted on 36 x 6 pneumatics, the standard equipment being Goodyear cords with all-leather tread.

These are only random examples of a line of over a hundred different types of vehicles which have been adapted by the Motor Equipment Section for military use. The result has been the gathering together of as fine a collection of specialized designs as has ever been assembled.

It is not permissible even now, with the armistice in force, to go into full details on many of the products of the Motor Equipment Section, but it can be stated that in addition to the transportation and hauling equipment a great number of vehicles for offensive purposes have been developed.

The vast personnel required to perfect these vehicles will soon be released in large part from war service. The industry can utilize these men with wonderful results because they have been used to rapid and efficient work and they have gained experience in laying out highly useful designs adapted to give maximum service. Many of the ideas generated in the War Department offices can be taken bodily for commercial practice, while others are adaptable. It will be an important feature of our reconstruction work to utilize as much of the knowledge gained in war work as possible.



## Port Huron Friction Drive Tractor

(Continued from page 928)

neto of the high-tension type, with impulse starter, is fitted. Cooling is accomplished by forced circulation, through a Perflex radiator.

The fuel capacity is 25 gal. of kerosene and 5 gal. of gasoline, and the fuel goes to the motor through a Kingston single-bowl carbureter fitted with a Bennett air cleaner.

The steering gear is of the screw and nut type and the tractor has a turning radius of 6 ft. inside of the inner wheels.

The frame of the tractor is made of steel channels. The front axle is of the built-up type and carries a coil spring upon which the front end of the frame rests. The tread of the front wheels is 52 in. and of the rear wheels 56 in. The front wheels are 34 in. in diameter with 6-in. face, and the rear wheels 56 in. in diameter with 10-in. face.

The over-all length of the tractor is 13 ft.; total width, 6 ft. 3 in.; total height, including canopy top, 8 ft. 9 in., and the wheelbase, 7 ft. 9 in. Without fuel and wheel lugs, but with canopy top, the tractor weighs 5700 lb.

The speed of the tractor is variable from 1½ to 4 miles per hour, in either direction, and it is recommended for use with three 14-in. plows. The belt speeds are variable from 2380 to 3900 ft. per minute.

## Four Hispano-Suiza Models Built in America

(Continued from page 915)

cylinder block, a relief valve being placed in the line to prevent the pressure at the carbureter becoming greater than 2 lb. This valve can be adjusted in accordance with the varying altitudes at which the machine travels. Sufficient pressure for starting is obtained by using a hand pump. If desired, a vacuum tank system may be used, the vacuum being usually secured by taking a lead from the throat of a compound venturi, placed in the draft of the propeller, to the main gasoline tank, a check valve being placed in the line and a branch line leading to the auxiliary fuel tank.

A centrifugal pump with two discharge outlets, which is mounted directly underneath the oil pump, circulates the cooling water through the waterjackets of the two cylinder blocks. The water pump is driven from the same shaft as the oil pump at 1.2 times engine speed. Its capacity is 100 litres (26.50 gal.) per minute at an engine speed of 1450 r.p.m. The cylinder waterjackets have a capacity of 18½ litres (4.9 gal.), or, by weight, 18½ kg. (41 lb.).

An interrupter driving mechanism is used to fire a machine gun which is synchronized with the propeller. This mechanism is operated by a gear pinned to the lower gear on the lower half of the vertical shaft which drives the camshaft of either the left or right hand cylinder block. Two ball bearings carry

the interrupter shaft, which is driven at crankshaft speed. It is bolted by a double flange connection to the driving shaft, one shaft having one less bolt hole than the other. When the firing mechanism is properly set, a bullet fired from the gun will miss the trailing edge of the propeller by ¼ inch.

When fitting the Hispano-Suiza engine to a plane, it is anchored on a rigid support, lined at the points of contact with fiber or sheet metal, the engine base being set flat on the support members. To facilitate disassembly, the camshaft and valve gear housings are usually left exposed, enabling the plane constructor to use smaller cowls. When an engine is mounted without cowls, it is necessary to protect the magnetos by covers, usually of leather.

To carry away any gasoline that may overflow from the bowl of the carbureter or drip back during maneuvers in the air a small drain pipe is attached to a nipple at the bottom of the carbureter. The excess gasoline is discharged as far as possible to the rear under the planes and away from the exhaust lines.

## Contracts Placed

WASHINGTON, Nov. 23—Following is a list of contracts placed by the Bureau of Aircraft Production prior to the armistice and just announced:

Nov. 1

Ideal Clamp Mfg. Co., 25,000 hose clamps, 385.  
Champion Spark Plug Co., 12 spark plug cleaners, \$4.20.

## Calendar

ENGINEERING  
S. A. E. Meetings  
1919

Jan. 8—Minneapolis Section, S. A. E.—Hotel Radisson. "Governors for Tractors and Truck Engines."  
Jan. 12, 13, 14—New York—Winter Meeting, Society of Automotive Engineers, Engineering Societies' Building.  
Feb. 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Radiator Cooling Fans."  
Mar. 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Tractor Service and Sales."  
Apr. 2—Minneapolis Section, S. A. E.—Hotel Radisson. "Implements Designed for Tractor Belt Power and Their Characteristics."

## CONVENTIONS

Dec. 4-5-6—Atlantic City—War Emergency and Reconstruction Conference of War Service Committees.  
Dec. 9—Philadelphia, Pa.—Meeting, Philadelphia Automobile Trade Assn.  
Dec. 9-13—Chicago—Convention Highway Industries Association, Congress Hotel.  
Dec. 11—New York—Annual Dinner Portland Cement Association, Biltmore Hotel.  
1919  
Feb. 17-22—Des Moines, Ia.—Tenth Annual Automobile Show, Des Moines Automobile Dealers' Assn.  
Feb. 25-28—New York—American Road Builders' Assn., Sixteenth Annual Convention.

SHOWS  
1919

Jan. 13-19—Des Moines, Ia.—First Tractor Show, Des Moines Thresher & Tractor Club, H. J. Clark Mgr.  
Feb. 17-22—So. Bethlehem, Pa.—Passenger Car Show, Lehigh Valley Auto Shows Co., J. L. Elliott, Mgr.  
Feb. 24-27—So. Bethlehem, Pa.—Motor Truck Show, J. L. Elliott, Mgr.

## A New British Coke-Fired Steam Commercial Vehicle

(Continued from page 921)

returns the water of condensation to the tank through a filter in which the cylinder oil is extracted.

It will be noted from the foregoing description and accompanying drawings that the new Clarkson chassis is identical with a gasoline 3-ton model in all respects with the exception of the power unit, i.e., the frame, axles, gearbox and clutch of a 3-ton gasoline chassis could be fitted with either a gasoline motor or a Clarkson coke motor.

The increasing cost and scarcity in Great Britain of all liquid fuels, including gasoline, benzol, kerosene and alcohol, made it imperative to develop to the utmost extent the use of solid fuels. Of the solid fuels available coke is by far the most abundant as well as the cheapest form in which thermal units can be purchased. The consumption is about 5 lb. p.m. when loaded and 3.5 lb. when light, and it is calculated that at present prices in Great Britain the fuel cost per mile is approximately one-fourth as much with coke as with gasoline.

Curtiss Aeroplane & Motor Corp., 50 gasoline shutoffs, \$72.50.  
McCord Mfg. Co., 648 spark plug gaskets, \$2.92.  
Curtiss Aeroplane & Motor Corp., 16 V-2-3 engine No. 81580 propeller hubs, \$369.60.  
Vichek Tool Co., Liberty engine spark plug wrenches, \$19.68.  
Wright-Martin Aircraft Corp., 80 sets tools for Hispano-Suiza motors, \$15,744.  
S. F. Bowsyer & Co., 180-gal. gasoline truck, tank and pump, \$274.50.  
Wright-Martin Aircraft Corp., parts for Hispano-Suiza engine, \$2,983.39.  
Wright-Martin Aircraft Corp., tools for Hispano-Suiza motors, \$43.94.  
Wright-Martin Aircraft Corp., parts Hispano-Suiza engines, \$7.49.  
Curtiss Aeroplane & Motor Corp., 25 tail-skid braces, \$107.25.

Nov. 2, 1918

Curtiss Aeroplane & Motor Corp., 85 propellers, wing, rathen, aeroplane, \$238.  
Wright-Martin Aircraft Corp., 35 No. 9968 magneto couplings, \$40.95.  
Standard Stamping Co., gasoline cans, \$40.  
The Vichek Tool Co., 6 cotter-pin, \$0.30.  
Oxweld Acetylene Co., Davis-Bournonville Co., welding material, \$164.45 and \$38.  
Armstrong Bros. Tool Co., wrenches, \$14.33.

Nov. 4, 1918

Standard Turnbuckle Co., 1000 turnbuckles for JN4 planes, \$600.  
Eastern Machine Screw Corp., 7000 bolts for JN4 planes, \$515.10.  
Thomas Morse Aircraft Corp., 15 sets controls for S4C planes, \$2,295.  
Thomas Morse Aircraft Corp., 38 axles for S4C planes, \$646.  
Wright-Martin Aircraft Corp., 25 exhaust valves for Hispano-Suiza 150-hp. engine, \$162.75.  
Splitdorf Electrical Co., spares for Hispano-Suiza "A" engines, \$87.23.  
Wright-Martin Aircraft Corp., running magneto assembly, \$80.  
Metal Specialties Mfg. Co., 975 instrument, 13,000 lights and bulbs for DH4 planes, \$4,333.88.  
Wright-Martin Aircraft Corp., Hispano-Suiza "A" 150-hp. engine repairs, \$10,573.26.  
Hartzell Walnut Propeller Co., 4 propellers for 300-hp. Hispano-Suiza, \$500.

Nov. 5, 1918

A. Schrader's Son (Inc.), 1250 tire valves (inside), \$32.  
Harrison Radiator Corp., 8 JN6H radiators, \$440.  
The American Metal Hose Co., 750 rubber connections and 750 ferrules for oxygen tubing, \$42.19.  
Curtiss Aeroplane and Motor Co., spare parts for JN4 planes, \$927.50.  
Willis-Overland Co., crankshaft assembly balanced, OX-5, 1986, No. 41754, \$287.970.



# AUTOMOTIVE INDUSTRIES

*The* AUTOMOBILE

Vol. XXXIX  
Number 23

PUBLISHED WEEKLY AT 239 WEST 39th STREET  
NEW YORK, DECEMBER 5, 1918

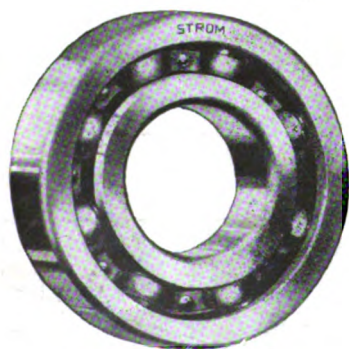
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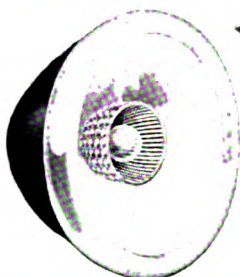
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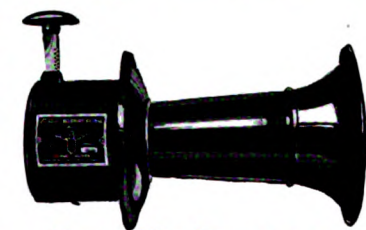
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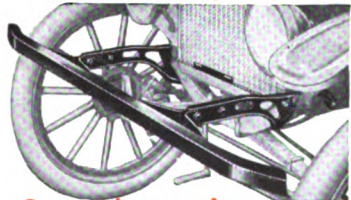
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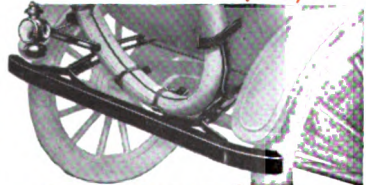
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# AUTOMOTIVE INDUSTRIES

## *The* AUTOMOBILE

VOL. XXXIX

NEW YORK, THURSDAY, DECEMBER 5, 1918—CHICAGO

No. 23

## Tractor Prospects in Siberia and Central Asia

Almost Unlimited Possibilities in Asiatic Russia—Population  
Has Been Largely Increased by Refugees from  
War and Revolution Swept Districts

By N. A. Stephanoff, M.E., Ph.D.\*

**T**HE question of industrial intervention in Siberia is now occupying the minds of many persons in the industrial circles of the United States. I regret to state, however, that the chaotic political situation in Russia, her internal troubles, the lack of reliable sources of information as to her economic conditions, and particularly those of Siberia and Central Asia, have so far prevented America from formulating any definite policy with regard to these countries, as far as economic assistance is concerned.

It is clear that Russia, and first of all Siberia and Central Asia, will greatly depend upon the United States, both politically and economically. It may be taken for granted that the big financial interests of America have already laid down a plan of action for the future industrial intervention in Siberia, and that they have taken full advantage of the lessons learned by French and Belgian concerns in Russia, who made the error of going there without sufficient preliminary study, and in consequence soon failed in competition with German capital, whose representatives are well organized and possess a thorough knowledge of Russian conditions.

### Unlimited Possibilities

From an industrial and economic point of view, Russia, and especially Siberia, Central Asia and Caucasia, are countries of unlimited possibilities. It is necessary,

however, to note that the opportunities exist only for a well-organized enterprise with a definite business program and a thoroughly developed plan of industrial intervention. Every adventure of a profiteering character is bound to fail—after a possible temporary success—when Russia will have recovered physically and morally.

### Stable Market Depends on Stable Buyers

Every student of industry well knows that a stable market for his goods depends upon stable buyers. Now, such a market can be created in Siberia and Central Asia in a short time. During the war and the revolution there was a great rush into Siberia of refugees from Poland and European Russia, with the result that the consumption there far exceeds the production of all articles of prime necessity. This raised the cost of living enormously. The issuing of large quantities of paper money and its accumulation in the hands of the farmers (about 10,000,000,000 roubles in Siberia and Central Asia alone) completely ruined the commercial machine, as the farmers could buy nothing from the cities, and therefore refused to sell their produce to them.

The industry of European Russia and Poland before the war was to a great extent under the control and influence of Germany. It is for this reason that the development of such important industries as sugar refining, textile manufacturing, etc., had been artificially hampered. Neither sugar nor clothes are to be found in Siberia and Central Asia now, nor any considerable

\*The author would like to express his indebtedness to O. A. Malychevitch, aeronautical and mechanical engineer, for assistance in collecting data concerning tractors.

TABLE 1  
SIBERIA

Provinces	Men	Women	Total	CITY		COUNTRY	
				Per Cent	Total	Per Cent	Total
1. Amour.....	225,000	225,000	450,000	45.2	203,400	54.8	246,600
2. Eniseisk.....	750,000	750,000	1,500,000	31.6	473,300	68.4	1,026,700
3. Transbaikai.....	750,000	750,000	1,500,000	33.1	496,400	66.9	1,003,600
4. Irkutsk.....	750,000	750,000	1,500,000	27.7	416,100	72.3	1,083,900
5. Primorskaya.....	500,000	500,000	1,000,000	58.2	581,600	41.8	418,400
6. Tobolsk.....	1,300,000	1,300,000	2,600,000	27.2	706,200	72.8	1,893,800
7. Tomsk.....	2,875,000	2,875,000	5,750,000	30.8	1,770,650	69.2	3,979,350
8. Jacoutsk.....	225,000	225,000	450,000	22.3	100,200	77.7	349,800
	7,375,000	7,375,000	14,750,000	....	4,747,850	....	10,002,150

CENTRAL ASIA

Provinces	Men	Women	Total	CITY		COUNTRY	
				Per Cent	Total	Per Cent	Total
1. Akmolinsk.....	950,000	950,000	1,900,000	14.7	297,300	85.3	1,602,700
2. Transcaspia.....	312,500	312,500	625,000	14.0	87,500	86.0	537,500
3. Samarkand.....	750,000	750,000	1,500,000	16.4	246,000	83.6	1,254,000
4. Semipalatinsk.....	550,000	550,000	1,100,000	7.9	86,900	92.1	1,013,100
5. Semirechensk.....	800,000	800,000	1,600,000	9.3	148,800	90.7	1,451,200
6. Sirdaria.....	1,225,000	1,225,000	2,450,000	14.6	357,700	85.4	2,092,300
7. Turpan.....	425,000	425,000	850,000	6.7	56,950	93.3	793,050
8. Ural.....	525,000	525,000	1,050,000	9.8	102,900	90.2	947,100
9. Fergana.....	1,337,500	1,337,500	2,675,000	19.6	524,300	80.4	2,150,700
	6,875,000	6,875,000	13,750,000	....	1,890,350	....	11,859,650

quantity of shoes, consequently the balance of foreign trade will be very unfavorable to these countries during the first years after the conclusion of the war. Any considerable export of grain from western Siberia cannot be counted upon, as the normal conditions of trade between Siberia and European Russia, and through the latter with western Europe, will not be re-established in the near future. The Far Eastern markets and the Pacific Coast are inaccessible as yet because of lack of cheap transportation.

Siberia and Central Asia need not and will not be exclusively agricultural countries, as they possess immense natural resources (iron, copper, timber, coal, etc.) sufficient for an extensive industry.

### Siberia in Need of Manufacturing Facilities

The most urgent need in Siberia and Central Asia is the creation of facilities for manufacturing articles of prime necessity, such as sugar, textiles, shoes, etc. By creating such industries and by cultivating the personal requirements it would be possible to enhance the general welfare and the standard of intelligence of the population. It is necessary to establish an intensified agriculture comprising the raising of cotton, flax and hemp, cattle raising, the production of vegetable oils and animal fats, etc.

If this be the case, then there is in Siberia and Central Asia an immense opportunity for tractors, together with all the latest types of agricultural implements.

According to figures given in the "Statistical Annual" of the Russian Bureau of Trade and Industry for 1914,

TABLE 2  
DAILY FOOD RATION PER PERSON  
(SIBERIA AND CENTRAL ASIA)

Grammes per Person with Ordinary Work—Continued	Bread (in Grain)	Fresh Potatoes	Fat	Cereals (in Grain)	Fresh Vegetables	Sugar	Meat	Total
Full ration.....	674.3	472.0	13.48	205.0	410.0	13.48	....	1788.26
Protein.....	80.43	10.0	0.60	20.05	37.27	....	....	148.35
Fat.....	11.98	0.66	10.78	6.48	2.58	....	....	32.48
Carbohydrates.....	433.0	107.19	....	124.7	109.63	12.13	....	786.65
Fuel value in calories.....	2219	486	100	654	626	50	....	4135
Half ration.....	387.15	236.0	13.48	102.5	410.0	13.48	....	1162.6
Protein.....	40.21	5.0	0.60	10.03	37.27	....	....	93.11
Fat.....	5.99	0.33	10.78	3.24	2.58	....	....	22.92
Carbohydrates.....	216.5	53.6	....	62.3	109.63	12.13	....	454.2
Fuel value in calories.....	1109.5	243	100	327	626	50	....	2455.5

and in the "Statistical Yearbook" of the Central Committee on Statistics of the Russian Department of the Interior, the population of Siberia in 1915 amounted to 10,377,900, Central Asia having at the same time 11,254,000. Data collected by the writer while in Siberia in 1917 indicate that it would be more correct to estimate the population of Siberia toward the end of 1918 roughly at 14,750,000, and that of Central Asia at 13,750,000 (see Table 1). The increase in population has been almost entirely in the cities and towns. We are justified in assuming that the bulk of this immigrated population will not return home after the war is over and conditions in Russia have improved; on the contrary, we may even expect a further tide of new immigrants from European Russia, and in the first place of the lower middle class.

In order to answer the question as to how large will be the area of land that will be cultivated in Siberia in the near future, we must not only know precisely the population of the country but also the minimum food ration per person available, as well as the amount of man power.

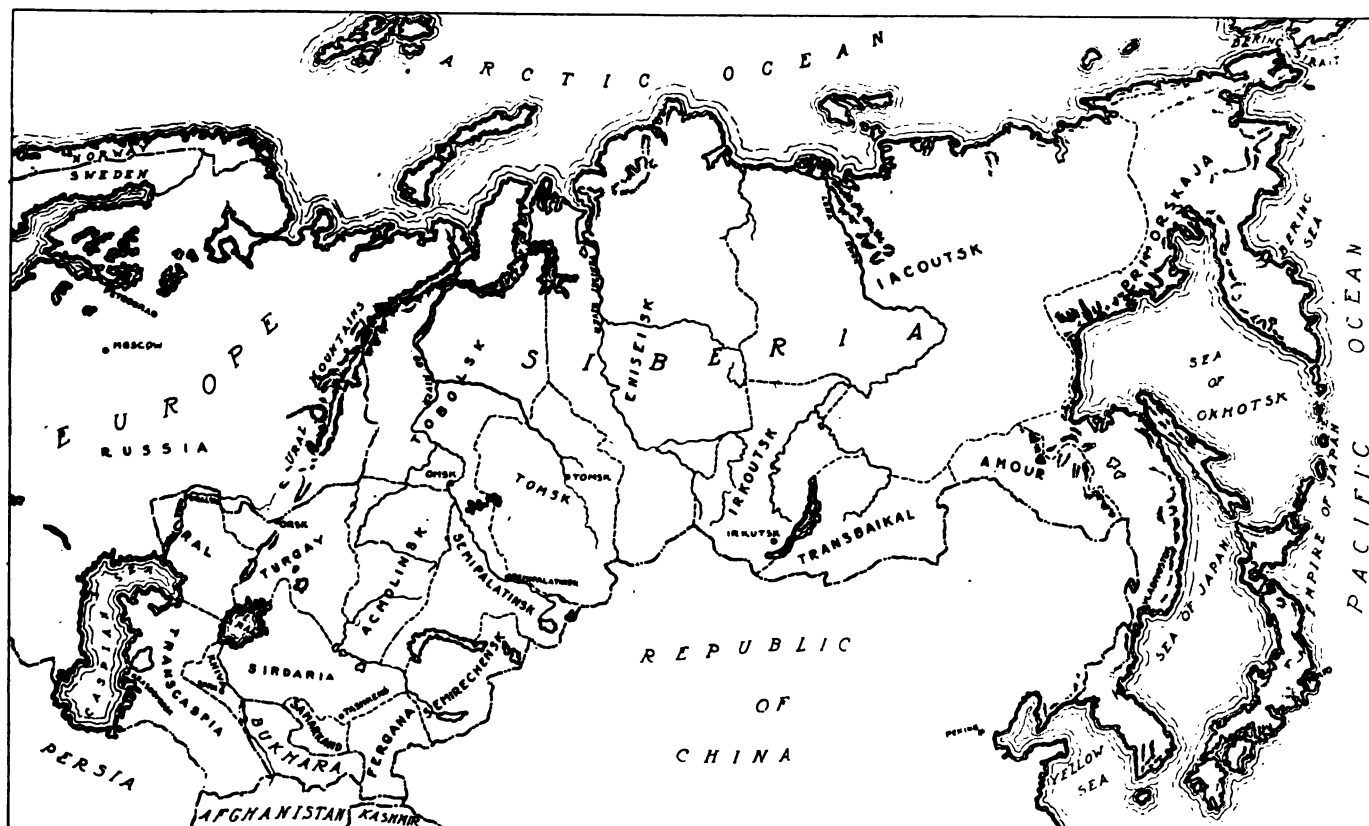
Siberia and Central Asia, as a whole, had never known starvation. Making an exception of the nomadic tribes, the food of the people used to be quite sufficiently varied, and contained enough meat, milk and fats. In this respect western Siberia, the province of Akmolinsk, and the neighboring regions of Central Asia, enjoyed especially favorable conditions. They exported a considerable part of their agricultural produce to eastern Siberia, to the provinces of Fergana and Trans-Caspia. This district is still the granary of Siberia and Central Asia; but there is one obstacle to further development: The farmers of the above mentioned fertile regions make no effort to increase the cultivated area to any extent, having no inducement to do so.

### Cities on Reduced Ration

As to the cities, they cannot expect to receive a full food ration for a few years to come, as they have nothing to give the farmers in exchange for foodstuffs; this accounts for the diminished ration (Table 2) for the entire city population and the country population under 9 years of age. The meat and the milk rations are excluded, as they bear no direct relation to the cultivated area and consequently to the question of tractors. Most of the area under cultivation in Siberia and Central Asia is sown to wheat; rye and barley are raised in small quantities, the distribution depending entirely upon climatic conditions. Table 3 shows the quantities of different cereals sown in 1912 (see also Tables 12 and 13). The crop is the chief factor in calculating the cultivated area, but the amount of collected grain is also given. Yield of grain is expressed in Russia in poods per dessiatina (1 pood = 36.1 lb.; 1 dessiatina = 2.7 acres).

Because of lack of data the average yield cannot be given in definite figures for Siberia and Central Asia. For illustration, reference may be made to Table 4, giving the yield in Siberia and Central Asia for the period 1908-1912, and Table 5 for 1912. For the period since 1912 the calculations were made by assuming a yield of 40 poods wheat and 30 poods rye per dessiatina. To simplify the calculations, the area under cereals is assumed to be all under wheat; this assumption is warranted because the total wheat crop exceeds the amount of rye raised, both absolutely and relatively.

Tables 6 and 7 show the area which must be sown to breadstuffs in Siberia and Central Asia in order to furnish a full yearly bread ration per person, which we estimate at 15 poods, corresponding to a full daily ration of 674.3 grammes and a half ration of 337.1 grammes of grain per person. (See Table 2.)



Map of Siberia and Central Asia

The area under other cereals called for will be determined by the yearly rations of:

(a) Grits or gruel,\* such as buckwheat, millet, barley, oats, rice, etc., of which a full ration is 4.5 poods per person and a half ration 2.25 poods; and

(b) Potatoes, of which the full yearly ration is 19.5 poods per person.

The average yield (full crop less the amount of seed necessary for the next sowing) is estimated at 18 poods for dessiatina for buckwheat and millet, 350 poods for potatoes in Siberia, and 250 poods in Central Asia.

The yearly ration of fresh vegetables is made up of 40 per cent cabbage,† 40 per cent beans (yellow beans, lentils, peas, etc.), 10 per cent cucumbers, and 10 per cent beets. Other vegetables, such as carrots, parsley, lettuce, tomatoes, etc., are consumed chiefly in the cities.

On the basis of the above consumption figures the area of truck farms required to raise the necessary vegetables for the whole of Siberia and Central Asia is 400,000 dessiatina, in round figures. Out of this, 200,000 dessiatina probably could be cultivated by means of tractors. The rest would be small gardens cultivated by hand labor exclusively.

\*The consumption of meat and fats being insufficient, cereals will play a pre-eminent rôle in feeding the city as well as the country population of Siberia and Central Asia, especially children. Cereals are used almost exclusively hot, with butter or milk.

†Cabbage is chiefly used in form of sauerkraut; cucumbers are salted. These proportions of various vegetables are the most unusual ones among the Russian farmers.

When first considering Tables 8 and 9 there seems to be a contradiction between the area to be used under wheat and buckwheat in 1919 and the actually cultivated area in 1912, for instance. The population of Siberia and Central Asia in 1912 was about 19,500,000; in 1918 it will probably be about 28,500,000; i. e., 46 per cent larger. Besides, the western part of Central Asia and eastern Siberia formerly obtained a certain quantity of cereals from without (European Russia and Manchuria); in pre-war times, moreover, there was a more plentiful supply of meat and fats, so there was no such need of using cereals as substitutes. However, we need not discuss this question at length, as it has no direct connection with our problem.

Among the other agricultural products, flax and hemp deserve serious attention as oil-giving plants, because they can be successfully raised in Siberia and several provinces of Central Asia.

The amount of fats in the food ration is figured at a

TABLE 4

Year	SIBERIA				CENTRAL ASIA			
	WHEAT		RYE		WHEAT		RYE	
	Winter	Spring	Winter	Spring	Winter	Spring	Winter	Spring
1908 .....	56.0	.....	44.1	41.8	53.5	45.2	39.2	39.4
1909 .....	41.5	.....	37.1	36.0	46.1	38.0	34.1	27.6
1910 .....	45.6	.....	51.2	44.0	49.3	35.6	18.8	38.1
1911 .....	33.9	.....	38.9	37.3	39.0	25.6	9.2	25.8
1912 .....	43.8	.....	60.9	39.0	52.8	45.4	43.0	44.2

TABLE 3  
(CULTIVATED AREA IN DESSIATINES (2.7 ACRES))

1912 r	Wheat	Rye	Barley	Oats	Buckwheat	Millet	Peas Lentils	Potatoes	Flax	Hemp	Total
Siberia.....	2,600,100	1,054,200	180,100	1,720,600	91,200	56,200	23,800	119,500	55,200	56,200	5,980,100
In per cent.....	43.6	17.7	3.0	28.8	1.6	0.9	0.4	2.0	0.92	1.08	100
Central Asia.....	2,848,600	149,200	291,500	367,400	3,200	431,400	22,500	37,400	77,900	8,100	4,237,200
In per cent.....	67.2	3.5	6.9	8.7	0.07	10.18	0.53	0.88	1.85	0.19	100



TABLE 5  
Crops

Siberia 1912	Buck- wheat	Millet	Barley	Peas Lentils	Potatoes	Oats
1. Amour .....	23.7	59.2	51.1	41.8	383.6	61.0
2. Eniseisk .....	17.2	22.6	46.4	31.8	287.3	46.3
3. Transbaikai .....	13.1	32.9	37.8	51.3	370.3	31.2
4. Irkoutsk .....	13.0	13.7	45.1	23.3	606.8	35.4
5. Primorskaja .....	42.4	50.6	67.1	66.2	431.4	70.1
6. Tobolsk .....	28.9	26.9	71.2	43.0	408.2	45.2
7. Tomsk .....	18.9	13.9	51.5	31.4	394.9	49.0
8. Jacoutsk .....	.....	.....	.....	.....	.....	.....
Average .....	2,307,200 94,100 =25.2	1,228,000 56,000 =21.9	9,891,109 137,400 =52.8	832,300 25,400 =33.6	48,696,600 120,900 =402.8	64,161,600 1,772,300 =48.9

Central Asia 1912	Millet	Barley	Peas Lentils	Potatoes	Oats	
1. Akmoinsk .....	18.2	37.6	25.3	216.6	38.8	
2. Transcaspian .....	42.6	37.7	.....	286.3	40.4	
3. Samarkand .....	54.2	34.3	39.1	445.8	46.7	
4. Semipalatinsk .....	32.2	64.1	23.6	224.6	67.6	
5. Semirechensk .....	59.0	46.7	65.9	303.3	47.1	
6. Sirdaria .....	45.0	24.9	37.9	350.3	22.7	
7. Turgay .....	43.0	43.2	16.4	204.1	51.5	
8. Ural .....	53.8	47.1	.....	290.8	56.2	
9. Fergana .....	51.7	.....	.....	315.8	.....	
Average .....	96,900 3,300 =29.1	20,703,800 431,200 =48.0	13,871,000 291,600 =48.3	274,000 6,200 =44.2	9,387,600 37,000 =253.7	17,999,300 367,300 =49.0

minimum, as the supply of fats in Siberia and Central Asia will be below the average in the first few years after the war. With a fat ration as given in Table 2, Siberia and Central Asia will consume 8,550,000 poods; butter cannot be counted upon in this quantity, as it is one of the most important items of export for Siberia, and a means of securing a foreign commercial balance. In normal times Siberia only consumed 5 to 7 per cent of her own butter, the production of which was about 5,000,000 poods in 1914. If we assume the same proportion for 1919, a minimum of 8,300,000 poods of vegetable oils has to be supplied to take the place of animal fats. Central Asia can meet the whole of this demand with cotton-seed oil. However, the necessary quantity cannot be guaranteed at present, owing to the decreased area in cotton in Central Asia, especially in the provinces of Fergana and Transcaspia. Owing to a reduction in the supply of bread cereals from without, the farmers of these regions were compelled to raise their own food stuffs.

### Flax and Cotton Raised for Their Oils

If we assume the average amount of fat obtained from the seed to be 15 per cent, we shall require 27,670,000 poods of flax and hemp seed in 1919, which does not include the cotton-seed oil expected from Central Asia, this latter oil constituting 50 per cent of the general oil consumption of Siberia and Central Asia.

Table 10 shows the average yield of seed and fiber for the period 1908-1912. The net yield of flax and hemp is assumed to be 20 poods seed and 25 poods fiber. These figures make it necessary to have a minimum area

of 1,383,500 dessiatines under flax and hemp in 1919, which would result in 35,000,000 poods of raw fiber, representing a great export value.

In order to simplify the calculations we give the area under other cereals in per cents, in addition to the data of Table 3. Thus we see that the whole cultivated area in 1919 should be at least 23,886,000 dessiatines, as per Table 11.

Furthermore, we should consider the loss of grain in transit, possible loss from fire, and a minimum allowance of 15 per cent for partial crop failure. Adding these, we arrive at a total cultivated area for Siberia and Central Asia of about 30,000,000 dessiatines in 1919, which can serve as a basis for further calculations. This figure is arrived at on the assumption that it is necessary to raise enough produce to allow of a satisfactory minimum food ration for the population of Siberia and Central Asia.

### Horsepower and Man-Power Required

What is the necessary amount of horsepower and man-power for the cultivating of this area?

The average depth of plowing in Siberia does not exceed  $4\frac{1}{2}$  in. It is hardly necessary to point out that this is not enough even under existing conditions. Taking as average draft in wheat stubble 5 lb. per square inch, the total draft for a 5 x 12-in. furrow would be 270 to 300 lb. In virgin gumbo soil, which will make up more than 50 per cent of the acreage under intensified cultivation, the total draft would be as high as 800 to 900 lb. per plow.

The average draft of a horse in plowing is equal to one-tenth of its weight, which latter for a Siberian horse amounts to about 900 lb. We would need three horses to pull a foot-list, beam-hitch sulky plow with steel plow bottom. But we have to take into consideration that the Siberian horse, though a very good and enduring runner, is not a good draft horse for general farm purposes, and therefore in Siberia or Central Asia one horse will be required to cultivate 10 dessiatines, or 27 acres for a year.

These figures show that 30,000,000 dessiatines under the plow in Siberia and Central Asia, with a draft 5 lb. per square inch, will require at least 3,000,000 horses, while over 6,000,000 horses will be required if 50 per cent of the 30,000,000 dessiatines is new-broken ground. The statistics for 1912 show\* that there were in Siberia and Central Asia 4,506,000 and 4,435,000 horses respectively. Of these 9,000,000 horses, probably 5,500,000 were used on the farm, the remainder comprising colts and breeding stock required to keep up the supply for

\*According to available data the absolute increase of horses throughout Siberia and Central Asia in 1912-1917 was negligible owing to reasons which are not within the limits of this article. The number of horses in Siberia was 4,328,000 in 1908 and 4,506,000 in 1912; the number of horses in Central Asia was 4,602,000 in 1908 and 4,435,000 in 1912.

TABLE 6  
SIBERIA, 1918-19

Provinces	POPULATION IN 1918-19			TOTAL SUPPLY OF GRAIN					CULTIVATED AREA IN DESIATINES (APPROXIMATELY)	
	With Full Ration	With Half Ration	Total	For Full Ration 15 poods/y.	For Half a Ration 7.5 poods/y.	Total	Plus 15 per Cent for Next Sowing	Sum Total	1918-19.	1912
1. Amour.....	172,620	277,380	450,000	2,589,300	2,080,350	4,669,650	900,500	5,570,150	140,000	142,400
2. Eniseisk.....	718,660	781,300	1,500,000	10,780,350	5,859,750	16,640,000	2,500,000	19,140,000	500,000	356,300
3. Transbaikal.....	692,520	807,480	1,500,000	10,388,000	6,056,100	16,444,100	2,470,000	18,914,000	475,000	347,900
4. Irkoutsk.....	758,730	741,270	1,500,000	11,380,950	5,859,525	16,940,475	2,540,000	19,480,475	500,000	253,100
5. Primorskaja.....	292,880	707,120	1,000,000	4,393,200	5,303,400	9,696,600	1,454,500	11,151,100	280,000	103,400
6. Tomsk.....	1,325,660	1,274,340	2,600,000	19,884,900	9,557,550	29,442,450	4,416,400	33,858,850	847,000	729,100
7. Tobolsk.....	2,786,545	2,963,455	5,750,000	41,798,175	22,225,912	64,024,100	9,603,600	73,627,700	1,840,000	1,322,100
8. Jacoutsk.....	450,000	.....	450,000	6,750,000	.....	6,750,000	1,012,500	7,762,500	194,000	.....
	14,750,000	.....	.....	107,964,875	56,642,587	164,607,462	24,897,500	189,504,775	4,776,000	3,654,300

TABLE 7  
CENTRAL ASIA

Provinces	POPULATION IN 1918-19			TOTAL SUPPLY OF GRAIN					CULTIVATED AREA IN DESSIATINES	
	With Full Ration	With Half a Ration	Total	For Full Ration 15 Poods/y	For Half a Ration 7.5 Poods/y	Total	Plus 15 per Cent for Next Sowing	Sum Total in Poods	1918-19	1912
1. Akmolinsk.....	935,000	965,000	1,900,000	14,125,000	7,237,500	21,362,500	3,204,375	24,566,875	614,172	598,700
2. Transcaspian.....	376,250	248,750	625,000	5,643,750	1,865,625	7,509,375	1,126,406	8,635,781	215,896	93,000
3. Samarkand.....	377,300	622,200	1,000,000	13,167,000	4,666,800	17,833,800	2,675,026	20,508,826	512,713	396,000
4. Semipalatinsk.....	709,200	390,300	1,100,000	10,633,000	2,931,000	13,564,000	2,034,600	15,598,600	389,965	185,200
5. Semirechensk.....	1,015,000	555,000	1,600,000	15,225,000	4,387,500	19,612,500	2,941,875	22,554,375	562,859	328,400
6. Sirdaria.....	1,464,000	986,000	2,450,000	21,980,000	7,395,000	29,375,000	4,403,250	33,778,250	843,956	483,900
7. Turpay.....	565,000	285,000	850,000	8,475,000	2,137,500	10,612,500	1,591,875	12,204,375	305,194	340,100
8. Ural.....	663,000	387,000	1,050,000	9,945,000	2,902,500	12,847,500	2,227,125	15,074,625	376,866	318,900
9. Fergana.....	1,505,000	1,170,000	2,675,000	22,575,000	8,775,000	31,350,000	4,702,500	36,052,500	901,312	258,200
	8,110,250	5,639,750	13,750,000	121,748,750	42,298,125	164,046,875	24,907,031	188,953,906	4,723,932	2,996,400

town and country, the driving horses and the idlers. Therefore, the available number of horses will hardly cover the requirements of intensified agriculture.

Let us now see how many laborers there are among the country population. By a fully efficient laborer we mean one between 19 and 50 years of age, and by a half-efficient one a laborer between 15 and 19 or between 50 and 55. From the whole country population we must exclude certain nomadic tribes (the kirgys, kalmyks, booriats, yakoots, bashkyrs, toongoos, etc.), to whom agriculture is almost unknown; these tribes number altogether about 8,750,000.

This gives an able agricultural population of about 13,111,800, among whom there are about 4,785,000 fully efficient laborers, men as well as women, and about 1,625,800 male and female half-efficient laborers. There will, therefore, be sufficient manpower to cultivate the 30,000,000 dessiatines.

### Modern Implements Lacking

It appears from the above figures that Siberia and Central Asia are in some respects in about the same state as the United States was in the 80's. There are, however, many points of difference, of which the chief one is the lack of up-to-date agricultural machinery. This must be introduced, together with the tractor. The experience of the United States shows that the horse cannot compete with the tractor, and that, on the other hand, the tractor cannot entirely replace the horse. The advantages of the tractor are of an entirely different character than those of a horse, namely:

(1) The tractor does such heavy work as would be entirely impossible for the horse, and can do it whenever it is most necessary, since it places at the command of the farmer, the co-operative society and the State a vast amount of power to be utilized at the proper season of the year. It is well known how important it is in agriculture to have certain kinds of work done at the proper time. The experience of the Bezenchok Agricultural Station in the province of Samara, Russia, proved this conclusively in 1911-1913, as far as the spring

sowing of wheat and oats is concerned, as appears from the following figures:

YIELD PER DESSIATINA IN POODS

1911—DRY YEAR					Day of Sowing	WHEAT	
Day of Sowing	WHEAT CROP		OATS CROP			Grain Poods	Straw Poods
	Grain Poods	Straw Poods	Grain Poods	Straw Poods			
April 13..	16.7	43.3	13.6	40.8	April 7...	96.6	200.4
April 30..	14.7	50.2	8.7	38.9	April 12...	86.6	179.0
April 25..	7.4	43.5	7.1	35.5	April 17...	58.5	133.3
					April 27...	35.6	107.3
					May 5....	25.6	50.7

In Siberia May 10 is the limit for drilling grain, with five to six weeks time previous to that for plowing.

(2) The ability of a tractor to plow to a good depth, especially in hot weather, and to work at night as well as by day. The joint use of the tractor and the horse allows the farmer to increase the cultivated area, and a detailed study of the requirements of Siberia and Central Asia shows that an increase on a large scale is the only way to supply these countries with sufficient food.

(3) The tractor is capable of many different kinds of work and raises the general efficiency of an agricultural unit; this is particularly true if we consider a machine with a two or three-speed transmission. The part of the tractor in other agricultural operations, such as reaping, threshing, transportation, etc., is no less important.

### Transport Facilities Must Be Developed

Besides the growing of grain, Siberia and Central Asia are looking forward to railroad construction and the development of other ways of communication on a huge scale. Enormous investments will be made for the erection of grain elevators, for the equipment of sugar refineries, factories for textiles and household articles, etc. To raise the money for such investments, Siberia and Central Asia must create a satisfactory balance in foreign trade, which can be accomplished only by placing her agriculture, and particularly the production of plants

TABLE 8  
SIBERIA

Provinces	BUCKWHEAT, MILLET			CULTIVATED AREA IN DESSIATINES (2.7 ACRES)		POTATOES			CULTIVATED AREA IN DESSIATINES	
	Full Ration 4.5 Poods/y	Half a Ration 2.25 Poods/y	Altogether in Poods	In 1919	1912	Full Ration 10.5 Poods/y	Half a Ration 5.25 Poods/y	Altogether in Poods 36.1 Lbs.	In 1919	1912
1. Amour.....	776,780	624,105	1,400,885	77,828	4,600	1,812,510	1,456,245	3,268,755	9,340	4,100
2. Eniscinsk.....	3,234,105	1,757,925	4,992,030	377,340	8,900	7,546,245	4,101,825	11,648,070	33,280	13,700
3. Transbaikal.....	3,116,340	1,816,830	4,933,170	373,000	26,300	7,271,460	4,239,270	11,510,730	32,900	6,600
4. Irkutsk.....	3,314,285	1,660,857	4,975,142	276,800	5,700	7,966,665	3,891,665	11,858,332	33,580	8,100
5. Primorsky.....	1,297,960	1,591,020	2,888,980	160,540	38,100	3,075,240	3,712,380	6,787,620	19,400	10,600
6. Tobolsk.....	5,965,470	2,867,268	8,832,738	380,000	2,800	13,919,430	6,690,285	20,609,715	58,885	17,700
7. Tomsk.....	12,539,462	6,667,778	19,207,240	1,067,700	64,000	29,248,720	15,558,140	44,806,860	128,200	58,700
8. Yakoutsk.....	2,025,000	.....	2,025,000	112,500	.....	.....	.....	.....	.....	.....
	32,269,402	16,985,778	49,255,180	2,736,310	.....	70,840,270	39,649,810	110,490,082	315,585	119,500

TABLE 9

Provinces	CEREALS BUCKWHEAT, MILLET, ETC.			CULTIVATED AREA IN DESIATINES (2.7 ACRES)		POTATOES			CULTIVATED AREA IN DESIATINES (2.7 ACRES)	
	Full Ration 4.6 pood/y	Half Ration 2.25 pood/y	Altogether in Poods	In 1919	In 1912	Full Ration 10.5 Poods/y	Half Ration 5.25 Poods/y	Total in Poods	In 1919	In 1912
1. Akmo-linsk.....	4,207,500	2,172,000	6,379,500	354,416	9,400	9,817,500	5,066,250	14,883,750	59,535	18,100
2. Transcas-pian.....	1,692,000	559,700	2,251,700	125,100	100	3,950,625	1,805,937	5,756,562	21,026	100
3. Samarkand.....	3,950,100	1,400,000	5,350,000	297,222	5,200	9,216,900	3,266,550	12,483,450	49,933	900
4. Semipala-rinsk.....	3,191,400	879,300	4,070,700	226,150	37,400	7,446,600	2,051,700	9,498,300	37,993	2,700
5. Semirechenk.....	4,567,500	1,317,000	5,884,500	326,916	80,300	10,657,500	3,071,250	13,728,750	54,915	4,400
6. Sirdaria.....	6,588,000	2,218,500	8,806,500	489,250	86,900	15,372,000	5,176,500	20,548,500	82,194	3,300
7. Turpay.....	2,542,500	641,250	3,183,750	176,875	97,700	5,932,500	1,496,250	7,428,750	29,715	5,500
8. Ural.....	2,983,500	870,750	3,854,250	214,130	105,200	6,991,500	2,031,700	9,023,200	35,973	2,300
9. Fergana.....	6,772,500	2,632,500	9,405,000	522,500	12,100	15,802,500	6,142,500	21,945,000	87,780	2,500
	36,496,125	12,689,775	49,185,900	2,732,550	434,300	85,157,625	29,608,637	114,766,262	459,065	36,800

possessing an industrial value, such as cotton, flax, potatoes, beans, etc., on a more intensive basis.

The development of agriculture will constitute a serious task to the government of Siberia and Central Asia. It is not within the province of this article to consider in detail the possibilities of the future export trade of Siberia and Central Asia. But considerations of even a most general character lead to the conclusion that the population of Central Asia and Siberia, as per Table 1, needs more than 60,000,000 desiatines of cultivated land to permit of a higher standard of living. This advancement will hardly be achieved unless tractors are introduced and the farms are equipped with modern implements generally.

We do not need to fear unemployment as a result of the use of machinery for farm work; any surplus of labor will find employment in the industries, especially in sugar refining, textile manufacturing, in the pulp, cellulose and paper factories. As far as the latter industry is concerned, the possibilities of Siberia are unlimited, and in connection therewith the tractor will prove of still greater importance, paving the way for more complicated machinery.

### Possible Demand for Tractors

Let us see what would be the result if the agricultural work to be done in Siberia and Central Asia were done by means of tractors. We do not intend to make a comparison of various kinds of tractors. But it is clear that a 3-plow tractor with 15-30 b.hp. engine would be the most suitable one for Siberia and Central Asia. With a 7 x 14-in. furrow and an average speed of 2½ m.p.h., the average draft being 7¾ lb. per sq. in., the tractor will plow 1 desiatina in 3 hours, which makes 300 desiatines in the 900 hours of the yearly plowing time. For the necessary minimum of 30,000,000 desiatines a year 100,000 tractors would be needed; considering that the average life of a tractor is 5 years, Siberia and Central Asia would need 20,000 new tractors yearly. There would be yearly requirements of 50,000,000 poods of kerosene (about 7 gallons per desiatina), about 120,000 poods lubricating oils and about 750,000 poods of heavy grease for the gear box.

As soon as normal conditions are restored there will be no great difficulty in supplying these quantities to Siberia and Central Asia from Baku by way of the

Caspian Sea, Volga River, Oural River, etc. On the other hand, eastern Siberia can be supplied with kerosene from Baku via Batoom, the Black Sea, etc., to Vladivostok.

With regard to the present and the immediate future the horse undoubtedly has the advantage over the tractor, owing to the exorbitant cost of kerosene and lubricating oils. But this will all be changed as soon as Siberia and Central Asia introduce industrial agriculture, producing vast quantities of cotton, flax, hemp, vegetable oils, animal fats, alcohol, sugar, etc. We may say with perfect assurance that only by means of tractors will it be possible for Siberia and Central Asia to treble in the next 10 years their cultivated area and thus to create for themselves a favorable export balance. It is clear, also, that Siberia and Central Asia must develop their smaller industries, out of political and economical consideration, in order to make the population spend the idle winter months in an efficient way. These industries include timber work, spinning, weaving, milling, dairying, soap making, etc., all of which can be established and organized permanently only with the aid of tractors.

The introduction of tractors in Siberia and Central Asia can be accomplished only by means of a comprehensive plan of work, a well-organized credit system, and—what is still more important—a previously developed campaign of tractor propaganda on well-equipped experimental farms and small shops.

Assuming that in the beginning Siberia and Central Asia were supplied with only 10 per cent of the whole number of tractors they will eventually need, this would call for about 2000 tractors.

Tables 12 and 13 show the agricultural characteristics of the different provinces of Siberia and Central Asia, and also contain data concerning the cultivated area in 1912.

### Conclusions

(1) The introduction of tractors, together with improved agricultural machinery and industrial tools, is absolutely necessary to promote industrial agriculture and the smaller industries in Siberia and Central Asia.

(2) It is necessary to organize, during the next 3 years, a widespread propaganda of tractors. For this purpose there should be established a number of experimental stations in the shape of farms under the management of capable instructors. At first they should be established in the provinces of Tobolsk, Tomsk, Akmo-linsk, Amur and Primorskaya but later on the net of experimental farms and model industrial units, together with repairshops, should be extended as far as possible.

(3) Stores of fuel and other supplies necessary for the efficient operation of tractors should be established; there must also be a completely developed and practical plan for supplying the farmers with these materials.

(4) Special banks should be opened, a bank of agriculture and a bank for small industries, offering liberal

TABLE 10

Year	SIBERIA				CENTRAL ASIA			
	FLAX		HEMP		FLAX		HEMP	
	Seed	Raw Fibre	Seed	Raw Fibre	Seed	Raw Fibre	Seed	Raw Fibre
1908.....	30.0	30.8	42.7	29.9	28.5	28.7	35.5	29.8
1909.....	25.1	22.1	30.9	27.3	22.9	22.0	24.4	29.7
1910.....	25.6	24.0	28.9	27.5	23.8	22.3	31.8	34.9
1911.....	22.0	19.4	29.0	21.6	17.2	14.1	23.8	20.8
1912.....	26.6	32.8	28.7	33.2	24.9	26.1	26.4	34.5



TABLE 11

1918-19	Wheat and Rye	Barley	Buckwheat Millet	Oats	Flax and Hemp	Potatoes	Kitchen Garden (Country)	Cotton	Total in Dessiatines (2.7 Acres)
Siberia.....	4,800,000	410,000	2,750,000	3,950,000	1,400,000	316,000	100,000	.....	13,026,000
Central Asia.....	4,750,000	750,000	2,750,000	950,000	.....	460,000	100,000	400,000	10,860,000
<b>Total</b> .....	<b>9,550,000</b>	<b>1,160,000</b>	<b>5,500,000</b>	<b>4,900,000</b>	<b>1,400,000</b>	<b>776,000</b>	<b>200,000</b>	<b>400,000</b>	<b>23,886,000</b>

TABLE 12  
SIBERIA. CULTIVATED AREA IN DESSIATINES (2.7 ACRES), 1912

Provinces	Wheat	Rye	Oats	Barley	Buckwheat	Millet	Flax	Hemp	Potatoes	Peas Lentils	Total
1. Amour.....	139,700	4,700	141,400	1,600	2,700	1,900	300	500	4,100	100	295,000
2. Eniseisk.....	143,600	212,700	110,700	15,400	4,000	4,900	2,700	5,400	13,700	1,300	514,300
3. Transbaikal.....	53,800	194,100	54,200	11,200	26,100	200	.....	.....	6,600	600	246,600
4. Irkutsk.....	47,300	205,800	83,200	21,100	4,900	800	400	3,200	8,100	1,400	376,200
5. Primorskaya.....	92,100	11,300	83,100	6,000	31,000	7,100	4,200	1,100	10,600	500	247,000
6. Tobolsk.....	561,200	167,900	350,400	32,500	900	1,900	13,200	6,300	17,700	2,800	1,155,300
7. Tomsk.....	1,564,400	257,700	897,600	92,300	24,600	39,400	34,400	39,200	58,700	17,200	3,025,500
8. Yakutsk.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
<b>Total</b> .....	<b>2,600,100</b>	<b>1,054,200</b>	<b>1,720,600</b>	<b>180,100</b>	<b>94,200</b>	<b>56,200</b>	<b>55,200</b>	<b>56,200</b>	<b>119,500</b>	<b>23,800</b>	<b>5,960,100</b>

TABLE 13  
CENTRAL ASIA. CULTIVATED AREA IN DESSIATINES (2.7 ACRES), 1912

Provinces	Wheat	Rye	Oats	Barley	Buckwheat	Millet	Flax	Hemp	Potatoes	Peas Lentils	Cotton	Total
1. Akmolinsk.....	587,600	6,100	96,700	24,300	600	8,800	18,700	1,800	15,200	1,100	.....	761,400
2. Transcaspian.....	93,500	.....	.....	8,000	.....	100	.....	.....	100	.....	43,400	145,600
3. Samarkand.....	369,700	26,200	1,800	66,100	100	5,100	24,900	700	900	6,100	31,600	533,200
4. Semipalatinsk.....	178,600	6,600	56,000	10,700	200	37,200	1,100	500	2,700	1,900	.....	295,500
5. Sirdaria.....	473,600	10,300	23,000	56,800	1,100	85,800	11,700	3,100	3,300	6,800	62,400	737,900
6. Turgay.....	322,000	18,100	43,200	16,900	400	97,300	10,000	600	5,500	300	.....	514,300
7. Semirechenak.....	320,900	7,500	122,600	86,300	500	79,800	3,200	1,400	4,900	2,500	.....	629,600
8. Ural.....	244,600	74,300	20,400	4,000	.....	105,200	.....	.....	2,300	.....	.....	450,800
9. Fergana.....	258,100	100	3,700	17,400	300	12,100	8,300	.....	2,500	3,800	264,500	570,800
<b>Total</b> .....	<b>2,848,600</b>	<b>149,200</b>	<b>367,400</b>	<b>291,500</b>	<b>3,200</b>	<b>431,400</b>	<b>77,900</b>	<b>8,100</b>	<b>37,400</b>	<b>22,500</b>	<b>401,900</b>	<b>4,639,100</b>

credit to farmers who desire to introduce tractors on their farms or to establish small factories and mills for manufacturing various kinds of ready-to-use goods and articles from local raw materials. The power of these banks should be widened so as to entitle them to exercise control over the choice of grains to be sown, and over the exportation of agricultural produce and manufactured articles from Siberia and Central Asia. To successfully accomplish this it is necessary for the promoters to establish close relations with the Siberian co-operative companies and with the local government.

(5) Much patience will be needed, as no considerable returns can be expected until the whole trading system of Siberia and Central Asia can be put into shape, which will require about 5 years of hard work. By that time

the agriculture of these countries will be placed upon a substantial footing.

(6) A well-conceived and well-elaborated policy, firmly adhered to, in full accord with the mass of the population of Siberia and Central Asia, is the only means of taking advantage of the immense opportunities for the tractor in these countries, and later on in European Russia and Caucasasia.

(7) Haphazard industrial intervention, based on selfish interests only, would introduce into these countries machinery of questionable quality. If this should happen the future of the American tractor in that part of the world could very easily be ruined, which would be a most unfortunate thing, considering the great advantages of the best makes of American tractors.

## Automatic Variable Speed Generator

THE Harvey-Taubert Mfg. Co., Los Angeles, Cal., recently formed for the purpose of manufacturing electrical specialties, will soon place on the market a new automatic variable speed generator, designed to maintain a substantially constant flow of current under variable speed. This generator is specially suited for use on motorcycles and automobiles. It is of standard form, but is made in two types, one for use without a battery (on motorcycles and trucks), and the other for use with a battery. The latter type is provided with a cut-out switch, which is enclosed in the generator housing, so that the whole forms a single unit.

The minimum speed required to produce full load is very low for this type of apparatus, viz., 1200 r.p.m. armature speed, which with a gear ratio of 2 to 1 corresponds to 600 r.p.m. engine speed.

The regulating mechanism is mounted as a unit directly above the generator proper, and is enclosed. It comprises a ball governor and an auxiliary commutator. The motion of the balls under the centrifugal force serves to actuate brushes

connected with the commutator for regulating resistance connected therewith, according to the speed of the armature shaft. The auxiliary commutator is stationary, and of internal contact design. It is of improved wedge construction, with the resistance mounted on its periphery. Should it become necessary to resurface the commutator, the whole unit can be easily removed. The wiping action of the brushes, rocking as the speed is increased or diminished, has a tendency to polish both the commutator and the brushes. As no voltage is generated between bars under the brushes in the regulating means, no sparking occurs. A speed variation of 5 to 1 may be taken care of.

We are informed that the generator has been thoroughly tested, and that applications for a patent on it have been filed. It was designed by E. E. Taubert, who was the organizer of the A-B-C Generator Co., now well known in the motorcycle field.

The Harvey-Taubert Mfg. Co. is located at 633-5 S. Los Angeles Street, Los Angeles, Cal.

# Dixie Standard Aircraft Magneto

**A Few Extra Parts Permit of Converting an 8-Cylinder 90-Deg. V Engine Magneto Into One for Almost Any Other Type of Aircraft Engine—Methods Used in the Manufacture of Magneto Magnets**

A GREAT opportunity offered itself to magneto manufacturers at the outbreak of the war in connection with the development of ignition apparatus for aircraft engines. Pre-war aircraft invariably carried magnetos and as Germany had been the main source of supply of these machines, the demand upon manufacturers in allied and neutral countries increased enormously with the outbreak of hostilities. American manufacturers were perhaps better prepared to take care of this demand than manufacturers in England and France, not only because of their much larger facilities but also because they already had had experience in producing magnetos for multi-cylinder automobile engines. It is no wonder therefore that our magneto concerns secured considerable European business from the very beginning of the war.

Among the American concerns which have been most active in the development of magnetos for aircraft engines is the Splitdorf Electrical Co. of Newark, N. J. It has furnished its Dixie magnetos in large numbers for Hispano-Suiza, Curtiss, Le Rhone, Hall-Scott and Bugatti engines built in this country and it has also supplied smaller numbers for other makes of engines. The special achievement of the Splitdorf engineering department in connection with aircraft work is the production of a standardized line of magnetos so that by the use of only sixteen extra parts the standard magneto for eight-cylinder engines can be converted into six other models covering practically the whole range of aircraft engine types.

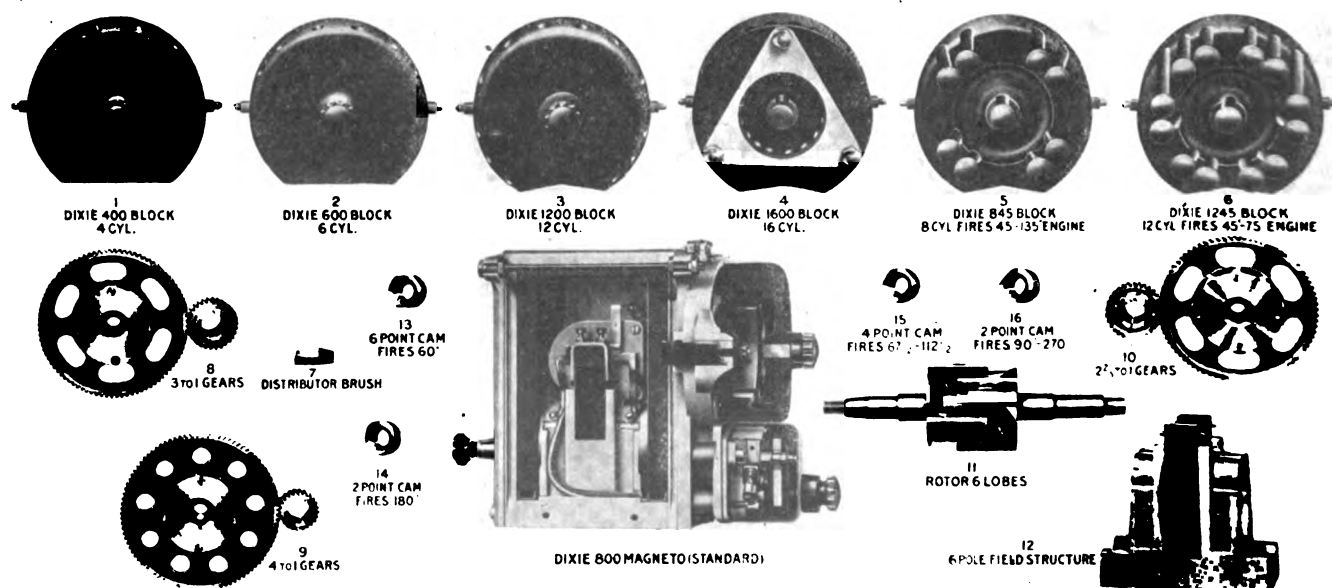
The demand for aircraft magnetos confronted ignition experts with a number of distinct problems. In the first place the magneto must be absolutely reliable. There

must be nothing on it that can break or shake loose in spite of the terrific vibration on an aircraft engine. Next, the machine must be light, as every pound of additional weight detracts from the speed, climb and ceiling of the machine and reduces its fighting value by just so much. Finally, it appeared at the outset that a great variety of types of engine would be used for different classes of planes, and as it was essential to get into production quickly it was necessary to adopt a single general design to different types of engines with the least possible number of changes. This the Splitdorf company set out to do and how well it has succeeded may be judged from the following description of the Dixie line.

Generally speaking, the Dixie aircraft magneto is of the same type as the automobile magneto of the same make. It operates on the distinctive Dixie principle without revolving windings and its magnets straddle the rotor lengthwise instead of transversely. However, before going into details of construction it will be best to explain how the single design of magneto is adapted to the different types of engine, as the solution of this problem forms the Splitdorf company's chief contribution to the carrying out of our aircraft program.

## Eight Cylinder the Basic Type

The basic type is the eight-cylinder 90-deg. V, the earliest as well as the greatest demand having been for magnetos for such engines. The eight-cylinder 90-deg. V Dixie magneto has a four-wing rotor, in which respect it differs from the Dixie magneto for four- and six-cylinder automobile engines which has a two-wing rotor. This eight-cylinder aircraft magneto generates four im-

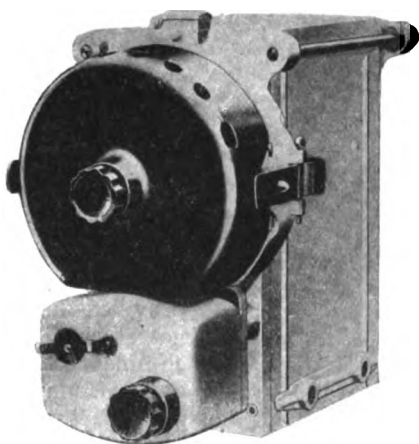


*Dixie eight-cylinder magneto and extra parts required to convert it into six other models*

pulses per revolution, exactly the same as the number of sparks required by the eight-cylinder engine. Also, with a 90-deg. V the sparks must come at equal intervals, as do the impulses of the magneto. The distributor gearing is the usual 1:2 gearing, the distributor having eight equally spaced contact segments all in a single circle.

Four-cylinder engines have been used to quite an extent for training planes and this is the smallest number of cylinders to which the magneto has been adapted. The four-cylinder model is very much like the eight-cylinder one, only two extra parts being required to convert the latter into the former. One of these is the distributor block, which has only four contact segments instead of eight, and the other is the breaker cam. As the magneto is driven at crankshaft speed and has the same magnetic circuit arrangement as the eight-cylinder model, four electric impulses will be generated per engine revolution, whereas only two sparks are required per revolution. The four-cylinder magneto is driven at the same speed as the eight-cylinder model, and every second current impulse is simply suppressed, by so constructing the breaker cam as to hold the primary circuit open during every second impulse. The type of cam used is illustrated herewith. It has two oppositely located lobes which cause the circuit to open at moments corresponding to the peaks of alternate inductive impulses and holds the primary circuit open during the period of the intermediate or unessential impulses, thus preventing the production of a spark during these intervals.

Next comes the six-cylinder model, which requires a different distributor block, a different cam and a different set of distributor gears as compared with the eight-cylinder model. In order to produce three sparks per revolution of the crankshaft, the rotor is driven at one and a half times crankshaft speed, thus insuring the production of six sparks per two engine revolutions, of which every other one is suppressed by means of the breaker cam. This breaker cam is the same as that used for the



*The eight-cylinder magneto complete*

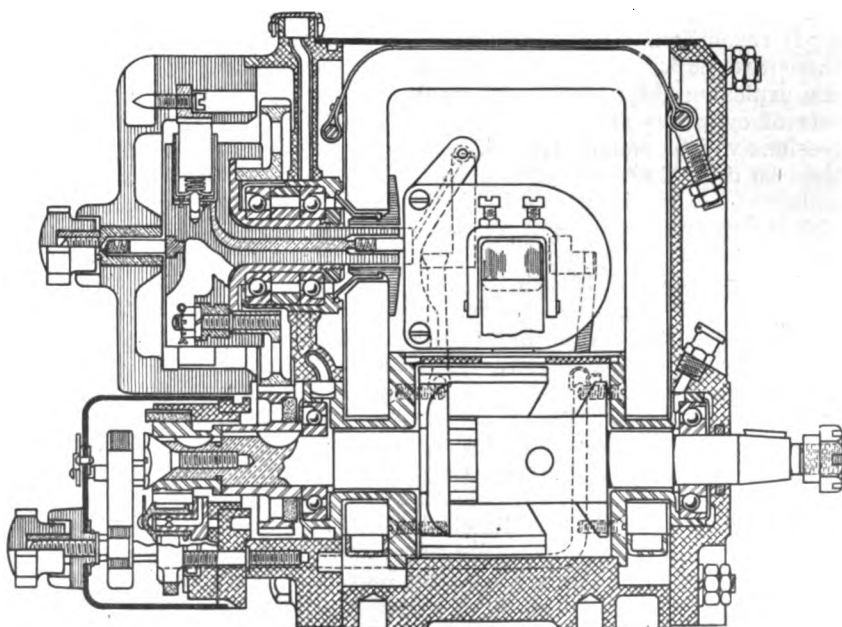
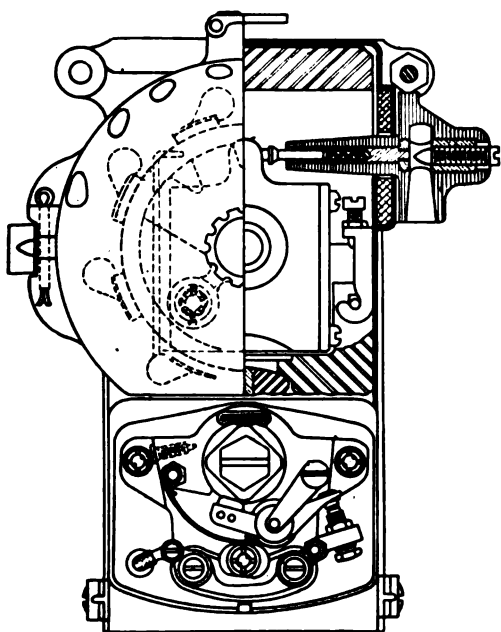
four-cylinder magneto. It is obvious that the high tension distributor must run at one-half crankshaft speed, and since the rotor is geared to run at one and one-half times crankshaft speed, the distributor gearing must give a speed reduction of 3 to 1.

No particular difficulty is encountered in adapting the magneto to the ignition of twelve-cylinder, 60-deg. V engines. Running it at one and one-half times crankshaft speed results in the production of six impulses per revolution, equal to the number of sparks required, and as they are evenly spaced, the sparks come in the correct order for firing an ordinary twelve-cylinder engine. The gears used, therefore, are 3 to 1. On account of the necessity of maintaining a space at

least  $\frac{1}{2}$  in. between distributor segments, a narrower distributor brush is used.

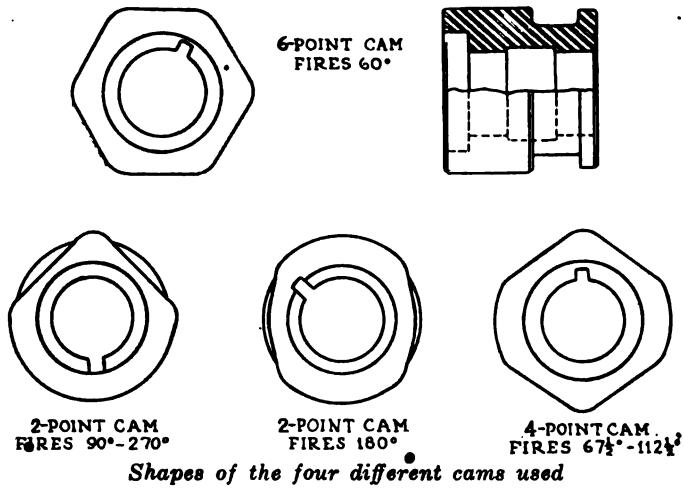
#### Special Field Structure in 16-Cylinder Type

For use on a sixteen-cylinder engine with equally spaced explosions, such as the Bugatti, the magneto is driven at one and one-third times crankshaft speed, and a special type of field structure and rotor are used. The rotor has six wings, so that six impulses are induced in the armature winding during each revolution. Rotating at one and one-third crankshaft speed, the number of impulses is equal to eight per crankshaft revolution, and to sixteen during two crankshaft revolutions or one complete cycle of the engine. Forming the rotor with six wings makes the individual wing comparatively narrow, and would result in an inadequate pole surface if the field pole masked only one wing at a time. Therefore, the field structure is so made that each field pole masks at the same time two of the wings of one rotor pole. In this way the effective gap area is even larger than with the four-wing rotor, and the magnetic flux is increased. This magneto also requires a special distributor block with 16 contact segments, special distributor gears giving a reduction ratio of  $2 \frac{2}{3}$  to 1, a special cam with six equally spaced cam lobes, and the same narrow dis-



*Longitudinal and cross section of Dixie aircraft magneto*





tributor brush as used in all of the multi-cylindere types.

The first Liberty aircraft engine ever built was an eight-cylinder 45-deg. V, and the Splitdorf company developed a magneto model for this. In an engine of this type the explosions do not come at equal intervals, but at intervals of 45 deg. and 135 deg. of crankshaft motion, and the sparks must be similarly timed. This requires a special distributor block with contact segments arranged in four pairs, the angular distance between the contacts of each pair being 22½ deg. The rotor is driven at twice crankshaft speed. In this model the ordinary rotor with four wings is used, which is capable of producing four impulses per revolution. Hence, eight impulses are produced per crankshaft revolution, or one impulse every 45 deg. Of these, two succeeding impulses are utilized for the production of sparks, and the next two impulses are suppressed. This requires a special cam, which opens the circuit at 90 deg. and 270 deg. intervals of its revolution. The brush used in the distributor of this model is of the narrow type, as the two contact segments of a pair are very close together.

#### Liberty Engine Model

The last model of the set is that for twelve-cylinder, 45 deg. V engines, such as the Liberty 12. This model has the special six-wing rotor and corresponding field structure, and as it is operated at one and one-half times crankshaft speed, it generates nine impulses per crankshaft revolution. In a twelve-cylinder, four-cycle engine there are necessarily six explosions per revolution, or one explosion every 60 deg. of crank motion. If the two sets of cylinders are set at an angle of 60 deg. the explosions will be equally spaced. If the angle of V is less than 60 deg., the shortest interval between explosions is equal to the angle of V, and the longer interval is equal to 120 deg. minus the angle of V. In the case of the twelve-cylinder 45 deg. V engine, the intervals between explosions are 45 and 75 deg.

As the rotor is of the six-wing type and rotates at one and one-half times crankshaft speed, it induces nine impulses per revolution, or one impulse every 40 deg. Of these two successive impulses are used, and then one impulse is suppressed. This makes the spacing of the peaks of the utilized impulses 40 deg. and 80 deg. However, it is not necessary to interrupt the primary circuit exactly at the moment of maximum induction in it, and by sometimes interrupting it immediately before the moment of maximum induction, and at other times immediately after the maximum induction, the intervals between sparks can be made 45 and 75 deg. instead of 40 and 80. The breaker cam used on this magneto has four cam lobes, the "opening" edges of which are 67½ and 112½ deg. apart. These

angular displacements of the cam edges, it will be noticed, are equal to one and one-half times the angular intervals between explosions, this multiplying factor depending upon the multiplication of rotor speed as compared with the crankshaft speed.

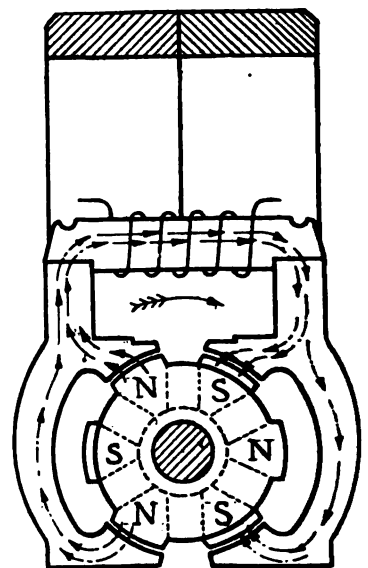
#### Manufacture of Magnets

Considerable improvement in the composition of magnet steel has been made in recent years, and the Splitdorf Electrical Co. claims that the magnets of its magnetos will not lose their strength within the life of the magneto provided the magnets are not removed and abused. Magnet steel is rather expensive material, and in order to eliminate waste, the bars are ordered in lengths which are exact multiples of the length of the individual magnets. After having been sheared off to the correct length, the bars are heated and bent to U form by means of a bulldozer. While still hot, they are inspected for shape by means of gages, and corrected, if necessary. Next they are accurately ground to shape and the holes for the armature shaft to pass through are punched. Then they are heated and quenched and subjected to a magnetizing process by being inserted into a double magnetizing coil through which a powerful current is sent momentarily by means of a switch.

There is one magnet, known as a master magnet, in the magnetizing coil, and the magnet to be magnetized is placed with its poles against those of the master magnet, so that the two together form a closed magnetic circuit. After the magnetization has taken place the pair of magnets are drawn to one side so that the newly magnetized magnet is entirely out of the coils, and a keeper is placed over its poles on the side, as shown in the sketch herewith. This keeper remains in position until the magnet is assembled on the magneto and the rotor is in place, which latter practically completes the magnetic circuit. The writer was informed that this precaution of never opening the magnet circuit from the time the magnet is magnetized till the magneto is assembled would be of no use with ordinary forms of field structure, as with these the armature reaction when the magneto is in operation causes a greater weakening of the magnetism than leaving the magnets open-circuited. In the Dixie magneto, owing to the comparatively high leakage factor of the magnetic circuit through the armature coil, the armature reaction is less pronounced. Tests made show that the reduction in field strength caused by armature reaction, after the magneto is first put in operation, is only about 5 per cent in the Dixie.

#### Testing Magnets

The aging process, formerly largely employed in the manufacture of permanent magnets, has been done away with, but each magnet, after it is withdrawn from the magnetizing coil, is subjected to a checking test to determine its magnetic strength. The apparatus employed in making this test consists of an exploring coil of rec-



*Six-winged rotor and corresponding field structure. Each field pole masks two rotor wings*

tangular shape, which is connected to a slow period ballistic galvanometer of the mirror type with damping feature. The light from the lamp used in connection with this galvanometer is reflected by the mirror onto a scale directly above the coil into which the magnet is inserted, and directly in front of the operator.

The operator introduces the magnet into the coils so that the latter is interlinked with the entire flux, and then withdraws the magnet with a smart motion. In this way all of the lines of force extending from pole to pole of the magnet are cut by the coil, and as the moving system of the galvanometer has a very slow period, the indication which it gives is directly proportional to the total quantity of electricity induced in the coil by withdrawing the magnet from it—in other words, to the flux of the magnet. In fact, the scale of the instrument is graduated so as to indicate directly the total number of lines of force of the magnet. A certain minimum flux corresponding to 60 C. G. S. units of coercive force is required with each type of magnet, and if a magnet shows less than this, it is scrapped. After the magnets have passed this test, they are placed in storage, but before they are assembled in the magnetos, they are recharged once more.

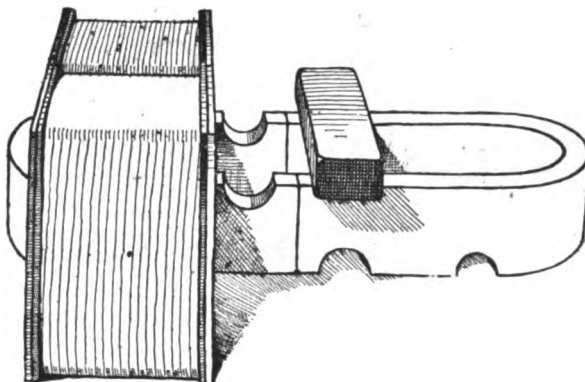
#### Structural Details

The end plates and base of aircraft magnetos are made of aluminum castings, and are held together by collar screws turned from the solid. The magnets fit snugly into this assembly of base and end plates, and are held rigidly in place by means of a steel strap which is hinged to one of the end plates and secured to the other one by means of an eye bolt. All screw connections are locked by the use of split washers, nuts and lock nuts.

The breaker is the regular Splitdorf type, and comprises a breaker arm of somewhat irregular shape. In order to facilitate the manufacture of this arm, the company makes use of extruded bar stock of a section similar to the breaker arm, which is sawed off to the thickness of the arm and then milled to lighten it. All magneto-fired aircraft engines use fixed ignition, and it is not necessary to mount the interrupter on a rocking base. This, of course, simplifies the construction. The absence of any need for variable timing also simplifies the design of the distributor. For services in which allowance must be made for considerable variation in the spark timing, the distributor segments must be of greater length circumferentially, and it is impossible to get more than six segments in a single circle. Distributors for eight and twelve-cylinder engines are then made with the segments arranged in two circles, side by side. With fixed spark the distributor contact segment can be made very short or narrow, and any number up to sixteen can be placed in a single circle.

#### Gap Type Distributor

In four, six and eight-cylinder magnetos the Splitdorf company has been using the regular brush type of distributor, because in the early part of the war the Government insisted upon adherence to this time-tried construction. In magnetos for twelve and sixteen-cylinder engines, the so-called open gap distributor is used, which will eventually be made the standard for all models. In this the revolving distributor brush is replaced by a revolving pin, and the distributor segments, instead of being turned down flush with the insulating material, slightly protrude from the insulation, and have a serrated formation of their sparking surface. This, as is well known, tends to facilitate the ionization of the air, and the breaking down of the air gap by the electromotive force.



*Dixie' method of magnetizing magnets*

For its aircraft magnetos, the company has been using a special insulating compound of its own, known as Americanite, which has a rubber base. One of the advantages of this compound is that it forms a very smooth track for the distributor brush. Besides it has a very high mechanical and dielectric strength.

Most of the aircraft magnetos which have been manufactured by the Splitdorf company are provided with a trailing brush in the distributor, which allows of starting the engine by means of a hand-operated high tension magneto. Connection from the hand magneto is made to a terminal at the center of the distributor block, which connects through a carbon brush and central contact on the distributor plate to the trailing brush. The connection from the high tension winding of the service magneto to the regular distributor brush is made on the opposite side of the plate, as clearly shown in the sectional view.

The advantage of the hand-operated magneto is that the engine may be turned over a couple of times by means of the propeller with the switch off, the operator then returning to his seat, throwing on the ignition switch and giving the hand magneto a turn, which produces a shower of sparks at the plugs insuring easy starting. This obviates any danger from the propeller.

#### British Aeronautical Society's Lectures

FOR the coming winter the Royal Aeronautical Society of Great Britain has arranged an interesting program of lectures. With the exception of three special lectures, the opening, popular and juvenile lectures, the subjects will be of scientific and technical character. Following is the list of the lectures, with the names of the lecturers and the dates: Shop Practice in Respect to Aircraft Steels, by Brig. Gen. R. K. Bagnall-Wild, Dec. 5; Civil Aerial Transport, by Claude Grahame-White, Dec. 11; Full Scale Aeroplane Experiments, by Capt. W. S. Farren, Dec. 18; To Constantinople and Back by Aeroplane, F. Handley Page, Jan. 8; Medical Aspects of Aviation, by L. E. Stamm, Jan. 15; Rigging of Aeroplanes, by Capt. R. J. Goodman-Crouch, Jan. 29; Fabrics and Dope, by F. W. Aston, Feb. 12; Points on Aeroplane Design, by Capt. F. S. Barnwell, Feb. 26; From Model to Full Scale in Aeronautics, by H. Levy, March 12; Lighter Than Aircraft, by Lt. Col. T. R. Cave-Brown-Cave, March 26; Aluminum Alloys for Aeroplane Engines, by Prof. T. C. Lea, April 26. The Wilbur Wright lecture will be given in May, and the annual general meeting of the Society will take place on March 19.

THE average production of benzol per ton of coal is in the neighborhood of 2½ gal. Seventeen and a half million tons of coal are at present being carbonized in Great Britain in recovery ovens, and this should accordingly yield approximately 44,000,000 gal. of benzol in the crude form.

# Co-ordination of Legislative and Operative Functions in Labor Essential to Success

By Harry Tipper

**EDITOR'S NOTE**—*The second part of this series, beginning with this article, will deal with the organization fundamentals and changes, as well as the newer experiments in organization and their advantages. Consideration will be given to the different industrial problems of organization.*

**I**N all group organizations established for whatever purpose by human beings, whether social, political, or industrial, for general or specific purposes, the functions required for the orderly progress of the organization divide themselves into the legislative and the operative.

In the earlier forms of organization where the necessities of operation were few, and consequently the necessity for legislation correspondingly simple, the same machinery could be made to serve both purposes. But the functions remain separate.

The operative functions require continuous decision, supervision and obedience to that supervision. They require the lodgment of large powers in the governor or leader, and an equally large measure of acquiescence in those who are subject to the government.

The legislative functions, on the other hand, dealing with those matters of rule and regulation and agreement by which the group shall remain in orderly co-operation depend for their permanency upon discussion, upon examination of all the possibilities, and upon agreement as to the conditions.

It is obvious, of course, that the operative functions represent the paramount necessity of any organization of human beings. It is necessary that all the operations of life should continue unless life itself is to cease.

But where the individual of the group depends for a part of his living upon the operations of other members of the group, the legislative necessities are of similar importance.

The legislative functions of the groups of Scandinavians who operated together under one leader in their first descent upon the British coast were easily disposed of by a meeting of all the free men of the group once a year, and the operative functions were started by the selection of a leader, and the oath of obedience to him.

In the early industrial groups where the numbers were small and the requirements of the group very simple, a few rules and regulations were easily disposed of between the leader and his subordinate, without the necessity of creating special machinery for the purpose, or without the necessity for constantly reviewing and adjusting the conditions.

## Military Type of Organization

This type of organization, the military type, as it might be termed, remains in essentials the usual type of industrial organization to-day. The necessities of industry and industrial groups have become more and more complicated; the groups themselves have become

larger and larger, and the questions for adjustment in the rules and regulations have occupied a corresponding increase of time.

While therefore the military system of organization remains essentially the usual system in industrial affairs to-day, other organization efforts have grown up outside the industrial unit in the attempt to provide for these increased legislative necessities, and at the same time permit the necessary efficiency in operation.

Unquestionably the operative function of an industrial organization requires a system which should in its character approach the military, and to this extent, and for this purpose, the customary industrial organization is the correct one.

The industrial difficulties have arisen from the fact that the purely military system of organization has no machinery with which to take care of the legislative functions; which cannot be separated from the operations of group organizations, and which become more and more important as the groups become larger, and their common co-operation more necessary.

It is this lack of legislative machinery which has given rise to the labor organizations, the worker attempting to secure through his occupational group the legislative powers which have been denied him in the individual industrial unit with its military form of organization.

## Growth of Industrial Organization

In order to illustrate this fundamental difficulty it is important to consider the growth of the industrial organization since the beginning of the industrial revolution, and the strength and weaknesses which have developed along with that growth.

In the beginning of the industrial revolution, about a century ago, very few establishments maintained over fifty workers; the large majority of them maintained less than ten workers under one roof.

Under these circumstances all questions relating to the condition of work, the hours of work, the value of the labor, and other matters of regulation were easily disposed of by the complete understanding between the members of such a small group and by the endless opportunities for the maintenance of that understanding.

The employer and the worker were very close together socially as well as economically, and the necessity for obedience in operation was accompanied by a confidence and understanding in regulation which made it possible to perform all the functions of the organization with this simple machinery.

As the machinery of production grew in quantity, in size and in skill, it became possible to concentrate in one industrial unit larger and larger groups of workers, following different occupations, and having somewhat different necessities in regulation and agreement.

These larger organizations did not change the system, but simply amplified the operating machinery of industrial government, so that the number of supervisors was



constantly increased, new officials were interposed between the worker and the employer or leader of the industrial unit, and the distance between the worker and his ultimate chief became greater.

This meant that the former understanding which existed between the leader and his employees was destroyed because of the lack of common interest and direct contact. The possibility of discussion did not exist in this larger organization, and the rules and regulations were promulgated by the owners or employers without either understanding or agreement.

In the political organization at the same time these legislative functions had been developed by the use of special machinery until they offered the individual an opportunity to share in the discussions and to agree with the regulations and requirements. In the industrial group, however, no machinery of the kind had been permitted, and very little modification has occurred even up to the present.

The position of the worker depended upon the attitude of his immediate supervisor, and his tenure could be ended by any conflict with his foreman. No matter what hardship a rule or regulation might inflict, there was no review of the matter, and there was no escape from its burdensome obligation. Some of the systems of penalties which obtained even up to 20 years ago are sufficiently indicative of the failure of the operating type of organization to meet the increasing legislative necessities with justice and discernment.

In the last 20 years the demands of the worker and the very necessities of efficient operation have compelled some important modifications in the military type of organization used in industrial work.

It has become usual in many lines of industry for a special department to hire men and to fit them for their work. There are many organizations where a man cannot be fired by his immediate superior until the case has been investigated in some other way. In a number of organizations the employee who is discharged has the right to demand a review of his case before a body composed of men other than the ones interested, while the establishment of the conference system among the heads of various departments suggests the beginning of special machinery for the performance of the legislative functions.

Even from an operative standpoint, however, the practice which has been usual in the development of the industrial organization has neglected to satisfy the demands of efficiency in some important particulars.

#### Knowledge of Human Nature Needed

To maintain the highest productive efficiency per man and to keep up a spirit of contentment, it would seem that some knowledge of human nature would be required of a supervisor; yet it has been customary in all industries to promote the man for his knowledge of the product and not for his knowledge of the producers. It is rare indeed, even to-day, in an examination of industrial organization to find any special attempt to discover the capacity of the prospective supervisor to understand and govern human beings.

These failures have induced a lack of faith in the present type of industrial organization, not only in the minds of the general body of the workers, but in the minds of many of those who must take part in the government of the operations. The failure is apparent even where the reasons for it have not been thought out.

In all operating organizations of the military type as they grow in size there is a distinct tendency to the development of a bureaucracy, so that precedent, custom and usual methods of examination and operation become

paramount. The rule is no longer a means to an end, but an end in itself.

The writer well remembers a case in a large industrial organization where the question of the disposition of a charge from one department to another took about 6 months' time, a voluminous correspondence, and several meetings of the parties concerned before it was adjusted.

The classic illustration of the disposition of a charge of 12 cents not accounted for by a soldier, which kept an array of clerks corresponding, sorting and filing for 3 years, and even came to the attention of several generals, is not without its parallel in the annals of industrial organization.

In both cases trouble arises from the same cause—the tendency for the rule to become paramount and the reason to be lost, in large organizations, where the human contact between one department and another is practically non-existent. On the other hand, it must be admitted that a somewhat greater difficulty confronts the organization which attempts to settle operating questions by means of legislative machinery.

#### Why Co-operative Business Societies Fail

There is a very good reason why co-operative societies engaged in business usually fail. Operating questions are not matters for discussion, but matters for decision and action. They require not co-operative understanding so much as individual authority and responsibility. In a co-operative organization there is grave danger that while the committees debate the business will pass out of existence.

In political matters there is a distinct danger that we shall not see clearly the divergent necessities of the two functions, and that we may turn over to legislative bodies the conduct of great operations, which require an entirely different form of organization.

Under modern conditions of industry, the military form of organization, despite its value as an operating body, has failed to meet the requirements of the case. The discontent of the worker has increased; his interests have been separated from his industrial unit and absorbed by his occupational organization.

His class consciousness has been aroused; his productive capacity has been increased only where he has been provided with additional machinery; and if the recent platforms of labor federation boards in some of the states are any criterion of the general feeling, he is principally concerned with protecting his economic status and demanding guarantees against their employment.

For this reason it is necessary to consider experiments which have been made in other forms of organization, which include attempts to separate the legislative functions of the industrial group from the operating functions of the same body and to discover, if possible, to what extent they offer a basis for the logical and orderly progress of the industrial group as a producing unit.

In the modern industrial unit the principal legislative functions are those relating to wages, hours of labor, conditions of labor, protective regulations, welfare regulations, the government of physical condition, etc. These present a distinct set of problems, where the greatest permanent benefit can be secured only through the fullest measure of understanding and agreement. In many industries they are at present settled or adjusted only through the interference of the outside labor organizations or the outside manufacturers' groups, with the public taking a hand in the matter from time to time.

Thus there is no complete unified industrial organization in the manufacturing unit of to-day, but a division of organizations, completing the separation between the

(Continued on page 986)

# The Chemistry of Pickling Baths

Action of the Acid on Metal Below Scale—Effect of Variations in Strength of Bath—Increase in Temperature Accelerates Pickling Action—Organic and Inorganic Materials for Modifying Action of Bath

**P**ICKLING is a process much used in connection with the hot working of iron and steel. Whenever steel is raised to a red heat a layer of oxide scale is formed on it, and this must be removed before the steel can be machined or before it can be painted or otherwise finished. In the pickling process the scale is removed by placing the objects in a bath containing a hot, dilute solution of sulphuric acid.

Sulphuric acid being very essential in the manufacture of munitions, an increasing scarcity has been noticeable for some time, and endeavors have been made to find substitutes for it in certain of its minor applications. One of these is its use in pickling baths. The U. S. Bureau of Mines has recently conducted a research on the practicability of substituting nitre cake for sulphuric acid in these baths and the results are presented and discussed in a paper by E. E. Corbett, chemical engineer of the Bureau, just published, from which we extract the following regarding the action of the acid in the pickling bath.

## Mechanism of the Pickling Action

The free acid in hot, dilute solution attacks the metal very readily, etching it away from beneath the coating of scale and consequently throwing off the particles of oxide from the surface. Iron goes into solution as ferrous sulphate; and the hydrogen which is liberated at the face of the metal is carried rapidly to the surface of the solution, where it escapes into the air with the steam and other gases rising from the pickling bath. These vapors carry out into the room considerable quantities of acid, finely divided particles or drops mechanically entrained, and are a source of constant annoyance to the operatives, as well as a source of *avoidable* expense due to their attack on the metal work and machinery in the building. Various no-gas or foam compounds are in use as a check to this loss and nuisance. They and their action will be referred to later in this report.

## Concentrated Solution Dissolves Scale

When the concentration of acid in the solution is high, both metal and oxide go into solution, the metal dissolving so rapidly and irregularly as to give the remaining sheet or bar an etched, pitted, or acid burned surface. Very dilute acid, however, does not dissolve the oxide appreciably; its chief action is on the sound metal. The ferrous sulphate which results is hydrolyzed, forming free acid and ferrous hydroxide, which, at the surface of the hot solution, is oxidized and thrown into suspension in the nearly neutral solution as hydrated ferric oxide. Its acid constituent, though small in concentration, is free to act on a fresh portion of metal. In virtue of this decomposition of the sulphate, a given quantity of ferrous sulphate should suffice to pickle an indefinite quantity of metal, constantly renewing its acidity as the oxidation of the lower oxide proceeds. Actually, however, a solution equilibrium is soon attained; and though ferrous sulphate is an energetic pickling compound, its action is ultimately poisoned by the products of its decomposition.

## Agitation Facilitates Action

With a fresh solution, in contrast, agitation of the bath which brings the acid-filmed surface of the metal into regular contact with the air and simultaneously renews the surface of the bath, facilitates the oxidation of the hydrolyzed ferrous compound and consequently accelerates the pickling. Hence a regulated jet of heated air, introduced with the steam into the pickling vessel, should serve further to increase the ac-

tivity of the acid through the formation of ferric sulphate, which because of the readiness with which it oxidizes the metal while it simultaneously splits the acid radicle from its own molecule, is even more corrosive than acid in its attack on the sound metal. It is this very corrosiveness and rapidity, however, which make ferric sulphate solutions unsuitable for pickling, for the attack is directed almost exclusively to etching the sound metal without the interpolation of a layer of hydrogen or other protective covering, leaving the scale unaffected where it has not been mechanically sloughed off, and burning the more intensely where the full strength of ferric sulphate is thus localized.

As the quantity of acid required to pickle a metallic mass is a function of the metallic surface, so is the rate of pickling a function of the dissociation of the acid in solution. The dissociation, or pickling energy, is in turn affected by, 1, the temperature; 2, the strength of acid; and 3, the presence of other bodies whose concentration tends to reduce the effective dissociation value of the acid.

1—Thus, if the temperature of the acid solution is raised from normal atmospheric to 170-190 deg. Fahr., the reaction velocity between metal and acid will increase fifty to one hundred fold, or even in higher ratio, depending on other conditions—notably the actual concentration of the acid in solution.

## Proper Acid Strength

2—For the most efficient action in scale removal, combined with minimum attack on sound metal and consequent preservation of gage as well as economy of time in pickling, this acid strength should run between two and four per cent, representing specific gravities of solution between 1.010 and 1.032 before any metal has dissolved. These limits represent maximum acid activity on average light oxide scale, under the most economical working conditions. For heavier, unbroken scales a stronger acidity is demanded; this may run up to seven or eight, and in a few cases to ten per cent. These concentrations are best worked out for the particular problem which necessarily arises from special conditions of working before and after pickling. Here the chief considerable variable is extent of surface, with the correlated danger of unnecessary loss of metal. The attack on light gage material is of necessity more carefully restricted than on heavier stock carrying a similar coating of scale. In machine pickling, furthermore, the strength of acid must be regulated in a certain measure by the time required to unload and charge the cradles.

## Exhaustion of Bath

As the percentage of ferrous sulphate in solution increases, due to decomposition of the acid which is continually added to preserve the pickling energy, the specific gravity and viscosity of the bath tend to rise to a point at which pickling begins markedly to slow down. The beginning of sluggish circulation becomes evident after a specific gravity of 1.17 is reached; the mobility of the acid falls off until at 1.25-1.27 specific gravity, activity at the specified temperature, 170-185 deg. Fahr., is practically at an end. Here the temperature may be raised to 200-205 deg. Fahr. for a short time in order to reduce the free acid to 0.0030 gm. per c.c. of solution, and finally to "kill down" to an essentially neutral ferrous sulphate for copperas recovery.

Two of the conditions treated in the foregoing paragraph, namely, specific gravity and temperature of operation, give

rise only too frequently to sources of waste which cannot be too closely guarded against. A few companies employing excellently regulated, chemically controlled cleaning processes use the pickle liquor until the continuous addition of acid and likewise its continuous utilization have enriched the solution with ferrous sulphate to the saturation point at a moderately high temperature, while the acidity is practically exhausted after "killing down." The aim is to avoid metal and acid waste and also to end with a solution for copperas recovery which will minimize subsequent fuel consumption in evaporating off excess water beyond that concentration required to form the sugar crystals. The processes both in pickling and in sulphate recovery are scientifically controlled and adequately carried out.

#### Causes of Waste

In the majority of instances, however, the copperas is not recovered; hence the density of the waste liquor is largely determined by the length and intensity of the working day. Many works require an acidity determination before the liquor is run off to the sewer. A few, however, do not demand this check on losses; as a result an acid balance between shipping point and pickle room is not kept. Acid is added to dead pickle liquor in order to enliven a heavy, saturated solution, and as might be expected, the action is not noticeably quickened.

It is idle to expect anything but the feeblest action from a bath whose density runs in the neighborhood of 1.25-1.27, regardless of how much acid is added to it. The acid is simply sent to the sewer as waste.

#### Excessive Temperatures Wasteful

Another more subtle source of waste is reached by the excessive temperatures which the majority of works employ at all stages of pickling, whether the solution be new or old, the acid strong or weak. The steam is turned on so as to keep the surface of the bath at a constant seething boil. The slight gain in speed which results from raising the temperature of the solution from 170 deg. Fahr. to boiling is more than offset by the heat wasted in the live steam which passes into the atmosphere uncondensed, carrying out with it to the fan-exhaust system or into the room from 5 per cent to 15 per cent of the effective acid, most of it mechanically entrained.

A temperature of 160-185 deg. Fahr. should not be exceeded except during the "killing down" of dense, heavy solutions. It is a significant fact that the point of maximum solubility of ferrous sulphate lies within this range, and any substantial increase of temperature results simply in unnecessary loss and waste without a compensating gain in speed of cleaning. At superior temperatures the peak of the ferrous sulphate solubility curve is passed, and anhydrous ferrous sulphate separates from the saturated solution.

#### Injurious Effect of Ferrous Sulphate

Above, it has been pointed out that ferrous sulphate, by virtue of its yielding sulphuric acid as a product by hydrolysis or dissociation, and momentarily ferric sulphate by surface oxidation, behaves as an energetic pickling agent—even to the extent of inducing a very undesirable etching and pitting of the metal. Because of this activity it is quite unsuited to general mild operation where the end sought is chemical action which shall remove oxide scale, rust, and siliceous particles of furnace bottom, leaving the surface of metal evenly cleaned, without substantial reduction of gage, and free of discoloring compounds or color patches. In conjunction with sulphuric acid in hot, dilute solution its tendency is to accelerate or at least to maintain the velocity of action of the acid on the metal as long as decomposition products do not disturb the acid equilibrium and limit its mobility.

#### Inhibition, or Moderation of Metal Attack

3—The activity of the acid, then, is directed to attacking selectively and dissolving the sound metal rather than the more resistant oxide or scale; but in well-regulated pickling practice the selective attack is limited, and, indeed, materially redirected and controlled by the use of bodies of a colloidal nature whose influence serves to protect the metal during

scale removal. These bodies are for the most part of vegetable origin, and comprise various wood sugars and gums, and cereal starches, and intermediates occurring in commercial grain milling.

#### Organic Substances Employed

Specifically, the organic substances which have been successfully used for this purpose, in quantities sufficiently small as to give simply a distinct film to the surface of the bath under temperature conditions which moderate the charring of the inhibitor by hot acid solution, are listed below:

Molasses	Fermented yeast
Sugars	Spent tan-bark
Cornstarch	Bran
Peanut meal	Middlings
Quebracho fiber	Rye flour

The inhibitor is usually prepared as a fermented swill or mash which is added to the bath at intervals determined by the rate at which its influence is destroyed by the chemical action of the acid.

Soap-bark and the various foam compounds in use are of an inhibitory nature. The last-named commercial preparations are essentially concentrated sulphite pulp extracts placed on the market as strong solutions or as powders incorporated with ground nitre cake and rock salt.

#### Inorganic Inhibitors

Tin and copper salts are representatives of the inorganic type of semi-colloidal inhibitors; but their action is of inferior consequence and their use restricted because of the cost of adding the bath quantities sufficiently large to exercise a sensible influence, as well as their tendency, undesirable for most purposes, to plate out from solution upon the metallic surface.

The precise chemical mechanism of the inhibitor in solution has not been established; its beneficial action, however, both in limiting surface corrosion of metals, and in reducing the fume nuisance in pickling rooms is beyond question. It is believed, more commonly than logically, that a small quantity of one of these substances, thrown upon the surface of an active solution simply prevents the escape of disagreeable gases by blanketing the bath and absorbing the vapors—this, notwithstanding the difficulty of comprehending how hydrogen may be so blanketed, above a solution whose temperature rises close to the boiling point of water. It is a fact, however, that the surface tension of such a film does prevent to an appreciable degree globules of acid solution from being forced almost explosively into the atmosphere surrounding the vats.

#### Action of the Inhibitors

Nevertheless the main value of the inhibitor, from the pickling viewpoint, lies in the modifying action which it exerts on the tendency of the acid to attack the sound metal rather than the scale; and this moderating influence first shows itself in the comparatively lesser volume of non-condensable gas, chiefly hydrogen, which rises from the surface of the solution. The solution is no longer a system of acid in water, but acid in an emulsion of a starch or sugar with water; hence, in the different pickling medium the acid is carried by an organic vehicle in which its properties are necessarily modified. Similarly, the catalytic accelerating function of the ferrous sulphate in solution is neutralized; its dissociation value is reduced in the new medium, its sensible influence thus rendered comparatively inert.

Other substances than colloids are materially effective as inhibitors or polarizers; sodium sulphate acts in such a capacity, chiefly perhaps in reducing the electrolytic dissociation of the acid and in neutralizing the influence of the ferrous sulphate—possibly by forming with the latter an undissociated, or little-dissociated, double-salt in solution. Its usefulness in pickling is more or less accidental—secondary to the important proposition of utilizing the comparatively large quantity of sulphuric acid which occurs in nitre cake, a by-product in the manufacture of nitric acid, and which is available for metal cleaning as well as for many other chemical purposes.



# Rumpler Two-Seater Biplane

Technical Description of a Late Model German Reconnaissance Machine  
Issued by the British Aircraft Department

**T**HE Rumpler two-seater biplane of the CV type, illustrated herewith, was in use at the beginning of the year, but we believe we are correct in saying that it is now obsolete or fast becoming so. As the type letter C indicates, the machine is designed for reconnaissance work, and as indicated by the V, it is the fifth design of this class produced by the Rumpler works. The information here given concerning its construction and performance is based on an official report on the machine issued by the Aircraft Production (Technical) Department of the British Ministry of Munitions.

The leading dimensions, etc., of the machine are as follows:  
Weight—Empty (including water), 2439 lb.; fully loaded, 3439 lb.

Military load—545 lb.; loading on wings, 9.5 lb. per sq. ft.

Weight per hp.—13.2 lb. Engine, 260-hp. Mercedes.

Capacity—Petrol, 59 gal. Oil, 3 gal. Water, 10 gal.

Endurance—About 4 hr.

Areas—Tail plane, 22 sq. ft.; fin, 4 sq. ft.; elevators, 20.8 sq. ft.; rudder, 6 sq. ft.; upper wings (including ailerons), 217.6 sq. ft.; lower wings, 146 sq. ft.

The capabilities of the machine are indicated in the following figures:

Height .....	10,000 ft.	15,000 ft.
Horizontal flying speed .....	100.5 m.p.h.	87 m.p.h.
Engine speed .....	1510 r.p.m.	1390 r.p.m.

Climb to 10,000 ft.—Time, 16 min. Rate of climb at this height, 400 ft. per min. Engine speed at this height while climbing, 1375 r.p.m.

Greatest height reached during test, 15,300 ft. Time, 38 min. 25 sec. Rate of climb at this height, 125 ft. per min.

Service ceiling (estimated)\* 15,500 ft. Absolute ceiling (estimated), 17,500 ft.

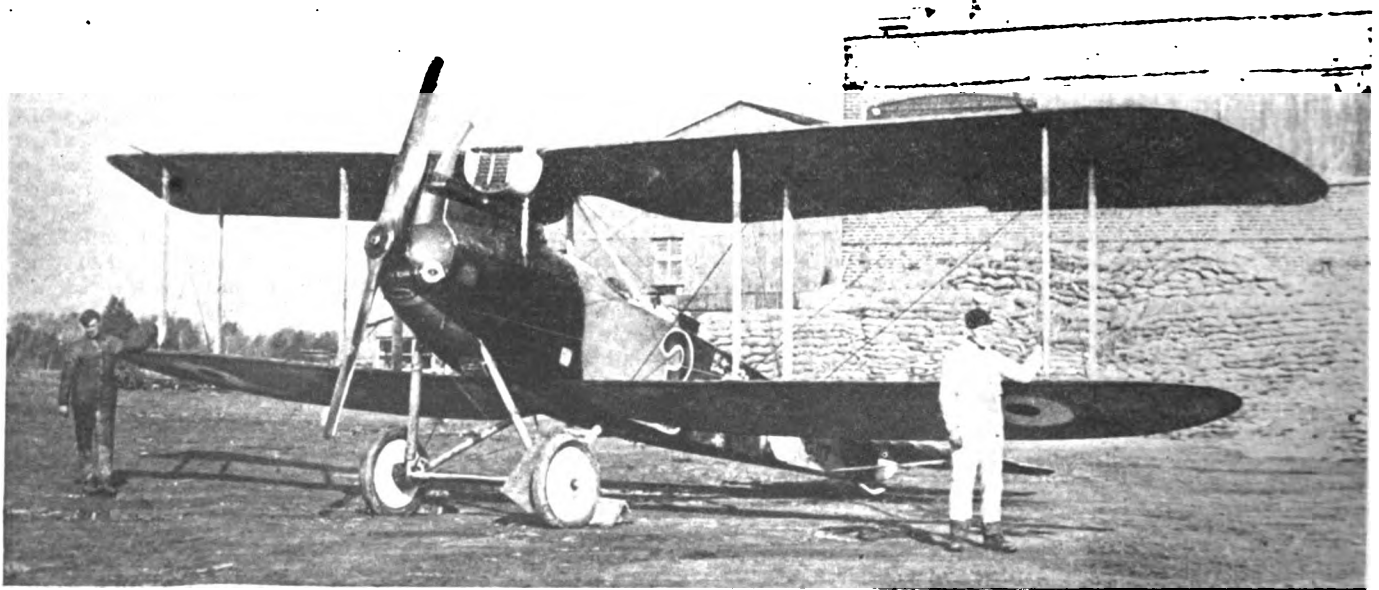
While the longitudinal control by means of the elevators is good and the directional, or rudder, control moderately light

and quite effective, the lateral control obtained from the ailerons is stated to be very heavy and ineffective and to make the machine tiring to fly. It is further stated that the machine is nose heavy and somewhat liable to get into a spin.

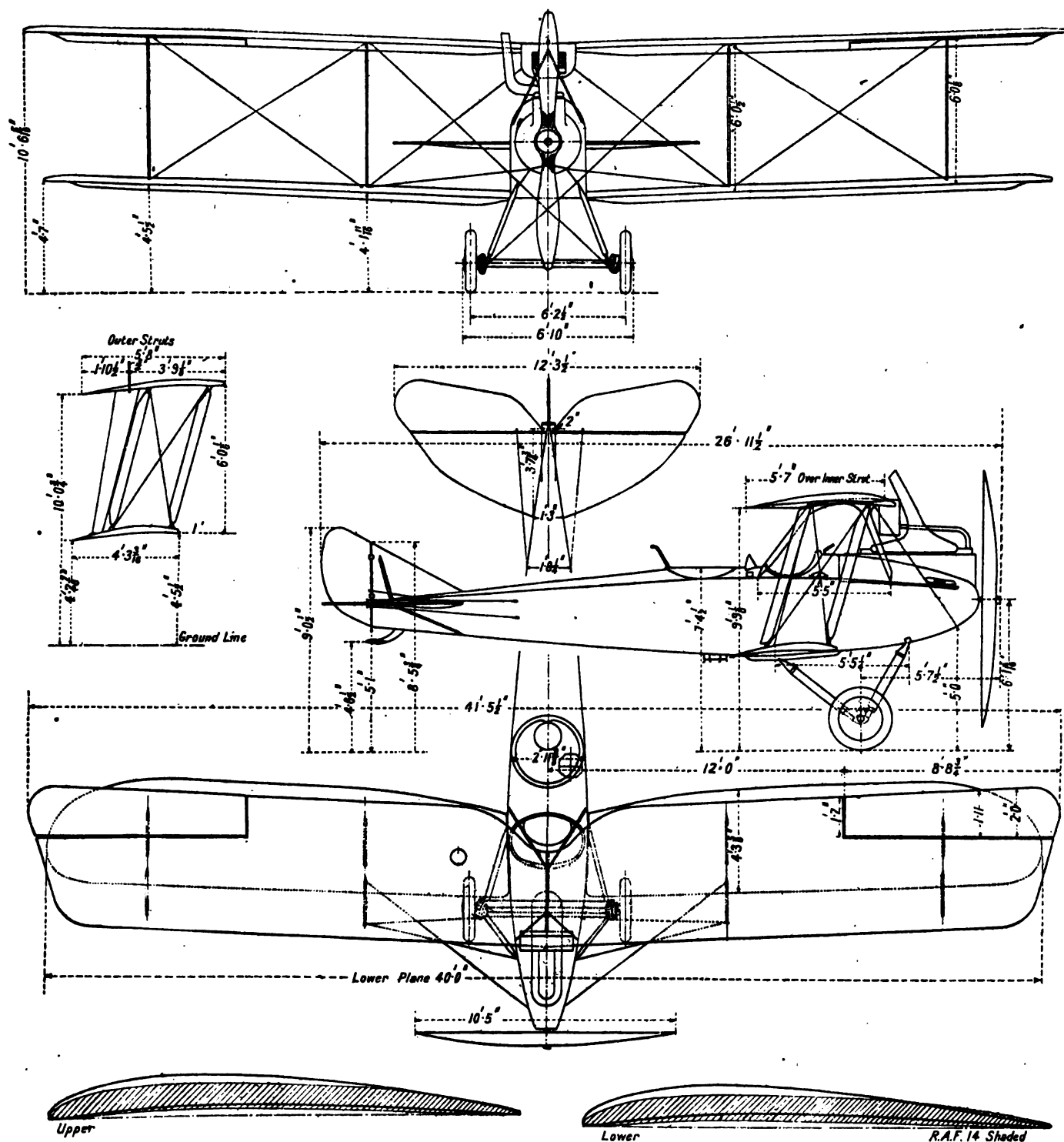
## Wings

The wing sections are shown in the general arrangement on page 963, contrasted with the R. A. F. 14 section shown shaded. As usual, the German design exhibits considerable camber. The angle of incidence for the top plane is 2 deg. 40 min. and for the lower 3 deg. The front and rear spars are of spruce and, as shown in Figs. 1 and 2, are made in two parts, which are grooved and tongued and glued together. The ribs are built up of ply-wood and strips, and as usual short false ribs extend from the leading edge to the front spar between the true ribs. Between the spars steel compression tubes are arranged and are braced by piano wire at the wing tips and cable and swaged rods toward the inner end. The trailing edges of the wings are formed of flattened steel tubes to which the ribs are attached by copper rivets. The workmanship displayed on the wing structure is good, and the design and construction appear to give adequate strength. Ailerons are fitted only to the upper wings, a fact which may account for the ineffectiveness of the lateral control, which has already been noted and which is characteristic of nearly all German aeroplanes. The area of each aileron is 15.3 sq. ft.

Rapid assembly and dismantling of the machine is facilitated by the means adopted for attaching the wings to the upper cabane and to the fuselage. Fig. 3 shows the attachment for the upper wings. Each wing is locked by means of a guillotine lever, which is held in the locking position by a pin passing through holes in both levers and holes in the center section. The fixture for the lower wings is illustrated in Fig. 4. It consists of a socket on the fuselage and a ball member on the spar end. The wing is detached by loosening the struts and bracing and lowering the outer end on to the ground. The center section cabane is a welded up structure and is illustrated in Fig. 5.



Photograph of the Rumpler CV biplane



Front and side elevations and plan; also wing sections

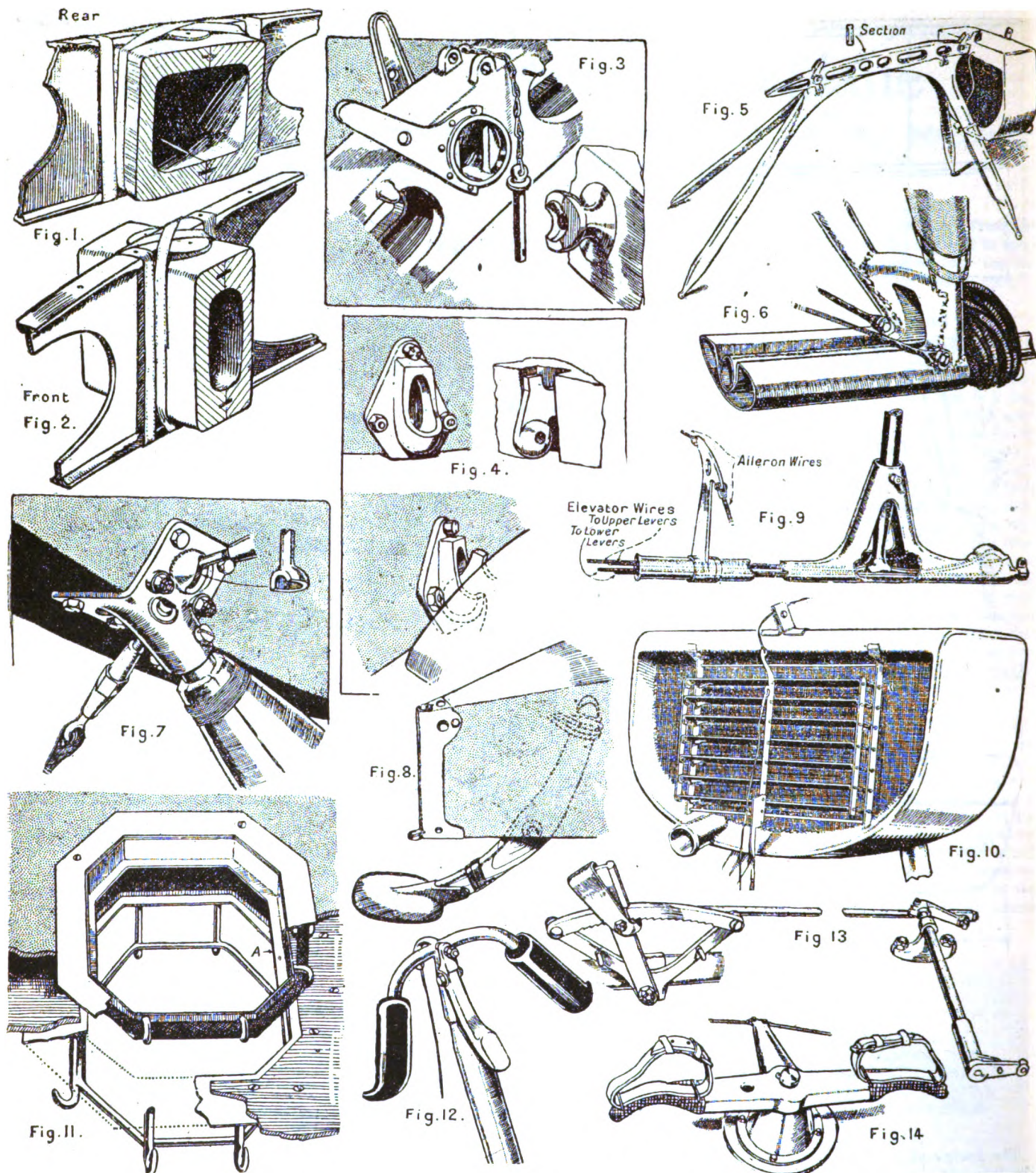
The design of the fuselage presents a compromise between the different rival methods of construction. It embraces steel tubes, three-ply wood and wooden longerons and struts braced with piano wire. From the rear of the after cockpit to the tail the fuselage framework is formed of a braced girder of wooden longerons and struts. The forward portion of the framework is composed of a similar wooden structure reinforced with steel tubes formed with forked ends and bolted together. For a distance of about 6 ft. forward from the sternpost the framework is covered with three-ply wood, which thoroughly stiffens up the fuselage at the points where the stresses thrown on it by the tailplanes are likely to be most severely felt. From the forward end of this three-ply covering to a point abreast of the pilot's seat the framework is fabric covered. Thereafter three-ply wood is again used. The arched top of the fuselage is formed partly of three-ply

and partly of aluminum. The bottom is entirely of three-ply. The engine cowling is made of sheet aluminum held in place by means of turn-buttons.

#### Landing Gear

The design of the landing gear follows the usual vee formation, with the upper extremities of the struts placed well apart. The struts are of streamline steel tubing. The front limb is of smaller section than the rear one, and has been additionally faired with wood, obviously as an after thought and not by the manufacturer. At the lower ends, as shown in Fig. 6, the struts are welded together by a bridge piece and joined to the sheet steel streamline sectioned trough within which the axle rests during flight. The landing shocks are taken by steel coil springs, and not, as might be thought from Fig. 6, by rubber cord. Four bracing wires connect the





four upper points of attachment of the struts with the apices of the vees. In Fig. 7 one of the front strut attachment pieces is shown.

The elevators are unbalanced. In the earlier CIV Rumpler machine they were balanced, so that as the longitudinal control of the CV machine is reported to be entirely satisfactory, it would appear that unbalanced elevators have been found all that is desirable. The fin area, in view of the side area, presented in the nose of the machine is regarded as hardly sufficient and the deficiency in this respect is suggested to be the cause of the tendency shown by the machine in flight to get into a spin. The four tail stays are of streamline steel tubing, the lower pair being serrated to remind the mechanics

not to lift the machine or hold it back by grasping these stays. The fabric has not been removed from the fin, rudder or elevators; but it is believed that the framework of these members is formed of welded steel tubing in the usual way. The tail skid is illustrated in Fig. 8. It is of ash, pivoted at its center and sprung at its upper end. The lower end is provided with a sheet steel shoe of the shape shown.

#### Control System

The controls are arranged in an unusual manner, the ordinary transverse rocking shaft for the elevators being dispensed with. The arrangement used is illustrated in Fig. 9. It consists of a longitudinal rocking shaft of steel tubing to



which a coned portion is welded, and on which a double-ended lever for the aileron wires is pinned. The vertical control lever is pivoted within the cone-shaped portion and is attached at its lower end to the cables extending to the upper levers on the elevators. The cables from the lower elevator levers are led round pulleys situated within the end of the longitudinal rocking shaft and are thence taken to the end of the control lever. The aileron cables are led over pulleys into the interior of the lower wings, and so up to the levers of the ailerons on the upper wings. These levers, as usual in German practice, lie in line with the main plane and are accommodated within slots cut in the rear edge thereof. The rocking shaft, shown in Fig. 9, lies somewhat below the level of the fuselage bottom, and is enclosed within a sheet aluminum farling screwed to the fuselage. The rudder bar, Fig. 14, is of welded sheet steel and is provided with rubber sleeves and leather straps to prevent the pilot's feet slipping. No provision is made for adjusting the distance between the bar and the pilot's seat.

The armament consists of a fixed Spandau gun controlled by the pilot and a Parabellum gun mounted on a rotatable ring in the usual way at the observer's cockpit. The pilot's gun is fixed close to the starboard side of the engine and is inaccessible during flight. It is controlled by a thumb lever on the control stick—see Fig. 12—and is fitted with the usual synchronizing gear. An aluminum tray with holes for ten Verrey lights is fixed to the fuselage. Provision is made for fitting a bomb rack, but no rack was found on the captured machine.

The engine is of the 6-cylinder, 260-hp. Mercedes type, but on other Rumpler CV machines a 240-hp. Maybach engine has been found. Both of these engines have been fully described in these pages. The radiator is illustrated in Fig. 10. It is slung, as shown in Fig. 5, from the central cabane structure. Its honeycomb is formed of circular brass tubes expanded at their ends into hexagons, and there sweated together. The total radiating surface is 1.5 sq. ft. The shutters regulating the cooling surface are operated by cables, one passing over the top of the radiator and one exerting a

downward pull and passing beneath. German pilots have reported that these shutters are rarely required except during protracted descents. A mercury thermometer is used to indicate the temperature of the cooling water and is marked in red to show the permissible range, which extends from 60 deg. to 85 deg. C. The radiator is regarded as thoroughly satisfactory, but it must obstruct the pilot's view somewhat.

The oil tank is situated on the port side of the engine and is lagged with a thick covering of felt to preserve the contents at an equable temperature. The main fuel tank has a capacity of 57 U. S. gal. and is arranged to serve as a support for the pilot's seat. An auxiliary tank of 16 gal. capacity is fitted between the two cockpits. Both tanks work under pressure. The initial pressure is obtained by means of hand pumps, of which there is one in each cockpit. Once the engine is started the pressure is maintained from an automatically regulated air pump driven off the engine. The tanks are made of sheet brass and each is provided with a pressure gage on the dashboard. By means of three 3-way cocks the pilot can shut off the fuel entirely, run on either of the tanks separately or on both simultaneously. The engine throttle valve is controlled by the gear shown in Fig. 13. The fact that the Mercedes carbureter is situated at the rear of the engine permits a direct control of the design illustrated to be adopted.

A tachometer working on the centrifugal principle and graduated from 0 to 1600 r.p.m. is driven off the engine crankshaft. It is not illuminated and is not marked to show the normal speed. The propeller has a diameter of 3150 mm. and a pitch of 1830 mm. It is secured to the crankshaft by eight bolts instead of the usual six. The machine is wired internally for wireless and a tapping key is fitted close to the observer's right hand. The rack for the aerial reel and a sheet steel shelf for the wireless dynamo were found in the captured machine, but other wireless details were apparently absent. The machine carried two cameras; one, a particularly large one, being accommodated in the fitting illustrated in Fig. 11, comprising a light octagonal tray *A* suspended from the floor boards by means of elastic shock absorbers.

## Wismach American Gage Blocks

**I**N all high-class manufacturing processes use is now made of gages of one kind or another, including standard gages, limit gages, etc. Standard gages are used for checking up other gages used in the shop. A new set of standard gages, known as the Wismach American gage standard, has recently been placed upon the market by O. Zernickow, 15 Park Row, New York.

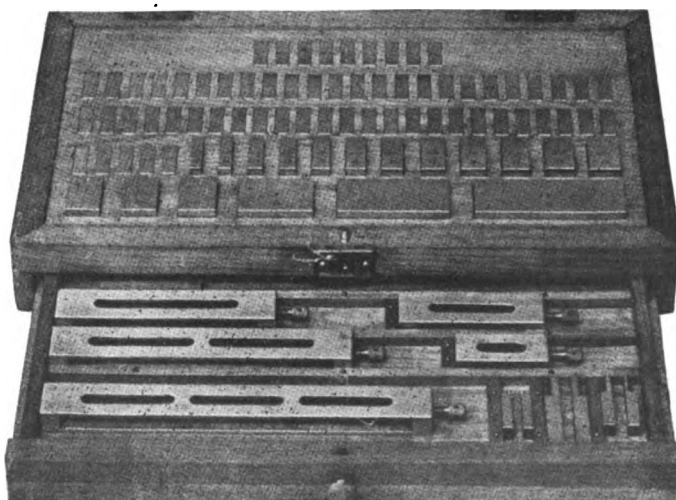
These gages come in five different sets. The No. 1 set is adaptable to combinations of 1/10,000 in. and the individual blocks are claimed to be accurate to 1/10,000 in. at 68 deg. F., at which temperature they are standardized. No. 2 set is similar to No. 1, but has not quite the same number of blocks. The No. 4 set gives dimensions in fractions of an inch, and the No. 5 set contains blocks in metric sizes.

These gage standards are made of high-carbon steel in rectangular prism shapes and have highly polished parallel surfaces, the distance between which is marked on the block. Owing to the fact that objects of hard steel are subject to variations in their shape and dimensions for a considerable time after they are completed, the Wismach gage blocks are subjected to a tempering process of long duration. It is stated, however, that this process in no way reduces their hardness. The tempering neutralizes the local strain within the metal and eliminates any further dimensional variations.

These gage standards are not magnetic, and care must be taken not to allow them to become magnetized, as if they are magnetic they will attract small particles of iron and steel, which will adhere to their surfaces and render the surface-to-surface combination impossible. The measuring surfaces are parallel to such a degree that in a proper combination of any number of blocks the units join just as if they were a single solid piece. The combination of two units is effected by sliding one block over the other and applying a little pressure at the same time. The surfaces then remain tightly held together by molecular attraction. Before doing this it is

important, however, to first wipe off any oil or grit which may have collected on the surface of the gage blocks.

Most of the combinations required in practice involving three decimal places can be made up of two to three units, while at most five units are needed for four decimal places. An interesting feature in connection with the gages is that they are self-checking. These blocks will also adhere to each other if only portions of the surfaces are superimposed. There are always several combinations for every total, so that the same total standard can be set up at least twice from one set of gage blocks. In checking, the two combinations are placed between any other two blocks.



Set of Wismach standard gages

# German Piracy of American Trademarks

Advantage Taken of Foreign Laws Giving Right to Exclusive Use of Trademarks Merely Through Registration—Misuse of International Bureau

By Albert E. Parker\*

**T**HE unscrupulous methods followed by German traders prior to the war, in attempting to monopolize foreign markets for their wares, have received considerable emphasis during the past 2 or 3 years by the evidence which has been brought forward from various quarters of the activities of German and Austrian firms in registering well-known American trademarks in foreign countries.

These activities have reached such a climax, and have extended into so many countries that government departments, such as the Bureau of Foreign and Domestic Commerce, have found it necessary to issue warnings calling attention to this practice, and advising American manufacturers against entering into trading relations with different countries before registering their trademarks in such countries; and it is believed the matter is one which will have to be brought up for adjustment on equitable lines at the peace conference.

## Piracy of Trademarks

In June last the Department of Commerce called attention in Commerce Reports to instances of the piracy of trademarks, consisting of the names of well-known American automobiles, motor trucks, pharmaceutical preparations and other articles the sale of which depends largely upon advertising and good will, and cited the case of a single firm applying for registration of the trademarks of six among the best-known American cars.

The report further stated that if registration had been granted thereon it would have been practically equivalent to the acquisition of an exclusive agency for the importation of each of these six cars in one of the most important foreign markets for automobiles, unless the manufacturers were willing to adopt a new trademark for that particular market.

It is not generally appreciated by manufacturers that in many foreign countries the exclusive right to a trademark is acquired by registration, and not, as in the United States, by actual use of the mark upon the goods sold thereunder.

In such countries as Argentine Republic, Bolivia, Chile, Costa Rica, Cuba, Germany, Guatemala, Nicaragua, Norway, Paraguay, Peru, Portugal, Santo Domingo, Serbia, Sweden, Turkey and Venezuela the right to a mark is granted by the registration thereof in such countries, and no consideration is given to the trader whose goods may have been sold thereunder but who has failed to comply with the statutory requirements of the countries concerned, and thereby secure a monopoly of the mark against all others.

## Laxity on Part of Owners

The laws of the United States, England, France, Belgium, Italy and the British colonies, among other foreign countries, provide for recognition of trademark ownership to the first to use the trademark in such coun-

tries, and while this is a reasonable and equitable arrangement it has undoubtedly led to a certain laxity on the part of American and British traders, who have assumed that the laws of foreign countries generally followed their own on this important matter.

A provision exists in the laws of some important foreign countries, including Great Britain and some of the chief British colonies, under which the registration of a trademark becomes conclusive of ownership after a few years from the date of registration, but before suit for an infringement can be brought under such a registration it is generally necessary to establish that the mark is in actual use upon the goods for which protection is claimed, as without such use the alleged infringer could counter claim for cancellation of the trademark on the ground of non-user.

## Benefits of Trademark Conventions

The benefits of conventions providing a simple and economical system of protecting trademarks have been recognized by European countries for many years past, and full advantage has been taken of such conventions by the countries which have adhered thereto, as is instanced by the fact that in the twenty-five years during which the Berne International Trademark Convention has been in operation about 20,000 trademarks have been registered through an international bureau.

The arrangement of this bureau, established at Berne, Switzerland, in 1893, provides for the registration of trademarks in thirteen countries by the simple procedure of paying a fee of 100 francs to the central bureau, which then notifies all the trademark offices of the other countries of the depositing of the trademark, and these thirteen offices register the mark, while the courts give the same protection thereto as would be afforded under separate registrations made in those offices.

The countries which are parties to this Berne Convention are as follows: Austria, Belgium, Brazil, Cuba, Spain, France, Hungary, Italy, Mexico, Holland, Portugal, Switzerland and Tunis.

It will be noted that Germany is not a party to this convention, but Austrian firms, and German firms established in one of the convention countries, have not failed to take undue advantage of the arrangement to the serious detriment of American traders.

## Tire Trademarks Stolen

Before the United States entered the war the trademarks of practically all the leading tires made and sold in the United States were registered under this international convention by one Richard Mittler of Vienna, Austria. By paying to this Central Bureau in Berne, Switzerland, the small sum of \$180, Mittler was able to protect in his own name the marks of nine of the best-known American tires in the thirteen countries of the convention, and in so far as those countries give protection to the first to register the trademark, he has acquired exclusive rights to such trademarks, unless the rightful owners had previously taken the precaution to register the same in their own names in those countries.

\*Mr. Parker is a member of the firm of Marks & Clerk and is a recognized authority on the subject of International Trademark Law.—EDITOR.

Mittler is now in the position where the American traders who failed to previously register the mark must negotiate with him to buy back their trademarks, or else change the name of the goods for that particular market.

Many other instances of the use of this International Bureau by Austrian firms, or by German firms located in one of the countries of the convention, can be cited.

As the United States is not a member of the Berne Convention, American manufacturers cannot take advantage of the simple procedure available to citizens of the countries which have adhered to the convention, and it is necessary, therefore, for trademarks to be separately registered in the thirteen countries in order to fully protect the American trader.

### South American and Other Piracy

A leading attorney in the Argentine Republic is now compiling a complete list of applications by Germans to register well-known American trademarks, of which scores of instances can be cited, so that proper action can be taken to recover these trademarks, either through the State Department by diplomatic action in the Argentine, or through such other government bureau as may be found advisable.

Many American manufacturers are at present debarred from using their trademarks in Scandinavian countries by reason of the fact that registrations have been secured thereon in the names of residents of those countries. In some of these cases the marks have been covered by agents of the American manufacturers—in the names, however, of the agents, who have thereby secured a monopoly thereon. It will readily be seen how an unscrupulous agent can exercise this monopoly to the serious detriment of the American trader.

### The Buenos Aires Convention

The International Convention of Buenos Aires, which was signed in 1910, and of which the United States is a member, will provide a simple procedure, similar to that available under the Berne Convention for the protection of trademarks on the American continent. This Buenos Aires Convention has been ratified by a sufficient number of the northern group of countries to enable it to be brought into operation, ratifications having been filed with the Cuban Government by the following countries, in addition to the United States: Costa Rica, Cuba, Dominican Republic, Guatemala, Honduras, Nicaragua and Panama.

The Cuban Government has appointed a director to take charge of the bureau, and has appropriated \$25,000 toward the cost of erecting a permanent home, and has authorized the president to give a suitable site in the city of Havana for the purpose.

Rules have been drafted for operating under the convention, and these have been submitted to the officials in the countries above referred to, so that it is expected that applications for registration at this International Bureau, covering the eight countries of the northern group which have ratified the same, may be accepted for filing and for communication to the other countries in a few months' time.

The United States Congress has had under consideration a new bill for giving effect to the convention in the United States, and this bill has passed the Senate and is now before the House for action. Congress has been requested to appropriate such proper sum as will adequately represent the quota of the United States toward the cost of maintaining the bureau as well as the cost of erecting its permanent home.

It will be noted that Mexico, Salvador and Haiti,

among the northern group of countries, have not ratified the convention, so that separate protection has to be obtained in those countries.

### Southern Group—Ratifications Incomplete

It should be clearly understood that for the present no possibility exists of securing any benefit, so far as the South American countries are concerned, from the Buenos Aires Treaty. A sufficient number of countries in that group has not yet ratified the convention to bring it into operation, and it still requires two further countries to send in their ratifications before arrangements for the opening of the office at Rio de Janeiro can be made. In view of the fact that the piracy of trademarks, particularly by enemy aliens, is most common in South America, and especially in the Argentine Republic, it is essential for the full protection of trademarks there that separate applications be filed to register the same as before.

One of the great difficulties militating against ratification by the Argentine Republic is that this will require recognition of trademark rights by the actual user, instead of by the first to register, as at present is the law of that republic.

In the past it has been a common practice for so-called agents of United States traders to enter into an agreement to represent the United States manufacturer, and to obtain a shipment of goods bearing the trademark, which in the meantime the Argentine agent has registered in his own name in that republic, and when the goods reach him these are confiscated, and unless new arrangements are made with such agent to his advantage the trader in the United States not only loses his goods, but also his trademark, and has to adopt an entirely new brand in that country.

It will readily be appreciated that as the courts of the Argentine Republic encourage practices of this kind by rendering decisions in favor of the first to register the trademark, officials there are not willing to ratify the convention of 1910.

### Under Webb Export Bill

The act known as the Webb law, passed by Congress in 1917, legalizing the formation of associations or trusts for the purpose of engaging in export trade, has provided an excellent means of building up foreign markets if proper advantage is taken of the measure, and it is believed that more attention should be given to this important piece of legislation and efforts be made by groups of the leading traders in different lines of industry to form associations for securing the full benefits thereof. Such associations, when properly organized, could undoubtedly exert considerable influence on the officers of commercial organizations in South American countries to secure either ratification of the convention, so as to bring it into operation there, or changes in the laws of those countries which would recognize the ownership of trademark rights based on the prior use of a trademark.

If the operations of the trademark bureau to be established at Havana indicate that the international registration of trademarks is advantageous to the members of the union, undoubtedly pressure will be brought to bear on the Government to seek admission to the Berne International Convention above referred to, so that there will gradually be built up a system which will tend to the eventual establishment of a single office for the registration and publishing of trademark rights in all countries of the world.

The proposal for the designing and adoption of a national trademark, for which a bill was introduced in

(Continued on page 986)



## Airplane Engines Manufactured and Shipped

	At Airplane Plants	Shipped to A. E. F.	Shipped to Navy	To Allies	At Fields	Total
Training Engines .....	9110	325	515	1	6169	16,120
Combat Engines .....	5245	4981	3746	1090	632	15,694
Total .....	14,355	5306	4261	1091	6801	31,814

# Official History of Aircraft Production

## Objects, Problems, Production and Results of Entire Air Program Laid Bare in Conjunction with Complete Exhibition of Planes and Equipment

WASHINGTON, Nov. 27.—The first definite and comprehensive official reply to past criticisms of military air activities was made here to-day when complete information about production of engines and planes was disclosed at the War Department by Air Service officers in the presence of Secretary Baker. The information was given in connection with an exhibition of a DeHaviland 4 plane partially stripped and exhibited with all its accessories and parts in a room at the State, War and Navy Building.

The front half of the fuselage was shown equipped with four machine guns.

Primarily, the history of engines and planes related by Lt. H. H. Emmons, U. S. N., R. F., A. S. A. P. in charge of engine production, developed that the original plans of the Aircraft Production Board headed by Howard E. Coffin have practically been followed completely from the beginning to the end of the war; that only two changes were made in the original design of the Liberty engine as laid down in May, 1917, despite all rumors to the contrary; that J. G. Vincent, vice-president in charge of engineering of the Packard Motor Co., and E. J. Hall, Hall-Scott company, were the actual designers of the Liberty engine; that in October of this year the United States turned out more engines than the combined Allied air factories produced in any one month during the war, and by April, 1919, the United States would have produced 10,000 Liberty engines a month.

The original contracts for 22,500 Liberty 12 engines, said Lieutenant Emmons, had been increased to 51,100 exclusive of contracts also placed for 44,893 other airplane engines, including 10,000 Hispano-Suiza 300-hp. engines, 8000 eight-cylinder Liberty engines, and rotary

and other engines. The production up to the signing of the armistice was 31,814 engines, of which 15,131 were Liberty 12s.

In October 5603 engines were turned out with a program calling for 8000 in January, 1919, and 10,000 a month for the following 4 months.

In contrasting our production with that of the foreign countries Lieutenant Emmons stated that in August, American production of Liberty 12s totaled 3850, while

Great Britain producing the Rolls-Royce—the only engine comparable to the Liberty—turned out only 59 per week.

Twelve thousand two hundred eighty-five airplanes, including both training and service planes, were produced up to the time of the armistice, including 3103 service planes for the expeditionary forces. In addition 700 kite balloons had been produced.

The cause for the failure of the Bristol was also explained in the discussions of the Liberty engine changes. These changes were due, it was said, to design, increase of power and manufacturing limits. The only design changes made were in the lubrication system, which was changed from scupper feed

to the forced feed, and an alteration in a part of the connecting-rod to allow sufficient play.

The power was increased twice in response to orders from the A. E. F., first from 330 hp. to 375 hp. and again to 440 hp. at the same time necessitating an increase in weight from 785 lb. to 860 lb.

The manufacturing limits were changed only in so far as this is a common practice in all production. The increase in weight from 785 lb. to 860 lb. may explain the Bristol failure.

Col. E. V. Clarke who selected the Bristol plane for the

### Salient Features of Aircraft History

1—Original Aircraft Production Board plans found correct and successful.

2—Official recognition given to Jesse G. Vincent and E. H. Hall for the design of the Liberty airplane engine.

3—Only two changes made in the original designs of the Liberty airplane engine.

4—Liberty engine production over 5000 in October, 1918.

5—Liberty engine production would have reached 10,000 a month in April, 1919, if the war continued.

6—More than 95,000 airplane engines on order at the signing of the armistice.

7—More than 31,000 training and combat engines delivered prior to November 1.

American program testified before the Senate Committee that his understanding of the Liberty engine weight was under 800 lb.

A committee composed of experienced production executives in the automobile industry, said Lieutenant Emmons, worked directly with the production section of the Air Service and included H. M. Leland, Lincoln Motors Co., C. Harold Wills, Ford Motor Co., and Messrs. Bell and Roberts of the Packard Motor Car Co.

The exhibition included practical demonstrations of the accessories used on the DeHaviland 4 with the most remarkable exhibit that of the flexibility of the two Lewis machine guns used by the observer. These guns weighing several hundred pounds are so arranged on a mounting as to allow firing both with one hand in any direction except directly below the plane.

Compasses of a type said to be much superior to the Allied compasses were being produced at the rate of 500 per week. A photographic machine exhibited is so constructed that it contains a long roll of film capable of taking 100 photographs in a row each 9 in. wide which when joined make a complete mosaic chart of the territory photographed.

Following are the complete statements made, the first a general introduction by Col. L. P. Ayres, General Staff, the history of aviation engine production by Lieut. H. H. Emmons and the descriptions of the manufacture of accessories by various officers:

"The Bureau of Aircraft Production is charged with the design, purchase, production and inspection of all material special to the Air Service," said Col. L. P. Ayres.

"There have been produced in this country during the period of the present emergency in excess of 12,000 airplanes, 30,000 aviation motors and 700 kite balloons, together with a vast variety and quantity of accessories therefor.

"In arranging this exhibit it was evidently impossible to illustrate all of the products involved. The exhibit, therefore, is concentrated on the DeHaviland 4 plane, which is an observation machine of advanced type, and is the American-built plane which has been extensively used over the front in France.

"The front half of the fuselage shown is one of over 500 machines lying at port awaiting shipment overseas when the armistice was declared; it is a regular stock machine and is in no way especially prepared for this exhibition.

"The accessories shown around the room are all parts of the equipment of the same DeHaviland 4 plane. At no time are all of these accessories installed on the plane at the same time, the particular installation depending on the service required. Nevertheless, all of the accessories must be furnished, and the machine must be designed to take each and every one of these accessories when required.

"In the production of airplanes, the limit has always been the possibility of engine production. Consideration of the vast investment in factory and machine tools, and the extremely high character of the workmen required makes this plain.

"It is felt that the second limiting point lies in the accessories, including instruments, armament, bombing equipment, radio equipment, photographic equipment, oxygen apparatus and the special clothing and personal

## AIRPLANES MANUFACTURED AND SHIPPED

	To A.E.F.	At Fields	To Navy	Total
Training Planes.	0	8170	140	8310
Service Planes..	3103	717	155	3975
Total .....	3103	8887	295	12,285

equipment of the aviator.

"The actual construction of the airplane is less difficult, as the investment in machinery and tools is much less, and the labor involved relatively less skilled.

"The special raw materials for airplanes have involved vast industrial operations, examples of which follow:

"It fell to the United States to supply spruce for the entire air program of the Allies and the United States. In October, 1917, these requirements were 5,000,000 ft. per month, with only 2,500,000 ft. per month being produced. In October, 1918, the requirements were 20,000,000 ft. per month with over 25,000,000 ft. being produced.

"These operations involved 30,000 men in the Northwest. It should be borne in mind that lumber actually usable in the airplanes is a relatively small percentage of even the best logs.

"Early in the war, it was evident that the Irish supply of linen would fail. Cotton fabric for airplane use was developed in this country and at the time of the signing of the armistice, about 2500 looms were producing about 1,200,000 yd. per month. There had been delivered up to that date a total of over 13,000,000 yd. of airplane fabric.

"The balloon cloth is of finer weave and 3200 looms were required to produce about 720,000 yd. per month."

In his outline of the history of aviation engine production Lieut. H. H. Emmons, U. S. N., R. F., A. S. A. P., Chief of the Engine Production Department, said:

"At about the time of the declaration of war, Mr. Coffin, and soon thereafter Mr. Deeds, were called upon to organize the production of aviation equipment. Naturally, the first point to be determined was what was to be produced. Limited to the engines, it became clear that three courses were open to them:

"1—To send a commission of experts abroad to study the engines used by the Allies.

"2—To encourage production in this country of such suitable foreign engines as had already been put in production in the United States.

"3—To develop a suitable engine from the talent and facilities available in this country in automobile and allied industries.

"Action was taken along each of these three lines.

"A commission, comprising Major Howard C. Marmon, Lieut. Col. V. E. Clarke and others, was sent abroad and made extensive investigation. The result of this appeared to be that the two best high-powered foreign engines were the Rolls-Royce and Lorain Dietrich. The Rolls-Royce does not adapt itself to American methods of manufacture and the Lorain Dietrich was not at that time completely demonstrated or accepted.

"In the United States the General Vehicle Co. was attempting, in a very small way for the Allies, to produce the Gnome 110-hp. rotary engine. Production, however, had not yet started, and facilities and talent for the production of a rotary engine did not exist in this country.

"The Wright-Martin Aircraft Corp. was beginning in a small way the production of Hispano-Suiza 150-hp. engines for the Allies. Production had not yet started and the power of this engine was so small that it was apparent that it would soon be obsolete for fighting purposes.

"Both companies, however, were assured of business

(Continued on page 987)

# Cultivating Japanese Automotive Field

## PART III

### Types of Automobiles Desired—Equipment and Finish—Japan Ambitious to Build Cars—Experimental Work Being Undertaken—Body Building Developed

By Tom O. Jones\*

**T**HE general principles of motor-car construction prevailing in America meet the requirements of Japan. There are, however, some modifications that would increase business in Japan and possibly in other export fields. A car with a comparatively short wheelbase, a small, high-speed engine, low rear axle, gear reduction, and a chassis that will permit attachment of a heavy limousine body, should prove popular. The price need not be held extremely low, for it is the type of car that would appeal to the wealthier Japanese, as meeting his desire for a car that would afford ample body room and at the same time be small enough to be handled easily in the narrow city streets. Possibly the reason higher-priced American cars have not become more popular in Japan is due as much as anything else to the American tendency to lengthen the wheelbase and build a generally bigger car, harder to handle on sharp turns.

The proposal of such a small car met with general approval from every dealer to whom the subject was broached. It is simply a case for American manufacturers to figure out whether the building of such a car in small quantities would be a financial success. It should be borne in mind, of course, that the business would be for chassis only, with the body built in Japan, a condition made necessary by high shipping costs. From this it may be concluded that the small car generally will be the most suited and acceptable for the market, either in the complete car or chassis. Why the closed car is more greatly in favor in Tokyo is explained by the fact that with the limousine construction the driver is separated from his passenger. Moreover, in the summer the capital is dusty, and a passenger in an open car is subjected to clouds of dust. The heat of an inclosed car, even without the least ventilation, is preferable to this dust. As the American woman has had much influence in motor-car construction, so may her Japanese sister be credited for the preference for

closed cars. Japanese women do not wear hats, and with hair daintily combed there is opportunity for tragedy if a wind storm strikes the fair occupants of an open car.

Although closed cars are undeniably the preference of those able to afford them, it must not be concluded that open cars have no field. They meet the demand for country travel, for renting service, and are largely used by foreigners. The American manufacturer will find his trade about equally divided between chassis and complete open cars.

The following details of design preferred in chassis construction reveal how little special engineering is required to meet the demand for Japan in a mechanical way.

#### Mechanical Features

**Engines.**—Generally, the preference is for block engines, either four or six-cylinder type. There is evidently no preference for overhead valve or L-head construction, but the engine must be serviceable, for it is in its construction, repair and adjustment that the

**J**APAN prefers chassis with short wheelbases owing to narrow streets and sharp turns.

Enclosed bodies are popular owing to prevalent dust and also to the desire to separate the driver from the passengers.

Little special engineering is required to meet the general demands of Japan in a mechanical way. Local repairmen are not expert on engine repairs.

Although in Japan the driver keeps to the left side of the road there is no definite demand for right-side steering. However, it is preferred and, though not essential, will help sales.

Japanese mechanic is at a loss more than in any other part of the car. Eight-cylinder engines are meeting with favor. There are at the present time less than half a dozen twelve-cylinder cars in Japan, but doubtless this is due to the size of the cars rather than to any objection to an engine with this number of cylinders. The sixteen-valve type is at present unknown in Japan, although six sample cars with engines of this type are now on the way to the biggest car-selling company in the Empire. The ideal engine for Japan is an economical, high-speed, four or six, in accordance with car size and weight.

**Transmission.**—A three-speed gearset will meet every requirement for Japan. A four speed is practically useless, for there is hardly any place where extreme speed can be utilized. The location of the gearbox is unimportant, with the possible exception that the transmission in unit with the power plant has preference over location on the rear axle.

**Clutch.**—On this point there is nothing that requires deviation from general practice. Either type is satisfactory, and will cause no prejudice either for or against the car in the mind of the buyer.

**Rear Axle.**—Little discussion as to the comparative merits of live or dead axles is heard in Japan, but there

\*EDITOR'S NOTE—Mr. Jones was formerly with the J. B. Crockett Co., New York, and was given a special appointment by the Bureau of Foreign and Domestic Commerce to investigate automotive conditions in Japan, China, the Philippines and Hawaii. This story is taken from the advance proof sheets of Mr. Jones' report to his departments. Part IV will deal with Japanese repair facilities, shipping regulations, duties, etc.



is a preference, and the sale of a car will be aided by a full-floating type of construction.

**Brakes.**—No part of the car construction is more vital than the braking system. The importance of powerful brakes is impressed on one continually. The regulations of Tokyo provide that "every automobile shall be equipped with two brakes, one working on a drum fixed on the wheel or axle, the other working on the other parts of the machinery," while the Yokohama regulations provide that "two brakes shall be provided on each automobile, one being applied to axles, wheels, or hubs, to enable the car to stop immediately upon application, and the other to prevent the car from backing. Both of the brakes shall be arranged so as to automatically stop the car and also regulate the speed." These clauses are, of course, not lived up to absolutely. The general American application of brakes to rear wheel drums is passed by the inspectors. It is well-nigh a crime to send a car into Japan unless its braking system is efficient, as the congested traffic conditions demand the constant application of brakes. The brakes must be relined and adjusted frequently, and adjustments, therefore, should be as accessible as possible.

**Other mechanical details.**—Strange as it may seem, with road rules the opposite of those in America, no great demand is made for right-side drive. It is preferred, and, while not absolutely essential, will help sales. Battery ignition is well established, and the magneto at the present time does not have the preference it did a year or two ago, although its fitting still has a favorable effect. Carburetors should have as few adjustments as compatible with efficient operation.

#### Equipment and Finish

Standard equipment, such as top, windshield, speedometer, lights, etc., give everything the Japanese require. Details requiring care and adjustment meet with disfavor rather than otherwise. Some of the requirements upon which there are differences in building for export trade are set forth below:

**Speedometer.**—Registration should be in miles, as the British standard is used throughout the country in measuring distances.

**Horn.**—The ordinary equipment may be furnished. It is probable that the old-fashioned bulb horn will be fitted when the car is put in service, but these are now made in Japan, and will be obtained by the dealer. The bulb type seems to be the recognized automobile warning signal in Japan, and its use is alternated with that of the newer types.

**Tires.**—Clincher types are most easily obtained in Japan, but straight-side types may be secured through American companies. The one tire factory now established in the Empire is building clincher tires exclusively, but seeing the probability that in the future the straight-side tires will be demanded, has equipment ready to build this style on short notice. Under present conditions, clincher tires assist in selling the car. Most dealers in Japan desire cars fitted with clincher rims and shipped without tires.

In style and finish, as little change from our common practice will be necessary as in mechanical construction, but the following points should have attention:

**Color.**—In open cars, any of the standard body colors, such as blue, gray, green and brown, will meet requirements, with lighter colors having the preference.

**Tops.**—Black tops will meet the demand. While no dealer interviewed indicated any decided preference for khaki-colored material, an option of either black or khaki is an added inducement. The climate generally does not go to extremes of hot or cold, therefore the mate-

rials used in standard production at home will meet every requirement.

**Upholstery.**—In any car selling above \$1,000 (American list price) the upholstery should be of leather. On cheaper cars imitation or substitute fabrics will fulfill the needs, but when it comes to buying an expensive car—and it must be borne in mind that the selling price in Japan will be in the neighborhood of twice the American list price—the Japanese buyer is earnest in his desire for real leather. All closed bodies are finished in whipcord, a light gray mixture having the preference, with silk window curtains to match.

**Metal Trimmings.**—Nickel-plated finishings are highly in favor. Most of the cars used in Japan are driven within only a few miles of the sea. There are some instances of rust absolutely spoiling the appearance of a car. If black japanned finish is used on any parts the enamel should be heavy, and baked hard, to withstand the elements.

**Seating Arrangement.**—The standard American bodies meet all requirements in Japan. It should be remembered that the Japanese are generally a small people, so that in bodies which in America we considered the limit in smallness for five persons it is not uncommon to see two extra seats added to make the vehicle of seven-passenger capacity, and every one seems to be comfortable. Within the past year the four-passenger cloverleaf type of roadster has become popular, practically every car of this type being sold immediately on arrival. These sales were found to be almost evenly divided between Japanese and foreigners. The fact that sales of this model had been made to Japanese seemed rather in contradiction to the statement that the Japanese wanted to be kept well removed from the driver.

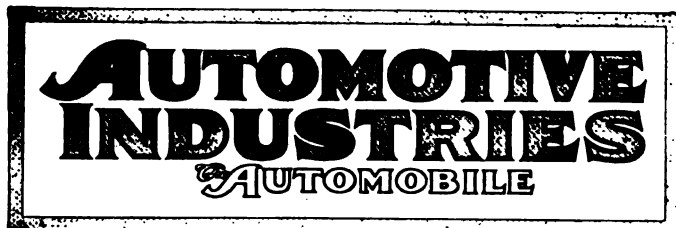
Japan is ambitious to build motor vehicles. The desire to enter the construction industry has become instilled in the minds of men of not less than five or six organizations, either operating now in different lines of industry or to be formed for the purpose of building cars. The plans in every case are still embryonic.

#### Motor-Car Manufacturing in Japan

As an impetus to the building up of a motor-manufacturing industry, the Japanese Government has since the first of this year instituted a system of subsidies, whereby all home-built motor trucks carry a bonus of \$1,000 and foreign-built trucks \$500. This is advanced by the Government at time of purchase and is followed by \$150 annually for upkeep. This subsidy will be paid for vehicles of at least 1 ton capacity originally built for commercial purposes and will not apply to converted passenger cars or vehicles developed by attachments to chassis. The idea is, of course, to apply the subsidy only to vehicles that will be of immediate and satisfactory service to the army if required. These vehicles are subject to military requisition.

The main difficulty in any building to date seems to be that no definite decision can be reached as to the type of car that should be built. The general impression is that a low-priced small car is the most suitable and the one offering the greatest opportunities. In Japan, as everywhere else, there is room for more than one type of passenger car, and probably all cars which may be built in Japan will be small, leaving the field for larger cars to the American and European manufacturers, mainly on a basis of chassis importation with Japanese-built bodies. The delay in preparing drawings may be accounted for by the fact that the Japanese companies plan to model their cars after typical small American cars, that is, those that sell in America for \$1,000 or less.

(To be continued)



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## Standardization of Brake-Shaft Bushings

THERE has been a very apparent slow-up in the standardization work of the Society of Automotive Engineers of late, which is perhaps natural in view of the fact that a very large percentage of firms in the automotive industry were engaged on Government work and the various classes of equipment required by the Government had been pretty well standardized. However, now that the thoughts of all are again turning to peace-time production new opportunities will be afforded the Standards Committee to serve the industry in standardizing parts of automotive machinery that are ripe for such procedure.

For some time there has been an increasing use of oilless bushings on brake shafts, that is, the shafts carrying the cams or levers which serve to expand or contract the brake shoes or bands. Oilless bushings on these shafts offer a material advantage in that they obviate the need of refilling grease cups

in these relatively inaccessible positions and largely eliminate the wear that occurs if no provisions for lubrication are made.

The manufacture of bushings for this particular purpose has been hampered so far in that the lengths and diameters differed on every car. There should be no difficulty in making three sizes of bushings serve all requirements in passenger car and truck work, and we believe that the Standards Committee would do a valuable service to the whole industry if it were to take this matter up for consideration and formulate standards as soon as possible.

## The Outlook in the Tractor Industry

UNDER the curtailment regulation in respect to steel for tractor manufacturers, which went into effect on October 1 last, the scale of operation of each tractor firm for the coming year was closely limited. No factory which had any appreciable production last year would have been able to exceed 75 per cent of this production the coming year, and through the operation of the priorities system many would not have obtained enough material for even this reduced volume of output. With the ending of the war all these artificial restrictions of tractor production will be removed. The only limit on the total output will be the capacity of the market, or its estimated capacity, to absorb tractors, and as to the distribution of this output between different plants, it will be entirely a matter of free competition.

During the past year the demand for tractors considerably exceeded the production. This does not mean that every firm in the industry could have sold many more tractors than it produced, yet it is a fact that most of the well-established concerns were unable to meet the demands made upon them. This was especially noticeable among implement firms with an extensive distributing organization and only limited tractor manufacturing facilities.

There were three factors which helped to increase the demand for farm tractors last year. One was the unprecedented demand for farm produce and the resulting high prices for same. The next was the scarcity of farm labor, which was due to the draft and to the luring away of farm-help to munitions plants. The third factor was the marked improvement made in tractor design and construction during the past couple of years.

Of these three factors, the first and last at least will continue to operate the coming year. From all reports there will be a greater scarcity of food products than at any time during the war. Hence farmers will continue to receive good prices for their produce and will have every inducement to cultivate every available acre. Just how the farm labor situation will shape itself it is difficult to foretell. There will undoubtedly be a certain relief as the Army is demobilized and munitions factories are closed. But wages are not likely to come down very much for some time to come, and it will therefore

be to the farmer's advantage to save man power by adopting the most modern farm equipment. With a good three-plow tractor outfit one man can do at least twice as much plowing in a day as with a horse-drawn two-bottom plow, hence the item of labor cost in plowing is cut in half by the use of the tractor.

### Intensified Engineering Development Imperative

What is most necessary in order to keep the demand for tractors on the increase is continued, intensified engineering development. The tractor must be improved both as to its operating efficiency, so as to reduce the amount of fuel and oil consumed per acre plowed, and as to its resistance to wear and depreciation. At the present time an almost insignificant proportion of the farms of the country are equipped with tractors. With millions of farms in the country the possibilities are enormous. But before the farmers as a class can be induced to discard their horses and adopt the tractor instead, they must be convinced that the change will result to their economic advantage. Practically all conditions of farm operation have recently changed in a way favorable to the tractor. The high wages of farm labor, the high cost of horse feed and the need of devoting more of the acreage devoted to raising it to raising human food combine to make the outlook for the tractor more encouraging than at any time in the past.

## Commercialism in the Wrong Place

IT is probably impossible to carry through such a gigantic task as that which was involved in our air program without making serious mistakes. Now that the war is won and the program as a whole has proven successful it may seem malapropos to harp on blunders relating to details. Yet it must be remembered that there are many things which could not be mentioned in the public prints before, so that if they are worth discussing, now is the proper time to take them up.

We have recently had a chance to look through a book of instructions for the installation, inspection and maintenance of the Liberty aircraft engine, issued by the Equipment Division of the Signal Corps. One chapter of this book, after describing the battery ignition system specially designed for this engine, enumerates a list of "advantages which this type of ignition presents over the magneto system."

Now, it is difficult to see how a knowledge of the advantages of the ignition system used, as compared with a rival system, will help the mechanic in "installing, inspecting and maintaining" the system used. The section referred to is nothing more or less than an enumeration of sales arguments or talking points, which has no proper place in an instruction book. What makes things worse is that some of the statements made are absolutely misleading, if not untrue. Thus, it is given as one of the advantages

of the Liberty system over the magneto system that the distributor heads of the former "run at slow speed (one-half crankshaft speed), hence the wear will be slight." Now, the distributor of a magneto, the same as that of a battery system, runs at one-half crankshaft speed, if the system is for a four-cycle engine like the Liberty.

Another advantage of the Liberty ignition system over the magneto system is said to be that the spark of the former "is hot and of short duration," from which it may be inferred that that of the latter is cold and long drawn out. It is very much to be doubted whether anybody ever measured the temperature of a spark and is in position to say that one spark is hotter than another.

This, however, is only by the way. The point is that the inclusion of such matter in a Government publication for the instruction of mechanics is an indiscretion of the worst sort, and on reading it one begins to understand the rancorous feeling that has been aroused in sections of the ignition industry by some of the things that have been done by people connected with the aircraft department.

## Maintain Americanism

NOW that the war is practically over, it is to be hoped that the marked impetus given to the "Americanization" movement will not be allowed to perish in the struggle of commercialism. If this war has taught the country anything, it is that our people must not only be citizens, but they must also be Americans. The English language should be as nearly universal in this country as it is possible to make it and we must do everything in our power to avoid the formation of virtual foreign colonies in our midst.

The Germans were highly indignant because the so-called German-Americans did not prove solidly loyal to the Fatherland. They would have been spared this disappointment and we would have been spared a great amount of trouble with a larger element than was comfortable, if such a thing as organized hyphenism had never been permitted to grow.

### American Workmen Should Be Given Preference

In our shops, preference should be given Americans. The emigrant should be encouraged to take out his papers and everything that can be consistently done to make him an educated, English-speaking citizen should be done. This will not only be doing a great work for the country, but it will also be making for a more efficient shop. The public school is working on the next generation. The shop works with this generation as well as the next.

Small shops cannot go as far in this as larger shops can. Here the work can be taken up collectively, through the agency of the Board of Commerce or some similar community organization. It is one of the most important situations which confront the nation to-day, and to do your bit in this in peace times is just as important as it was to have done your bit when war was here.



# □ Latest News of the

## Government Should Let Business Set Reconstruction Pace

**Five Thousand Delegates at Atlantic City Congress Enthusiastically Endorse the Principle That Readjustment of Commercial Activities Is a Function of Business and That Government Should Follow Business, Not Lead It, in Its Task**

ATLANTIC CITY, N. J., Dec. 4—Special Telegram—More than 5000 delegates representing the foremost business interests of the United States to-day vigorously applauded the principle that the readjustment of business policies and activities is logically a function of business and that the Government should follow business and not lead it in the task. The convention, which is a reconstruction conference of three hundred and eighty-one war service committees, representing as many industries, formally opened to-day under the auspices of the Chamber of Commerce of the United States. The meetings are being held at Young's Million Dollar Pier, and the initial gathering, which heard such eminent authorities on business as Charles M. Schwab, Secretary of Commerce William C. Redfield, and Harry A. Wheeler, president of the United States Chamber of Commerce, packed the great hall to capacity.

The convention undoubtedly is the most important gathering of its kind that has ever been held and it is certain that the results of the deliberations of the five thousand delegates which will be made public in a series of resolutions at the last of the session on Friday will have a profound effect in guiding and shaping the reconstruction and readjustment policies of the business world.

### Comprehensive Road Program Favored

The economic importance of an uninterrupted policy with regard to public works and particularly in the building and maintenance of national highways is one of sustaining interest to the convention. The hearty applause which greeted both Charles M. Schwab and Secretary Redfield when they separately advocated

the necessity of a comprehensive road program in order that the fullest possible use may be made of highway transportation leaves no room for doubt regarding the sentiment of the gathering on this point. Individual recommendations to this effect have been adopted by nearly every separate war service committee.

And at a meeting of the War Service Committee on Highways a resolution was adopted strongly urging "the immediate creation of a separate and distinct Federal Highways Commission, whose duties it shall be to construct and maintain a system of national highways and that appropriations be made therefor." At the meeting of the War Service Committee of the automobile industry a similar sentiment was apparent, and the members went on record as favoring a continued road program to facilitate and stimulate highway transportation.

### Advocates Commission Be Sent to Paris

Harry A. Wheeler touched a responsive chord at the opening session to-day when he advocated that a commission of business men be sent to France to be available for consultation in the solution of such problems affecting American business as may be expected to come before the peace conference.

"Counsel can hardly be taken except where minds meet and personalities come in contact with each other. The counsel of statistics cannot adequately represent American business," said Wheeler. "Since in questions of economic reconstruction other nations will undoubtedly be adequately represented with the most expert support that can be marshalled, it is for you to determine whether you regard the matter of sufficient importance to advocate the appointment of a commission whose continuous presence in Paris will provide like representation on behalf of American industry."

Touching on the matter of war con-

tracts, Wheeler advocated a liberal policy on the part of the Government in cancellations. "There must be," he said, "a willingness to retain possession of the materials owned and controlled, releasing them only so fast as the market can readily absorb these commodities without breaking prices to an unwarranted extent or stopping production during the period required to digest Government controlled stocks.

"It is vital, however, that such adjustments be made as far as possible before those representatives of the Government who placed the contracts have returned to their private concerns, as only these have knowledge of the circumstances under which the work was undertaken, and who have some sympathetic consideration for the difficulties which confront a converted plant in the reconversion to its normal uses. No substitute adjusting medium can ever accurately and justly determine the measure of damage to plant, or the true value of materials bought solely for other purposes at anything like their invoice cost."

A similar feeling prevailed at the meeting of the War Service Committee of the automobile industry. Here it was reiterated that it was manifestly unfair to subject a manufacturer to a market glutted through no action of his own but through the unrestricted sale of Government owned products. Such products, it was pointed out, should be sold abroad where they would assist our Allies in getting on their feet.

### Optimistic Over Labor Readjustment

Neither Secretary Redfield nor Charles M. Schwab expressed any apprehensions regarding labor during the present reconstruction period. Both believe that there will be no period of unemployment that our factories will absorb workers as quickly as they are released from mili-

(Continued on page 979)

# Automotive Industries □

## Detroit Automotive Conditions

### Unsettled as Regards Getting Back to Normal Production —Price Trend Doubtful

DETROIT, Dec. 3—Conditions here still are unsettled as regards the time when the motor car factories will get back onto a normal basis of production and also as to what prices are going to be. The time when normal production will be reached will depend upon the extent to which factories were on a 100 per cent war basis and upon the ease with which materials may be secured. Some of the factories were on a 100 per cent war basis, while others were working in that direction, with the expectation of being so by the first of the coming year. Manifestly, these latter companies, other things being equal, will be able to resume normal production sooner than will the former. The general impression prevails that it will be several months in coming.

No material changes in the price situation have taken place during the last week. Reductions, or rather a return to price conditions of early last fall, will be made by one or two concerns which are not, however, ready to make public announcement of their intentions just at this time. These contemplated reductions hardly will affect the situation seriously, it is believed.

The worst feature of the price situation, from the viewpoint of the concerns which have already announced that no changes are imminent, or which have no intention of making a change, is the psychological effect upon the dealers of the reductions already announced. It is feared that there will be engendered in the minds of the dealers as a class the expectation that prices in general will come down, with the effect of slowing up business for the next 90 days.

But that price reductions will be generally resorted to is regarded as highly improbable. Some of the larger concerns already have stated positively that no changes will be made, and as far as this goes it will have a counter effect on dealers and will tend to stabilize the situation.

There is no intimation of a downward tendency in prices on motor trucks. The truck manufacturers anticipate a big demand for trucks for industrial and farm purposes, and with labor and material conditions as they are they profess to regard lower prices as an impossibility. Indeed, some of the truck manufacturers

are inclined to take the other angle and assert that if any movement of prices is manifested it will be upward rather than downward.

### N. A. A. J. to Hold Convention

CHICAGO, Dec. 2—The National Association of Automobile Accessory Jobbers will hold a convention Dec. 16, 17 and 18 in this city. It had scheduled a convention and exhibit for about Nov. 1, but dropped its plans at the request of the War Industries Board.

The directors and committees will meet the 16th, which is Monday, and the general sessions will be held the 17th and 18th. The usual practice had been to hold the convention for an entire week, and such would have been the case had not the exhibit been discontinued.

## Detroit S. A. E. Sees Liberty Engine Manufacture

### Record Attendance Brought Out by Ford Reels and Lecture on Aerial Warfare

DETROIT, Nov. 30—The convention hall of the Pontchartrain Hotel was crowded to capacity last night to accommodate the great crowd which came to attend the third fall meeting of the Detroit Section, S. A. E. The program for the evening consisted of a moving picture portrayal of the manufacture of Liberty motors in the Ford plant, followed by an illustrated lecture on Aircraft Warfare by G. Douglas Wardrop, managing editor Aerial Age Weekly.

The Ford film was intensely interesting. The manufacture of Liberty motors was followed through from the raw materials to the finished aircraft. The wonderful machinery which is used in the manufacture of motors, the speed and precision of manufacture and the careful inspection of every process were depicted in full.

Mr. Wardrop's illustrated lecture was no less interesting. Recently returned from England and the Flanders front, where he had the privilege of investigating the use of aircraft in war activities, accompanied by the experience of being a companion in the flight of some of the noted airmen, the speaker was enabled to invest the story with what he said was a personal and intimate touch, which made his story stand out vividly. The pictures, too, with which the lecture was

## 1918 Car and Truck Production

### Passenger Cars Show Big Drop; Commercial Cars Have Increased

WASHINGTON, Dec. 2—Production of passenger cars and trucks, by quarters, for 1918 is as follows:

	Passenger Cars	Commercial Cars (Civilian only)
First quarter.....	293,333	45,500
Second quarter.....	345,100	45,417
Third quarter.....	186,173	45,429
*Fourth quarter.....	150,900	46,300
Total .....	974,606	182,646

\*Estimated.

In 1917 there were produced 1,718,000 passenger automobiles and 160,000 commercial motor vehicles, whereas under the war restrictions this year the total output of passenger cars will be slightly less than 1,000,000, or 740,000 fewer than in 1917. There was no enforced limitation of truck production until last August, except that many assemblers were unable to obtain deliveries of engines, transmissions and axles. Trucks produced and sold for civilian use only last year totalled 109,000, while this year they will reach 182,000—an increase of 67 per cent.

### Saxon Price Reduced

DETROIT, Dec. 4—The Saxon Motor Car Corp. has reduced the price of its 6-cylinder passenger car from \$1,295 to \$1,195, effective at once.

### Decreased Appropriation for Air Service

WASHINGTON, Dec. 2—Appropriations for the current year submitted to Congress by Secretary McAdoo to-day included \$144,943,000 for the Air Service as against \$760,000,000 last year.

illustrated, were of a nature to give the observers a better understanding of the important part aircraft had played in the great war than many had heretofore had an opportunity to gain. Particularly interesting were the illustrations of all the various types of aircraft machines at present in use.

The lecture concluded with some prophecies for the use of aircraft in times of peace which would have sounded wildly Utopian just a little while ago, but which appeared very probable in view of the marvelous advances which have been achieved under the stimulus of war.

## Coast to Coast Air Mail Route

New York - San Francisco Service Planned with Feeder Lines to All Important Cities

WASHINGTON, Nov. 29—The inauguration of an aerial mail service between New York and San Francisco with feeder lines to all the important cities between those points is certain to follow the signing of the peace terms.

The Post Office Department plans to ask appropriations of \$1,500,000 and possibly more for this work. In addition to the postal service the Navy plans to continue and develop mail service between its various stations and Naval hydroplanes may also be used by the Post Office for mail flights over water routes.

It is possible that one route will be established over the Mississippi River, connecting New Orleans, Memphis, St. Louis and St. Paul on the Mississippi River; St. Louis, Jefferson City, Kansas City and Omaha on the Missouri River, and Louisville and Cincinnati on the Ohio River. Another route will likely extend up the Hudson River valley, connecting New York City with Albany and other up-State points.

That there will be an extension of the Air Mail Service to include Denver was indicated in a telegram from Postmaster-General Burleson to Senator John F. Shafroth of Colorado, stating:

Referring to conferences with you relative to extension Aerial Mail Service to Colorado points, I have directed the extension immediately after the war of Aerial Mail Service to Denver in connection with the transcontinental route from New York to San Francisco.

Mr. Burleson has announced that the New York-Chicago air mail route will start some time before Dec. 15, the exact date depending upon the receipt of necessary airplanes. Work is in progress on the hangars at Woodland Hills Park, Cleveland; Bryan, Ohio, and at Clarion, Bellefonte and Lehigh, Pa. The hangars will be ready for use Dec. 1. The winter plan of operation is for trips from Chicago and New York, starting at 6 a. m. and including all stops to be made within 10 hours. It is expected that approximately 20,000 letters will be carried daily.

Preparations have been made to insure successful service through the winter months. Electrically-heated clothing for the pilots and individual heating plants for each plane form a part of the program. The heating plants will keep the engines warm in the hangars through the coldest weather and allow immediate starting. Landing and take-off areas will be well packed during snow time and equipment has been devised for the control of planes on sleet and ice. The New York-Chicago airplanes will be equipped with wireless.

That the service has proven efficient up to this time was stated recently in a

public announcement issued by the department, adding further that it has proven the possibility of further extension and the value of the saving in time which may be accomplished by the use of the airplane for the transportation of mail, the benefit being in accumulating ratio as the distance covered is increased. In future extensions, when war conditions permit of this, there will be nothing experimental. That the Air Mail Service has progressed beyond the state of experiment is shown by the following figures:

During August there were 27 flying days, 108 legs of journey being made. In making these 108 flights there were only two forced landings, one causing a delay of 17 min., the other of 10 min. Of the total mileage to be flown, 11,961 miles, 11,957 were actually completed.

The record for the month of September and for October was 100 per cent perfect, according to the Post Office Department.

The Post Office appropriation bill passed by Congress permits the War Department to turn over the airplanes to the Post Office as requisitioned and without charge, and it is expected that a large number of planes and considerable equipment will be turned over to the postal authorities, and that the \$1,500,000 appropriation will be used exclusively for maintenance cost.

### Naval Pilots Use Parachutes

WASHINGTON, Nov. 29—Two Naval aviators dropped from more than 3000 ft. from swiftly moving seaplanes flying over this city yesterday by means of parachutes and made successful landings. Ten minutes were consumed in the descent.

### A Three-Stop Transcontinental Air Service Predicted

WASHINGTON, Dec. 2—From New York to San Francisco by air with three stops, Chicago, Denver and Salt Lake City, will be a commonplace flight soon.

That non-stop air mail service between Chicago and New York is not only a possibility but a certainty was demonstrated last week, when non-stop flights, Dayton to New York, 550 miles, consuming one-half of the gasoline supply, and Mt. Clemens, Mich., to New York City without use of the extra gasoline supply, proved conclusively that the post office plan of service between New York and Chicago is a sane one, and that the present scheme which contemplates landing places between these points is particularly conservative. The DeHavilland-4 Army planes have displayed their ability to make 850-mile flights without stopping.

In fact, judging by the numerous non-stop records announced, it is a safe prediction that mail from New York to San Francisco by air with three stops, at Chicago, Denver and Salt Lake City, will be a regular occurrence before 1920.

## Plan 21 Naval Aerial Stations

Coastal Patrol Would Include 4 Zeppelins, 12 Dirigibles and 144 Smaller Balloons

WASHINGTON, Nov. 29—The establishment of a coastal air patrol to include four Zeppelin-type airships, twelve dirigibles and 144 smaller balloons was discussed by naval officers before the House Naval Affairs Committee to-day. The Navy intends to pay \$1,500,000 each for the Zeppelin-type of airships. The dirigibles will cost \$250,000 each and the smaller balloons \$75,000 each. The Navy will also buy 108 fighting escort planes.

During the discussion it was said that \$90,000,000 of the \$220,000,000 appropriated for Naval aviation will be returned to the Treasury in July, 1919, as "unnecessary." Rear-Admiral Taylor, Chief of Naval Construction, described the work of the Zeppelins, telling that during the war one of these airships flew from Germany to German East Africa.

### Navy Asks Aid from Congress

The Navy urgently requests the aid of Congress in the establishment of aerial coastal defenses. Officers testify that with proper defense the U boats which appeared off the American shores last year would have been unable to do any damage and would probably have been destroyed.

The discovery of a non-inflammable balloon gas was announced and pronounced so efficient that it could be fired into the gas bag without igniting. The gas costs more than hydrogen but leaks less rapidly, thus evening up the final cost.

Twenty-one aerial stations are planned, some of which are under construction. They will command the Gulf, Pacific and Atlantic coasts and insular possessions, and will be established on the Maine coast near Portland, Narragansett Bay, New York harbor, Port Arthur, Texas; San Francisco; Seward, Alaska; Guam and St. Thomas, West Indies; Hawaii and the Panama Canal Zone. Stations under construction are at Camp Lookout, N. C.; Brunswick, Ga.; Galveston, Texas. Completed stations are at Chatham, Mass.; Rockaway Beach, N. Y.; Key West, Fla.; Miami, Fla.; San Diego, Cal.

### Plane Capable of 160 M.P.H.

Further discussion by Admiral Taylor confirmed the reports current in Washington of a plane capable of 160 m.p.h. Admiral Taylor told that experiments with a Kirkham triplane had resulted in the speed of 160 m.p.h. It is reported here that this plane has been developed by the Curtiss Engineering Co.

It is also stated that \$36,000,000 worth of contracts for Naval airplane service have been canceled since the armistice was signed.



## Non-Stop Flight Records Broken

### A Standard De Haviland-4 Plane with Liberty 12 En- gine Travels 550 Miles

WASHINGTON, Dec. 2—Making a dinner and theater engagement in New York City at 10 a. m. from Dayton, and arriving to keep the engagement for the same day, was what C. F. Kettering, vice-president of the Dayton-Wright Airplane Co., and H. M. Rinehart, premier pilot of that company, accomplished late last week, at the same time breaking all non-stop airplane flight records in the United States. The trip was made in a standard DeHaviland-4 plane equipped with a Liberty 12 engine, and the journey of 550 miles was accomplished in 4 hr. 10 min., an average of 134 m.p.h. When Mineola, Long Island, was reached there was enough oil and gasoline in the tanks to carry the machine back to Dayton, and Mr. Rinehart thought a 1000-mile non-stop journey with a DeHaviland-4 should be a comparatively simple matter.

#### Leaves Dayton 11 A. M.

The journey was made leaving Dayton at 11 a. m. Saturday, just following receipt of orders to bring a DeHaviland-4 plane to Washington. Mr. Kettering, who was desirous of going to New York, suggested that the journey be made via New York, stopping there for dinner and a show, and then going on to Washington. At exactly 11 a. m. the machine arose in the air. At 3.10 p. m. it landed on Mineola Field. The aviators kept their dinner and theater engagement. At 2.05 p. m. yesterday afternoon the fliers started for Washington. At 4.10 they stepped from their plane in front of the hangars on Bolling Field, covering the distance of 224 miles in 2 hr. 5 min.

Mr. Rinehart stated that on the trip from Dayton to New York and New York to Washington an altitude of 5000 ft. was maintained, and at no time did he go more than 5 miles off the air line course.

#### Seaplane Carries 50 Passengers

WASHINGTON, Dec. 2—All records for carrying a large number of passengers in any type of airplane were broken Wednesday, Nov. 27, at the Naval Air Station, Rockaway, when the Navy's newest type of seaplane, the giant NC-1, the largest seaplane in the world, made a flight with 50 men on board. Most of the men were accommodated in the large boat body.

The design and the construction of the NC-1, with its triple motors, huge size and other distinctive features, was carried out by the Navy in co-operation with the Curtiss Engineering Corp. It is not specifically a flying boat nor is it of the pontoon variety of seaplane, but combines the most valuable advantages of

both, its size and purpose being considered. While it is entirely new and original in type, the NC-1 incorporates proven essentials in aircraft construction, and even before it was tested was regarded in naval circles as a pre-insured success rather than as an experiment.

This is the first American tri-motored seaplane, being propelled by 3 Liberty motors that develop a maximum of 1200 hp., giving it a cruising speed of 80 m.p.h. The flying weight of the machine is 22,000 lb., while the weight of the seaplane itself, unloaded and without a crew, is 13,000 lb.

An idea of the size of the big seaplane is shown by the fact that the wing spread is 126 ft., the breadth of wing 12 ft., and the gap between wings 12 ft.

Recently the NC-1 made the trip from Rockaway to Washington, about 350 miles, in 5 hours and 20 minutes. The flight from Washington to Hampton Roads, 150 miles, was covered in 2 hours and 15 minutes, and the trip from Hampton Roads to New York, 300 miles, took 4 hours and 20 minutes.

#### Praises John D. Ryan

WASHINGTON, Nov. 29—That the aircraft program had already succeeded when Howard Coffin resigned and John D. Ryan was appointed as head of the Air Service was indicated in correspondence between President Wilson and Mr. Ryan, in which the latter was thanked for his service and for the management which speedily established the public confidence. The President's letter recognized Mr. Ryan's desire to return to industrial work and added:

The aircraft program was in all likelihood proceeding toward success but the energy of your management and the broad business experience which you brought into the Air Service speedily established the whole thing in the public confidence and gave the country full assurance that our participation in the war through the Air Service would be in keeping with our responsibilities and resources.

#### Department of Labor Reorganized

WASHINGTON, Nov. 29—The Department of Labor will be reorganized from a war to a peace basis by a committee appointed by Secretary of Labor Wilson, and including Louis F. Post, Assistant Secretary of Labor, chairman; A. W. Parker, Bureau of Immigration; Roger W. Babson, Director of the Education Service; Mary Van Kleeck, Director of the Woman Industries Service, and Grant Hamilton, Director of the Working Conditions Service. The department now has two services and eight boards created during the war, and the committee will decide upon the conversion of some of the boards and the elimination of others. Those to be converted, as for example the United States Employment Service, which has 900 branch offices and 4400 employees, will probably be expanded to meet the exigencies arising from demobilization.

## Australia in Need of Farm Tractors

### Much Interest Displayed in First Official Field Trials at Melbourne

SYDNEY, N. S. W., Oct. 12—S. L. Tyler, a director of McIntosh & Sons, Ltd., Buick distributors, states that the demand for farm tractors is increasing rapidly, and that the first field trials held under the auspices of the Federal Government were carried out so successfully that interest was greatly stimulated as to the possibilities offered by power farming.

Experiments are being conducted with a suction gas generator designed to eliminate the use of gasoline as a fuel. These have proved satisfactory, according to Mr. Tyler.

Whether the passenger car dealer will handle the farm tractor or not seems to be a point under consideration, as in Australia it has been found that a dealer cannot, as a rule, sell both cars and trucks satisfactorily. In the case of the larger firms, such as McIntosh & Sons, it is likely that subsidiary companies will be formed for the express purpose of handling tractors.

The Commonwealth of Australia is a very large grower of wheat and other grain, and improved shipping conditions are practically certain to further increase production.

#### Will Market Liberty Fuel Jan. 1

WASHINGTON, Dec. 2—The new motor power called Liberty fuel will be sold to the general public by Jan. 1, according to a new announcement by Capt. E. C. Weisgerber, the inventor. The base of the new fuel is said to be kerosene. The invention has been patented and according to the regulations of the War Department the inventor may make it a commodity for public use. Three thousand gallons are reported to have been manufactured to date, this amount being used largely for experimental purposes. It is said that the new motor gas is composed of 80 per cent kerosene, the balance being chemicals that constitute the essentials of the discovery.

The price of the new fuel has not been fixed, but it is stated that the ingredients other than kerosene are of low cost and can be obtained readily.

#### Makes 500-Mile Non-Stop Flight

WASHINGTON, Dec. 2—Major N. J. Boots, Army pilot, made a non-stop flight of 500 miles from Mt. Clemens, Mich., to New York City last week in 4 hours and 30 minutes. He used a Fisher Body Co. DeHaviland 4 with a Liberty engine and one extra 25-gal. gasoline tank. An altitude of 8000 ft. was reached between Buffalo and New York City. The supply of gasoline in the extra tank was not used.

## Export Product List Revised

### Tires and All Manufactured Rubber Articles Can Be Shipped; Not Crude Rubber

WASHINGTON, Nov. 29—All manufactured rubber articles, including automobile tires, have been removed from the export conservation list and can now be shipped to all destinations. Crude rubber cannot be exported from this country. Numerous other commodities are removed from the list and can be exported generally. These include the following:

Alloys containing tin.  
Anti-friction metal, bars and pigs and all shapes, unless an integral part of a complete machine.  
Babbitt metal, bars and pigs and all shapes, unless an integral part of a complete machine.  
Anti-friction bearings, unless an integral part of a complete machine.  
Babbitt bearings, unless an integral part of a complete machine.  
Bichloride of tin.  
Oil cans, second-hand crushed.  
Oil squirt cans.  
Chloride of tin.  
Founts, lamp, tin.  
Lamp founts, tin.  
Lanterns, tin.  
Anti-friction metals.  
Babbitt metals.  
Type metals.  
White metals.  
Oxide of tin.  
Phosphorized tin.  
Any metallic alloy containing tin.  
Bichloride of tin.  
Bottle caps or covers of tin foil.  
Chloride of tin.  
Collapsible tubes.  
Cork corks.  
Compounds of tin.  
Crystals.  
Oxide.  
Salts.  
Silverware containing tin.  
Carbon Tetrachloride.  
Wire tin.  
Aeronautical instruments.  
Aeronautical machines, their parts and accessories.  
Anti-aircraft instruments, apparatus and accessories.  
Boring machines, horizontal and vertical.  
All iron and steel chains, either welded, case or stamped.  
Chronometers.  
Chucks, drill.  
Chucks, lathe.  
Circular-saw blades.  
Engines, marine, and parts (individual licenses not required to Canada and Newfoundland for engines of 60 hp. and under).  
Machine tools, as follows:  
Grinders, internal, plain and universal.  
Horizontal and vertical boring machines.  
Lathes, all sizes.  
Milling machines, plain and universal (except hand millers).  
Planers.  
Radial drilling machines.  
Slotters.  
Vertical boring mills, all sizes.  
Machines as follows:  
Boring, horizontal and vertical.  
Milling, plain and universal (except hand millers).  
Drilling, radial.  
Micrometers.  
Presses, hydraulic.  
Pyrometers, equipment and thermocouples.  
Tachometers.  
Tools, as follows:  
Callipers, drill chucks, drills, files, abrasive (see Files), lathe chucks, micrometers, reamers, saw blades, circular, hack and band.  
Twist drills.  
Vertical boring machines.  
Vertical boring mills, all sizes.  
Alloy steel.  
Bars, iron and steel.  
Bars, iron and steel (including flats 6 in. wide and narrower).

Cable (iron and steel consisting of 6 wires or more).  
Casing, oil well (frequently described as "boring tubes").  
Cast-iron pipe.  
Fabricated structural steel, iron and steel, including angles, channels, beams, tees and zees, and plates  $\frac{1}{4}$  in. thick and heavier, punched or shaped, including tanks made of plates  $\frac{1}{4}$  in. thick and heavier.  
Boiler tubes.  
Sheets less than  $\frac{1}{4}$  in. thick.  
Tool steel.  
Wire.  
Formic acid.  
Hydrochloric acid.  
Muriatic acid.  
Chemical compounds of manganese.  
Chemical compounds of tungsten.

### American Farm Tractor Demonstrated in Uruguay

WASHINGTON, Dec. 3—A trial exhibition of an American tractor at Montevideo, Uruguay, reported by the American consul there as taking place early in October, attracted considerable attention in interested circles. The exhibition consisted in plowing to a depth of 4.7 and 7 in. and at a speed of from 2.5 to 3.1 m.p.h., harrowing and free running. It is estimated that the tractor can plow 10 acres in an 8-hr. day with a consumption of 5.8 gals. of kerosene per 2.471 acres. The make of tractor was not named in the report, which stated that it was offered for sale completely equipped in Uruguay for \$1,447.

### N. A. C. C. Confers with Dealers on Shows

NEW YORK, Dec. 5—At yesterday's meeting of the directors of National Automobile Chamber of Commerce a committee was appointed composed of C. C. Hanch, J. Walter Drake and S. A. Miles to confer with the representatives of the New York and Chicago automobile trade associations in connection with the local automobile shows which the dealers propose to hold in those cities early in 1919. Henry Paulman and G. M. Allison attended for the Chicago Automobile Trade Association, and Chas. H. Larsen, R. J. Gilmore and Chas. H. Stewart for the New York Dealers' Association. Announcement of the result of their deliberations is promised within two or three days.

### President Exonerates Vincent of Improper Intentions

WASHINGTON, Dec. 4Lt. Col. Jesse C. Vincent, one of the designers of the Liberty airplane engine and formerly vice-president of the Packard Motor Car Co. and George W. Mixter, both army officers named by Charles E. Hughes in his report on the aircraft investigation as having violated a code, have been found completely innocent of any intentional wrong doing by Attorney General Gregory, and his recommendation that they be pardoned has been acted upon by President Wilson, according to an announcement from the White House last night. Col. Vincent, it was said by Attorney General Gregory, "rendered invaluable service in designing and perfecting the Liberty engine." He acted in entire good faith and took no advantage of the Government, said Mr. Gregory.

## An Aerial Weather Forecast

### Bureau Issues First Report of Conditions in Co-operation with Mail Service

WASHINGTON, Dec. 3—The first aerial weather forecast to be issued in the history of the United States was made public last night by the Weather Bureau, in co-operation with the aerial mail service of the Post Office Department. The forecast marks a new phase of aviation. It is as follows:

"New York to Cleveland. Cloudy 8 p. m. Snow near Lake Erie. Winds moderate northwest to north-northwest east of the Alleghenies up to 6500 ft. and moderate south winds west of Alleghenies shifting to west-southwest at about 1500 ft. Forecast: Snow Monday, with increasing northeast to north winds up to about 6000 ft., backing to strong northwest above.

This forecast was wired to the Aerial Mail Field, Woodland Hills Park, Cleveland, and the intention is to extend the service as aerial mail routes are lengthened.

"The forecast," said Otto Praeger, Second Assistant Postmaster General in charge of aerial mail, "enables the department to lay its plans on a scientific basis and assures a greater degree of success than would otherwise be possible. The Weather Bureau undertook this new research on its own initiative. Dr. Charles F. Marvin, chief of the Weather Bureau, and a member of the National Advisory Committee for Aeronautics, saw while the war was on that it would be impossible to develop the airplane commercially in time of peace without meteorological guidance so as to overcome adverse conditions on long-distance flights. This forecast is the result."

### Plans Extension of Service

The Postoffice Department is rapidly completing its plans for an extension of the service so that on December 15 daily airplane mails will be run between New York and Chicago. Experiences demonstrates that this service can be operated with greater economy as the lines are extended, and so the department is able to announce, for the New York-Chicago service, a reduction in the rate of postage from 16 cents an ounce or fraction thereof to 6 cents. This applies to sealed parcels, not exceeding 30 inches in length and girth combined, as well as the letters. The old rate of 16 cents on the first ounce allowed 10 cents for special delivery service. Under the new rate it is left optional to the sender of a letter whether he desires to place a special delivery stamp on his aeroplane mail. This places the aeroplane rate on the same basis as all other letter mail.

On the New York-Chicago route all mail stops are made in ample time to catch the regular carrier delivery, insuring the delivery of the letter that day, and making it unnecessary to apply special delivery unless the sender desires immediate expedition of the letter upon its arrival in the city of address. Faster machines, beginning December 15, will also be placed on the New York-Washington route, insuring arrival of the mail for the regular carrier delivery in Washington and New York on the day of arrival.

Special aeroplane postage stamps or ordinary postage stamps may be used. When ordinary postage stamps are used the mail should be endorsed "By Aeroplane." If special delivery service is desired, a special delivery stamp or its equivalent in ordinary postage stamps must be placed on the mail in addition to the 6 cents air postage. If ordinary postage stamps are used in place of the special delivery stamp, the mail should be endorsed "Special Delivery."

# Government Should Let Business Set Reconstruction Pace

(Continued from page 974)

tary duties. Schwab came out flatly in favor of labor organization but with the proviso that such organization should be local to a given plant with the control of the body vested in local hands rather than in the hands of some national body which knows little of actual conditions probably thousands of miles from national headquarters.

## No Room for Pessimist To-day

There is not even standing room for the pessimist in American business to-day, said David L. Ludlum, in opening the meeting of the automobile group, and his statement was very ably backed up by George M. Graham, president of the Pierce-Arrow Motor Car Co., who stated that business faces a period of unprecedented prosperity.

With the practical dislocation of foreign trade Mr. Graham pointed out that dealers in the United States are given an unparalleled opportunity. Hand in hand with the opportunity of the dealer go the prosperity of the maker and the contentment of labor. Upon the ability of the dealer to distribute the product depends the ability of the maker to keep his plant busy and thus to keep his workers fully employed.

During 1917 there was a total of 1,718,000 vehicles marketed in the United States. The possible market in 1918 was 2,000,000 vehicles. Against these figures the actual conditions reveal that during the present year manufacturers of passenger cars and motor trucks have sold only 50 per cent of their market, and during this time they have been operating against the additional handicap of attempting to convert their business to 100 per cent war work.

With relation to cancellation of Government contracts, Graham deplored the excessively rapid action of the Government and stated that there was little that could be done now to alleviate conditions which might not have come to pass had the Government heeded the suggestions which it sought from the industry, but which it subsequently discarded. When the matter of contract cancellation first came up the automobile industry was requested to consult with Government authorities and to offer such recommendations as in its opinion would operate to the best advantage of all concerned. Motor vehicle makers, in approaching this problem, made only one request of the Government. That was that the Government adjust cancellations with this one thought in mind—"in what period of time can manufacturers turn from a war basis to a peace basis without creating conditions of unwarranted unemployment."

## Industry Will Readjust Itself

It is Graham's opinion that the automobile industry can and will readjust itself to a peace production basis without outside assistance. Despite disrupted manufacturing conditions, and

with sales organizations in many cases completely torn down, the sentiment still prevails in the industry that some of the manufacturers will get out. In consequence it is believed that the best policy will be to urge that the industry be left severely alone to follow its own problem.

It is believed that the 30,000 motor vehicle dealers of the country have sufficient enterprise, courage and zeal to put the industry back in its proper place in the sun.

"Motor car and motor truck dealers must by merchandising and salesmanship replace the domestic business that has been taken by war business," said Graham.

## Does Not Anticipate Disruption of Market

Graham offered as his opinion that there will be no disruption of domestic markets through the sale in the United States of trucks now owned and operated by the Government in France and England. It is not regarded as likely that the governments of our allies or that of the United States will permit trucks at present in use on the other side of the sea ever to come back to America. At present they are desperately needed for the transportation of food. With winter coming on, when railroads are demoralized and the waterways frozen solid and rendered useless, it is estimated that thousands of persons would literally starve to death for the lack of transportation facilities alone.

It is the belief, said Graham, that the trucks at present in use abroad will be held there. Trucks owned and operated by the Government in the United States will in all probability continue to be so owned and operated. It is likely that many thousands of army vehicles will be used for a long time at the various cantonments, that hundreds will be turned over to the postal authorities for the use of the post office, and there is a possibility that the railroads may be induced to take up the use of motor trucks as a means to relieve the rail carriers of short haul work.

## Against Restrictive Measures

Graham is uncontrovertibly against restrictive measures of any and all natures. He believes that the motor car industry must have a fair chance under normal competitive conditions to work out its own conservations and that the industry should not be controlled except by itself.

With regard to our merchant marine, the committee adopted a resolution which if put in force would go far to eliminate the possibility of a glutted market. It is urged that regardless of who may operate a merchant marine, makers, who have materials and unfinished products for which the Government has no use, be given the first opportunity to sell such products abroad through the medium of shipping provided by an American mercantile fleet.

The oil industry went on record to-night as against federal roadbuilding but favoring the construction and maintenance of highways under local supervision and by local and state taxation. This was something of a surprise, as most of the other 300 industries officially represented at Atlantic City have or will urge a strong federal roadbuilding program under a special cabinet officer.

The action was taken in the form of a resolution adopted by the group meeting of the oil and oil products group under the chairmanship of A. C. Bedford, chairman of the Standard Oil Co. of New Jersey. The resolution opposed the building of highways by the federal government until the constitution is changed giving more power to the highways commission and urging that for the present, highways be built and the roads to be improved be selected by the localities involved.

Other resolutions urged the National Petroleum War Service Committee to form a national association of the petroleum industry, and indorsed the attitude of the American government in protesting against any confiscation of American property in Mexico.

The surprising highway resolution followed a talk by Van H. Manning, of the Bureau of Mines, who, in telling of the possibilities of fuel conservation in the future and in pointing out ways in which the oil industry could improve its methods, stated that from 50 to 75 per cent of all the oil in the ground fails to reach the surface, being lost in the sands, etc. Another field of research which was pointed out as looking to a more complete use of the crude supplies is in the improvement in cracking oils to get their lighter constituents.

## Development of Oil Shales

Director Manning also pointed out the need of developing the enormous reserves of oil in the oil shales, but warned that such work was not one which could be engaged in without large capital or with the expectation of immediate dividends.

For years, he said, the United States has supplied two-thirds of the world's supply of petroleum. If transportation and other facilities were as good in other countries, among them Mexico, South America, and India, the world's output could be greatly increased. The American oil industry, he urged, must play a part in developing these foreign fields. He told the oil men that their industry had nothing to conceal and urged them to take the public into their confidence.

He complimented the oil industry for its part in the winning of the war and stated his pride in the American citizen for the way in which the public responded to the gasless Sunday request and other conservation measures. So valuable was this, he said, that a famous British admiral remarked: "We floated to victory on oil."



## Fordson Tractor Men Meet at Dearborn

### State Distributors Discuss Plans and Fix Trade Policies for Coming Year

DETROIT, Nov. 30—The State and district distributors of the Fordson tractor have been summoned to Dearborn, Mich., for a conference on Dec. 5 and 6. This summons automatically called off the meeting of the distributors, which had been set for Chicago on Dec. 2, 3 and 4.

The purpose of the conference is to discuss plans for the coming year, to fix the trade policies which Henry Ford & Son desire to see put into effect in handling the Fordson business during 1919, and to discuss such other matters as may affect the distributors as a body. Among other important matters which will come up for discussion is the discount which shall be given the Fordson dealer. On a percentage basis this now is just a little more than 11 per cent, a rate of commission which many of the dealers contend is too low when the cost of necessary service is taken into consideration. Some of the distributors will strive to have the commission raised so that it shall be at least on a parity with that given on Ford cars.

The summons to come to Dearborn for a conference on practically the same date the distributors' association had set for the Chicago meeting lends strength to the belief that Henry Ford is not entirely in accord with the purposes of the association. There are men in the association who chafe under dictation and who are disposed to assert a degree of independence of action which it is said does not altogether please Mr. Ford. It is intimated that at the Dearborn meeting the rights of the distributors to conduct their business in their own way and free from dictation from Dearborn may be threshed out.

#### Roadway Legislation Planned

WASHINGTON, Nov. 29—Indications point to the presentation of a number of bills before Congress for the establishment of highways throughout the country, and it is expected that this will be one of the important subjects at the next session. The immense value of the motor truck for rural express, postal service and as an auxiliary to railroads, the importance of highways for the development of food production, and the general increased value through education, and transportation accomplished by highways have been recognized by practically all the Government officials here in statements made at various times.

Secretary Houston of the Department of Agriculture stated this week that reconstruction plans must include highway construction under the federal aid road act. The public highways, he said, will be a vital factor, and construction should be started as soon as possible. Road

building he considers a worthy project for employment of the surplus labor supply expected to result from demobilization of the Army.

Under the federal aid road act federal and state funds appropriated for road building and not expended because of the stoppage of construction by the war will amount this year to about \$75,000,000.

#### Tractor Ousts Horse in Canada

TORONTO, ONT., Nov. 29—A census of the livestock of Ontario, figures of which are reported by the Grand Trunk Railway system, shows a decrease in the number of horses for 1918 over 1914 of from 774,000 to 733,000, due, says the report, to the influence of the tractor on farming. Tractor farming with government assistance has attained a great vogue in the province, and the uncertainty of the future demand for horses on account of growing use of the tractor has had a corresponding effect on the number of horses.

There has also been a noticeable decrease in the number of fowl, due to the fact that the care of fowls is mainly in the hands of women and children, who have been too busily engaged in the fields since 1915 to take care of poultry. The following table shows the number of heads of animals of various kinds and of poultry on Ontario farms in 1914 and 1918:

	1914	1918
Live stock		
Horses	774,000	733,000
Milch cows	1,006,000	1,102,000
Total cattle	2,604,000	2,812,000
Sheep	922,000	972,000
Hogs	1,770,000	1,656,000
Poultry	14,175,000	12,271,000

#### Baruch Resigns from War Industries Board

WASHINGTON, Dec. 2—Bernard M. Baruch has tendered his resignation as chairman of the War Industries Board, taking effect Jan. 1, and substantiating thereby the forecasts that all restrictions upon the peace time industries will be removed with the beginning of the new year. The activities of the War Industries Board have already been curtailed as rapidly as its releases with industries would permit. Further, all restrictions which were placed and were regarded necessary to complete the war program have been either removed or largely modified. The automobile industry is still held to a 75 per cent production basis, and motor truck makers must abide by the allotments for manufacture provided prior to Nov. 11 by the Automotive Section, War Industries Board, but both of these restrictions, it may safely be assumed, will be lifted by the end of this year.

#### Discover Fuel for Internal-Combustion Engine

WASHINGTON, Dec. 2—It is reported here that both the United States Navy Department and the National Advisory Committee for Aeronautics have discovered a fuel for internal combustion engines which is said to be superior to the new Liberty fuel, discovery of which was just announced.

## To Localize Contract Cancellations

### Adjustments to Be Made by District Boards—Two Appeals Are Possible

WASHINGTON, Nov. 30—A complete plan has been devised by the War Department for adjustment of war contracts, according to an announcement by Benedict Crowell, Assistant Secretary of War. After the War Department decides which contracts will be carried through or gradually tapered, and contractors are notified accordingly, the plan provides that the holder of a canceled war contract will make an inventory of the raw material on hand, work in process and finished articles ready for delivery, and any other items of cost with figures on the various elements of cost which enter into production, such as new buildings and machinery. This inventory will be checked by War Department accountants. The statements will then be presented to the district boards in the specific locality. District boards have been organized in all of the large cities that are centers of production.

A board to deal with ordnance contracts at each of these places will be presided over by the district ordnance chief, in every case a civilian and prominent business man in the community, and if possible a man connected with the prevailing industry of the locality. Another member of the board will be the regional advisor of the War Industries Board, and a third a man of legal training, the fourth a cost accountant, and fifth a highly experienced production expert. These boards, it is expected, will make just and prompt settlements on all claims.

Boards will also be established for the settlement of contracts for more standard articles of merchandise. These boards will operate along similar lines, and wherever a settlement can be reached between the contractor and board, recommendations arrived at will be forwarded to Washington to be finally approved and promptly paid in full.

Wherever there is a difference of opinion between the board and the contractor a statement can be made to the Claim Boards in this line of work in Washington which will consider the data presented and endeavor to reach a settlement with the contractor. Failing in this the matter will be taken up with the Board of Contract Adjustment of the War Department, which assists the Secretary of War and is the final tribunal in such cases.

If the contractor is still dissatisfied with the decisions he can appeal to the Court of Claims.

"The War Department," stated Mr. Crowell, "recognizes that it is highly important to make provisions for cases where contractors have such a considerable part of their working capital tied up in expenditures for labor and other disbursements on unfinished work that without a speedy repayment to the

contractors of at least a part of this sum they cannot make that prompt return of the plants to commercial work essential to prevent a break in their continuous operation and employment of labor.

"In many such cases, while it is practicable to determine readily a minimum sum which will be within the figure of ultimate settlement, it will frequently be difficult to fix with exactness the ultimate sum without a delay which will lose to the Government and the country the advantage of speedy return of such plants to commercial work.

"Where this situation exists and to meet it, it will be the policy of the Department to stand ready to enter into supplementary contract with such contractors by which a sum not to exceed 75 per cent of the amount which it is certain will ultimately be paid by the Government on the agreed basis of adjustment will be paid immediately to the contractor upon his consent to a termination of the original contract and a release to the Government of its obligations thereunder, the Department agreeing to pay subsequently such additional sum as it may determine will complete payment to the contractor on the agreed basis of adjustment.

"The machinery outlined above will be availed of in arriving at the terms of final settlement.

"This plan will make it practicable for contractors to secure almost immediately a very substantial part of their working capital for use in switching back to commercial work, even where the circumstances are such that the final determination of the compensation to be paid cannot be so speedily arrived at."

#### Attorney General Examining Contract Legality

WASHINGTON, Dec. 2—Attorney General Gregory will file an opinion shortly with regard to the legality of contracts which have not been legally executed—for example, those given and accepted verbally or by telegram. Congress may be asked to straighten out the tangle by adopting legislation to legalize such contracts. This problem was created by the stand taken by Controller Warwick of the Treasury, who maintains that where contracts were made by telegraph or telephone and not formally signed no contracts exist because they were not legally executed.

#### Fifth Avenue Bus Earnings

NEW YORK, Dec. 3—In its annual report, the Fifth Avenue Coach Co. shows total revenue of \$2,654,457 for the year ending July 30, 1918. This is an increase of \$410,640 over the preceding year. Net income amounts to \$399,147 after deduction of expenses and taxes, and the surplus for the year is \$191,794.

#### Willys-Overland Declares Quarterly Dividend

NEW YORK, Dec. 3—The Willys-Overland Co., Toledo, Ohio, has declared a regular quarterly dividend of 1% per cent on its preferred stock. The dividend is payable Jan. 1, 1919, to stock of record Dec. 20.

## Record Earnings for U. S. Rubber

### Shows \$21.64 Per Share for First Six Months of 1918—Assets Triple Liabilities

NEW YORK CITY, Nov. 30—The United States Rubber Co. established record earnings during the 6 months ended June 30, 1918, when it earned \$21.64 a share on outstanding common stock amounting to \$36,000,000. The extraordinary record which has been made is indicated by the fact that during the entire year of 1917 the company earned only at the rate of \$28.77 per share.

At the present time current assets exceed current liabilities by three and one-half to one, despite the fact that the company has charged off nearly half a million dollars more for war taxes during the first 6 months of the year than it did for the full year of 1917.

The following is the consolidated balance sheet of the company and its subsidiary:

ASSETS			
	June 30, '18	Dec. 31, '17	Dec. 31, '16
Plants, etc.	\$132,322,696	\$128,105,826	\$130,187,629
Inventory	76,760,203	72,440,170	48,530,398
Cash	11,116,050	9,463,833	10,123,709
Notes rec.	1,422,530	2,056,906	1,764,000
Accts. rec.	41,692,422	36,313,607	26,052,707
Securities	10,537,140	7,937,921	3,481,655
Sinking fd. cash			509,852
D'd assets	2,292,041	1,257,518	1,716,620
Total	\$276,143,082	\$257,575,781	\$222,366,569
LIABILITIES			
1st pfd. stk.	\$61,722,200	\$61,722,200	\$60,773,600
2d pfd. stk.	403,600	403,600	403,600
Com. stk.	36,000,000	36,000,000	36,000,000
Sub. co. stk.	320,655	320,655	1,376,980
Bonds	71,600,000	71,600,000	36,807,000
Accts. pay.	7,892,257	8,548,084	6,526,168
Gen. res.	10,746,409		
Dfts. pay.		1,877,676	1,891,093
Accrued tax, etc.	5,815,597	5,249,718	801,527
Accept cr. rub. imp.	2,191,720		
Notes and ins. pay.	21,249,995	19,430,955	26,703,866
Misc. res.	1,865,867	4,874,021	1,300,329
Dep. res.*	8,741,753	7,707,891	5,000,000
Div. res.	1,240,498	1,240,498	1,223,040
Sub. co. surd.	6,709,275	6,709,275	15,080,231
Surplus	39,643,256	31,891,207	28,479,135
Total	\$276,143,082	\$257,575,781	\$222,366,569

\*These reserves have been set up to provide against shrinkage in inventories that may arise from post-war conditions, and possible increase in taxes if basis of taxation should be changed by a new revenue law—provision for taxes having only been otherwise made on same basis as called for by existing tax laws.

#### Export Conservation to Be Shortened

WASHINGTON, Nov. 29—There will be a reduction in the items listed on the export conservation list shortly, according to announcement by the War Trade Board. Whether automotive products will be included in those items removed from the list and thereby allowed free export or not has not yet been decided by the board, which will make a definite announcement in the very near future.

Further modifications of rubber import restrictions announced to-day allow the

importation from overseas of not to exceed 900 tons of utta-siak in addition to the 740 tons heretofore approved.

Under a new export ruling steel can be shipped abroad to any destination without application for priority certificates from the War Industries Board.

Importers are requested in a new ruling to certify on their invoices where the goods were manufactured, or where they were purchased or contracted to be purchased for export to the United States, or where they were assembled for shipment to the United States.

#### Buyer from South Africa Here

NEW YORK, Dec. 3—L. H. Shapiro, representing S. Smith & Sons, Ltd., and H. W. Allkin & Co., Ltd., of Port Elizabeth, South Africa, is making a tour of the U. S. for the purpose of getting in touch with manufacturers of automotive products. He is especially anxious to hear from makers of accessories and parts for Ford and other cars, and can be communicated with at the National Bank of South Africa, 10 Wall Street, New York.

#### Studebaker Note Issue Coming

NEW YORK, Dec. 2—The Studebaker Corp. is considering additional financing which, according to President A. R. Erskine, probably will take the form of a new issue of notes. The purpose is to pay off a considerable amount of floating indebtedness and provide funds for other essential purposes. It is stated that there will be no new issue of preferred stock.

#### Chandler in Strong Position

CLEVELAND, Nov. 29—It is reported that the passenger car production of the Chandler Motor Car Co. for the present year is between 9000 and 10,000 as compared with a production of 15,000 cars in 1917. In addition about 1000 tractors have been built for government. Earnings are expected to be in excess of \$1,400,000 after deduction for taxes.

#### Prices Fixed on Hides Expire

WASHINGTON, Nov. 30—The maximum prices fixed by the War Industries Board on foreign hides and skins to cover shipments or take off during November and December, 1918, will expire automatically by limitation and will not be continued. Any foreign hides or skins sold on or after Jan. 1, 1919, ordered in this country, foreign countries or in transit, will not be governed by maximum prices.

#### Foreign Agency Desired

WASHINGTON, Nov. 29—The Bureau of Foreign and Domestic Commerce, Department of Commerce, has an inquiry from Switzerland desiring an agency for the sale of automobiles and agricultural implements. Further information can be secured by applying to the bureau and mentioning "Opportunity No. 27724."

WASHINGTON, Nov. 30—Detailed figures supplied by the Bureau of Foreign and Domestic Commerce show that for the year ending June 30 the total number of automobiles and motor trucks exported, not including cars and trucks shipped abroad for use of the American Expeditionary Forces, was less than in the fiscal years ending June 30, 1916 and 1917, but materially greater than in 1915 or any preceding year.

The record for the last six years is as follows:

Fiscal Year	Passenger Cars		Commercial Cars	
	No.	Value	No.	Value
1913.....	24,293	\$24,275,793	993	\$ 1,737,141
1914.....	25,306	25,392,963	784	1,181,611
1915.....	23,880	21,113,953	13,996	39,140,682
1916.....	56,234	40,660,263	21,269	56,305,548
1917.....	64,808	48,612,632	15,977	42,343,502
1918.....	52,312	45,331,366	12,200	31,874,459

# EXPORTS OF CARS AND TRUCKS FROM THE UNITED STATES FOR THE FISCAL YEAR ENDED JUNE 30, 1918.

Countries	Passenger Cars		Commercial Cars	
	Number	Value	Number	Value
Denmark.....	2	\$ 4,100	2	\$ 3,300
France.....	1,169	1,518,858	2,754	10,001,636
Gibraltar.....	.....	.....	27	58,325
Greece.....	4	6,580	14	32,000
Iceland and Faroe Is.....	15	11,396	1	2,245
Italy.....	129	78,228	52	23,055
Norway.....	97	115,810	40	133,227
Portugal.....	223	270,987	12	36,914
Russia in Europe.....	492	1,136,400	406	1,562,303
Spain.....	1,205	1,346,826	46	97,910
Sweden.....	95	111,377	7	10,360
Switzerland.....	3	1,533	.....	.....
England.....	742	1,712,672	4,805	13,438,981
Scotland.....	150	217,000	447	1,203,328
British Honduras.....	8	6,858	2	3,700
Canada.....	12,985	10,189,865	1,108	1,381,542
Costa Rica.....	199	85,070	5	10,245
Guatemala.....	34	46,657	3	5,512
Honduras.....	16	12,292	6	3,373
Nicaragua.....	49	32,031	1	2,509
Panama.....	129	93,329	47	47,859
Salvador.....	54	68,297	4	14,811
Mexico.....	2,578	1,653,545	365	525,664
Newfoundland and Labrador.....	27	34,676	2	7,250
Barbados.....	58	33,198	2	3,400
Jamaica.....	236	149,673	10	6,775
Trinidad and Tobago.....	161	100,571	14	.....
Other British West Indies.....	80	50,009	28	89,914
Cuba.....	2,846	3,029,813	554	1,130,982
Danish West Indies.....	152	12,313	2	2,845
Dutch West Indies.....	12	7,435	.....	.....
French West Indies.....	248	146,698	26	49,626
Haiti.....	102	54,613	11	10,578
Dominican Republic.....	248	157,607	21	13,323
Argentina.....	3,525	2,666,898	51	50,124
Bolivia.....	152	105,408	14	24,958
Brazil.....	1,575	1,000,011	24	31,133
Chile.....	3,399	3,576,511	220	282,638
Colombia.....	164	121,422	3	7,100
Ecuador.....	142	130,086	3	6,876
British Guiana.....	180	100,546	7	5,100
Dutch Guiana.....	16	17,775	.....	.....
French Guiana.....	8	3,632	.....	.....
Paraguay.....	13	5,025	.....	.....
Peru.....	784	913,669	73	155,834
Uruguay.....	2,232	1,177,463	16	15,809
Venezuela.....	160	97,485	16	12,410
Aden.....	8	6,879	.....	.....
China.....	833	818,669	23	26,236
British China.....	6	3,000	.....	.....
French China.....	2	2,017	.....	.....
Japanese China.....	10	7,321	.....	.....
Chosen.....	2	1,300	2	1,629
British India.....	73	53,428	11	20,275
Straits Settlements.....	287	202,221	70	113,554
Other British East India.....	11	17,740	3	7,138
Dutch East Indies.....	1,272	1,302,800	68	162,749
French East Indies.....	18	21,175	2	3,500
Hongkong.....	117	91,228	8	5,371
Japan.....	2,139	2,040,897	279	317,787
Persia.....	2	1,048	4	2,712
Russia in Asia.....	5	8,425	.....	.....
Siam.....	65	60,220	6	4,535
Australia.....	4,307	3,410,557	109	163,405
New Zealand.....	1,818	1,453,311	74	145,764
Other British Oceania.....	30	20,863	2	2,404
French Oceania.....	12	7,612	5	6,480
German Oceania.....	12	11,029	4	5,518
Philippine Islands.....	1,714	1,373,204	163	215,106
British West Africa.....	202	115,772	27	20,136
British South Africa.....	2,142	1,706,136	70	107,085
British East Africa.....	112	75,778	1	787
Canary Islands.....	15	5,378	.....	.....
French Africa.....	121	50,550	18	12,963
Liberia.....	12	4,220	.....	.....
Madagascar.....	2	1,659	.....	.....
Morocco.....	35	17,718	.....	.....
Portuguese Africa.....	9	9,673	.....	.....
Egypt.....	21	17,300	.....	.....
	52,312	\$45,331,366	12,200	\$31,874,459

## Six Years' Exports of Cars and Trucks

Shipments Aggregated 52,312  
Passenger Cars and 12,200  
Trucks, Valued at \$77,-  
205,825

The total valuation of passenger and commercial car exports during the last fiscal year, despite war conditions, was \$77,205,825, compared with \$90,956,134 in the 12 months ended June 30, 1917; \$97,465,811 in 1916; \$60,254,635 in 1915, and \$26,574,574 in 1914, the last pre-war year.

In addition, there were shipped to our non-contiguous territories: Alaska, 96 automobiles, valued at \$86,771; Hawaii, 1554, value \$1,507,498, and Porto Rico, 1106, value \$1,146,533 (class of cars not stated).

### Fuel Restriction May Soon Be Abolished

WASHINGTON, Nov. 30—The likelihood of modification of the fuel restrictions upon the automobile industry by the Fuel Administration is forecast by action taken by the Administration to-day in releasing several other industries from their curtailment programs. The florist, glassware and cement industries have been allowed to secure 100 per cent coal.

Plans now are for the abolition of the Fuel Administration by Jan. 1, 1919. Arrangements are being made with the Bureau of Mines and the Department of Interior generally to take over the various Fuel Administration departments. The Bureau of Mines will probably take over the oil and coal divisions, the Geological Survey and the Statistical Department.

### Canadian Tractor Men Support Duty on Imports

NEW YORK, Dec. 2—Canadian manufacturers of farm implements and tractors have entered the lists with the Consolidated Grain Growers over the importation of American tractors into Canada duty free. They claim that this practice is having a deleterious effect on Canadian industry and should be stopped. The Grain Growers, on the other hand, insist that the Canadian industry is not adequate to care for the tractor demand of the Dominion and that cheap tractors should be permitted to enter without duty.

Early in 1918 the Canadian Government eliminated the duty on farm tractors costing less than \$1,400. This was done as a war measure and to encourage food production. Larger tractors have never been found suitable for use in Canada.

In consequence of the elimination of the duty four times the number \$3,259,670 were imported into Canada in 1917 as in the previous year. During 1917, 2792 American tractors valued at \$3,259,670 were imported into Canada. During the period between Feb. 7 and Oct. 31, 1918, a total of 8684 tractors valued at \$7,993,916 was imported.

The normal import duty on farm tractors is 20 per cent plus a special war tax of 7½ per cent. Farm implement manufacturers would like to see this tax applied as before the special exception was made. They contend that this duty is necessary to protect Canadian industry.



**Hovey Made Eclipse Vice-President**

BELOIT, WIS., Nov. 29—W. S. Hovey, for 5 years general manager of the Eclipse works of the Fairbanks-Morse Mfg. Co. at Beloit, Wis., has been elected vice-president in charge of all manufacturing of the organization. Mr. Hovey has moved his headquarters from Beloit to the general offices in Chicago, from which he will direct the plants at Beloit, Baltimore, Three Rivers, Mich., and Indianapolis.

**Major Segrave Returns to England**

WASHINGTON, Nov. 27—The British Aviation Mission has closed its offices preparatory to returning to England, and included with those who are relinquishing their duties in this country is Major H. O. D. Segrave, who has been the direct point of contact between the British Aviation Mission forces and the American Division of Military Aeronautics. In addition, Major Segrave has performed the important work of enlightening the American public through the press of the accomplishments of the British Air Forces. Prior to coming to this country Major Segrave served both with the active forces in France in the infantry and as a flier, and with executive divisions in England. The knowledge which the American public has of British air activities is due more to the information given out by Major Segrave than to any other agencies.

**Racine Rubber Secretary Dies**

RACINE, WIS., Nov. 30—Herbert C. Severance, secretary and general sales manager of the Racine Rubber Co. and a director of the Ajax Rubber Co., died recently at his home here. He was appointed general sales manager of the Racine Rubber Co. Nov. 1, 1913, and later elected secretary.

J. W. Powelson has been appointed works manager of the Pittsburgh plant of the Pittsburgh Model Engine Co. He was for a number of years production engineer of the Rochester Motors Co., Rochester.

**Chandler Declares Quarterly Dividend**

CLEVELAND, Dec. 2—The Chandler Motor Car Co. has declared a regular quarterly dividend of \$3 per share, payable Jan. 2, 1919, to stock of record Dec. 17.

**Ordnance Board of Claims Personnel Announced**

DETROIT, Dec. 4—The personnel of the Ordnance Board of Claims was announced yesterday as follows:

F. J. Robinson, chief of Ordnance District, chairman; C. E. Huyette, assistant chief; Major P. C. Thomas; Major C. W. Owston; C. C. Jenks, president of the Security Trust Co.; Captain J. G. Dalglish, secretary, and Captain C. A. Strand, chief of the investigating staff.

## Men of the Industry

*Changes in Personnel and  
Position*

**Willys-Overland Promotes Officials**

TOLEDO, Dec. 2—Edward H. Belden has been elected vice-president in charge of engineering, and Kelly R. Jacoby vice-president in charge of purchase of the Willys-Overland Co.

Richard A. Watson, secretary and production manager of the American Bronze Corp., Berwyn, Pa., has resigned his active duties with the company, but will continue as a member of the board of directors. He has resigned in order to carry on experimental work in connection with several patents in which he is interested. No successor has been appointed as yet.

**Lt. Col. Barrett Andrews Returns to Civil Life**

WASHINGTON, Dec. 2—Lt. Col. Barrett Andrews, head of the Training Section, Motor Transport Corps has received his discharge from the Army and will return to his civilian pursuits.

**Lt. Col. Uhler Resigns from M. T. Corps**

WASHINGTON, Dec. 2—Lt. Col. W. D. Uhler, head of the Convoy Service of the Motor Transport Corps has resigned and returned to his duties as Highways Commissioner of Pennsylvania.

**Frank Turner Is Buick Comptroller**

DETROIT, Dec. 4—President Walter P. Chrysler, of the Buick Motor Co., Flint, announces the appointment of Frank Turner, of Wilmington, Del., formerly comptroller of the DuPont company, as comptroller of the Buick company, to succeed L. M. Ohland. Mr. Ohland will later assume an important executive position with the General Motors Corp. in New York. E. W. Procter, also of the DuPont company, will succeed J. M. Ryan as assistant treasurer of the Buick company, Ryan having resigned. Both these appointments are effective Dec. 1.

**Wadhams Oil Co. Gives Insurance**

MILWAUKEE, WIS., Dec. 2—The Wadhams Oil Co., 359 Clinton Street, Milwaukee, one of the largest independent refiners and distributors of petroleum products in the Northwest, has presented each of its 150 direct employees with a free life insurance policy under the group insurance plan. The policies are fully paid by the company and range from \$500 to \$2,000, according to the term of service of the insured employee.

**Brickbauer Heads Plymouth Motor**

PLYMOUTH, WIS., Nov. 29—The Plymouth Motor Mfg. Co., formerly the Steiner Mfg. Co., Plymouth, Wis., at its annual meeting elected the following officers: President, George W. Brickbauer; vice-president, Charles Steiner; secretary, Frank Schryer; treasurer, Gust. W. Schiereck; directors, George Gerhard, H. J. Goelzer and C. C. Arndt. The company manufactures gasoline and kerosene engines and motors, and orders now on the books indicate that the coming year will be one of the busiest in its existence.

**McConnel to Represent M. A. M. A.**

WASHINGTON, Nov. 29—R. M. McConnel, formerly connected with the Firestone Tire & Rubber Co. at the Detroit branch, has arrived here to represent the Motor and Accessories Manufacturers Association. Mr. McConnel will be the point of contact for the manufacturers in the association with the Government.

B. T. McDonald, Jr., has been appointed superintendent of the Moline Plow & Tractor Co., to succeed J. L. Irving, who becomes vice-president and general trade manager. Mr. McDonald was formerly with the Poughkeepsie and Stoughton branches and also founded the McDonald Pitless Scale Co., which was absorbed by the Moline company 8 years ago.

S. E. Cole has been appointed manager of the Omaha branch of the H. W. Johns-Manville Co. He succeeds Chas. F. Simms, deceased.

L. E. Schumacher, who for the past eight years has been chief inspector of the Westinghouse Electric & Manufacturing Co. at East Pittsburgh, Pa., has been promoted to works manager of the Krantz Manufacturing Co. of Brooklyn, N. Y., the latest subsidiary of the former company.

James A. Bennett has been appointed purchasing agent of the Connecticut Telephone & Electric Co. of Meriden, Conn. This appointment is in the nature of a promotion for Mr. Bennett, who for some time past has been connected with the sales department of this company.

**Puritan Gets American Ball**

DETROIT, MICH., Nov. 30—The Puritan Machine Co. has purchased from the American Ball Bearing Co., Cleveland, its entire service and repair parts business, including a complete stock of parts, tools, jigs, dies, blueprints, etc., covering all American axles manufactured prior to Jan. 1, 1918. The stock is being moved to the Detroit plant of the Puritan company.

**Gerlinger Electric Steel Starts**

MILWAUKEE, WIS., Nov. 29—The Gerlinger Steel Castings Co., Milwaukee, which expects to place in operation a large new electric steel foundry on Dec. 10 or 14, has formed a new corporation to control the new plant. This is known as the Gerlinger Electric Steel Foundry Co., and is capitalized at \$99,000. At the same time the original company has increased its capital stock from \$25,000 to \$75,000. The ownership of both corporations is virtually identical, the principal officers being George P., William E., Walter and Charles A. Gerlinger, all of them pioneer foundry operators of the Milwaukee district and among the first to employ the electric furnace process of manufacturing castings. The concern is widely known in the motor car, truck and tractor manufacturing industry.

**Pull-More Plant on Block**

NEW CASTLE, PA., Nov. 30—The plant and equipment of the Pull-More Motor Truck Co. is to be sold by the receiver on Friday, Dec. 27, at 2 p. m. Included is a brick building 100 by 500 and 20 acres of ground.

**International Steel Nearly Ready**

HARTFORD, WIS., Nov. 29—The International Steel Products Co., formerly of Milwaukee, hopes to be able to begin operations in its new \$40,000 works at Hartford, Wis., on Dec. 2. The company will specialize in the manufacture of mufflers or silencers for motor vehicles and gas engines and its initial capacity will be 1000 mufflers a day.

**Not to Take Ford Milwaukee Plant**

MILWAUKEE, Nov. 29—Official announcement that the Government had abandoned the project of converting the Milwaukee assembling plant of the Ford Motor Co. into a reconstruction hospital was received in Milwaukee on Saturday, Nov. 23, by owners of apartment buildings near the plant, which has been commandeered to serve as officers' barracks, nurses' homes and for similar purposes.

**Two New Allis-Chalmers Tractors**

MILWAUKEE, WIS., Nov. 29—The Allis-Chalmers Mfg. Co., Milwaukee, which for several years has manufactured farm tractors in a single standard model, known as a 10-18, has increased the line to embrace two new models. One is a 6-12, listing at \$790, and the other a four-wheeled type, rated 15-30.

**Standard Foundry Co. Erects Plant**

RACINE, WIS., Nov. 30—The Standard Foundry Co., Racine, Wis., a large gray iron casting plant, has awarded contracts for the erection of a \$50,000 foundry building, 80 x 200 ft. in size, and of brick and steel construction. It is to be ready to begin operations shortly after Feb. 1. Arthur G. Janes is president and general manager.

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged***Universal Motor Increases Capital**

OSHKOSH, WIS., Dec. 2—The Universal Motor Co., Oshkosh, Wis., manufacturer of direct-connected generating systems for isolated power and illumination requirements, has increased its capital stock from \$50,000 to \$100,000. The company has been filling large Government orders for mobile repairshop power units.

**Board of Review Contracts**

WASHINGTON, Nov. 30—The following contracts were placed by the Board of Review prior to the signing of the armistice and have just been announced: Mandeef Mfg. Co., Springfield, car hubs, \$8,800. McCord Mfg. Co., Detroit, radiators, \$7,020. McCord Mfg. Co., Detroit, radiators, \$7,687.50. Ford Motor Co., Detroit, Ford cars, \$235,887.50. Locomobile Co. of America, Bridgeport, chassis, \$2,232,230. Covert Gear Co., Lockport, clutches; seven clutches additional at \$0.8087 shall be delivered. United States Tire Co., New York, casings and tubes f.o.b. delivery point to be Detroit instead of New York. Dodge Bros., Detroit, Dodge cars; contractor may deliver Elsemann magneto G-4, \$18.50 or Simms magneto at \$12.50 when available. Cadillac Motor Car Co., Detroit, automobiles: change in specifications and price from \$3,309 to \$3,360; also \$7 for Klaxon horn and 50 cents switch key additional.

**Quartermaster Contracts**

WASHINGTON, Nov. 30—The following orders were placed by the Quartermaster Department on Nov. 1, prior to the armistice, and just announced:

Ford Motor Co., Detroit, motor parts, \$5,140.67. Chandler Radiator Co., Detroit, radiators, \$12,600. Pierce Oil Corp., New York, oil, \$1,478.40. Atlantic Refining Co., Philadelphia, gasoline, \$11,550. Indian Refining Co., New York, motor oil, \$572.90. Gulf Refining Co., Pittsburgh, gasoline, \$4,926. Gulf Refining Co., Pittsburgh, fuel oil, \$3,816. Atlantic Refining Co., Philadelphia, gasoline, \$5,577.

**Ordnance Contracts**

WASHINGTON, Nov. 30—The following contracts were placed by the Ordnance Department prior to the signing of the armistice and have just been announced:

Bljor Motor Appliance Co., Generator-starters, etc., \$120,466. Langstadt-Meyer Construction & Supply Co., gasoline, engine driven generator sets, \$40,590. Chatham Machine & Tool Works, tools and accessories for mobile repair shop, \$20,473.35. Hale & Kilburn Corp., dismounting, camouflaging art. rep. trucks, \$15,000. Dorris Motor Car Co., air pressure pumps for petrol tanks, \$57,000. Holt Mfg. Co., ex-work on caterpillar gun mounts, \$15,000.

**Prest-O-Lite Refill Station Damaged**

MILWAUKEE, Nov. 29—The Milwaukee filling or compressing plant of the Prest-O-Lite Co., Indianapolis, was almost totally wrecked by an explosion last week. One workman was killed and another fatally injured. The plant is located at Thirty-third Avenue and Mitchell Street, in West Milwaukee. The cause of the explosion is not yet known, but suspicion has been aroused by the finding of a loaded bomb in the vicinity. It is expected that the plant will be rebuilt at once.

**Cars Coming from Madison**

MADISON, WIS., Nov. 29—The Universal Products Co. of Madison, Wis., has been organized, with a capital stock of \$50,000, to engage in the manufacture and sale of motor cars, trucks, tractors, machinery and other equipment, and the installation of lighting and heating plants. The incorporators are John L. Newman, John L. Bourke and Ethel Lee, all of Madison.

**No Curtiss Plants to Close**

BUFFALO, Nov. 29—The Curtiss Aeroplane & Motor Corp. does not intend to close any of its plants, despite the cancellation of Government contracts. It was stated by an official of the company that the shops will be kept busy on aircraft for other than war use. The experimental field at Garden City, L. I., will be maintained.

**Syracuse Home for Lippard-Stewart**

BUFFALO, Nov. 29—The Lippard-Stewart Motor Car Co. has been completely reorganized with additional capital. The entire stock and equipment of the company is being moved from Buffalo to Syracuse, where the business will be carried on henceforth. Plans and specifications of new models will be made public shortly.

**More Room for Canadian Allis-Chalmers**

TORONTO, Nov. 29—The Canadian Allis-Chalmers Co. has had plans prepared for an addition to its gray iron foundry, to cost \$20,000. Work on the proposed addition will be started as soon as possible. Part of this plant will be used for tractor production.

**Ralston Iron Adds Trucks**

SAN FRANCISCO, Dec. 2—The Ralston Iron Works, which for the past 4 years has been manufacturing the Ralston truck unit, has added trailers and semi-trailers to its line as well as pole and lumber dollies and special trailer equipment. The company has taken over the Hewitt-Ludlow motor truck plant, now under construction, and is planning to increase the production of Hewitt-Ludlow 1½ to 5-ton trucks. Pratt & Williams, which has heretofore distributed Ralston products, hereafter will be exclusive distributor.

# AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>		<b>Peelers, combed, lb.</b> 1.05-1.20	
Muriatic, lb. ....	.02 -.03	Peelers, carded, lb. .95-1.05	
Phosphoric (85%)..	.35 -.39	<b>Fibre (¼ in. sheet</b>	
Sulphuric (60), lb..	.006	base), lb. ....	.50
<b>Aluminum:</b>		<b>Graphite:</b>	
Ingot, lb. ....	.33	Ceylon, lb. ....	.09 -.22
Sheets (18 gage or		Madagascar, lb. ....	.10 -.15
more), lb. ....	.42	Mexico, lb. ....	.03%
Antimony, lb. ....	13%-13%	Lead, lb. ....	.07%-08%
<b>Burlap:</b>		<b>Leather:</b>	
8 oz., yd.....	.17½-.17½	Hides, lb. ....	.18 -.35%
10½ oz., yd.....	.21½-.22	Nickel, lb. ....	.40
<b>Copper:</b>		<b>Oil:</b>	
Elec., lb. ....	.26	<b>Gasoline:</b>	
Lake, lb. ....	.26	Auto., gal. ....	.24½
<b>Fabric, Tire (17½ oz.):</b>		68 to 70 gal.....	.30½
Sea Is., combed, lb.	1.65-1.70	<b>Lard:</b>	
Egypt, combed, lb.	1.25-1.35	Prime City, gal...2.30-2.35	
Egypt, carded, lb.	1.20-1.30	Ex. No. 1, gal...1.62	

Linseed, gal. ....	1.63-1.65
Menhaden (Brown)	
gal. ....	1.42-1.43
Petroleum (crude),	
Kansas, bbl. ....	2.25
Pennsylvania, bbl.	4.00
<b>Rubber:</b>	
Ceylon:	
First latex pale	
crepe, lb. ....	.63
Brown, crepe, thin,	
clear, lb. ....	.60
Smoked, ribbed	
sheets, lb. ....	.61 1/2
<b>Para:</b>	
Up River, fine, lb.	.68

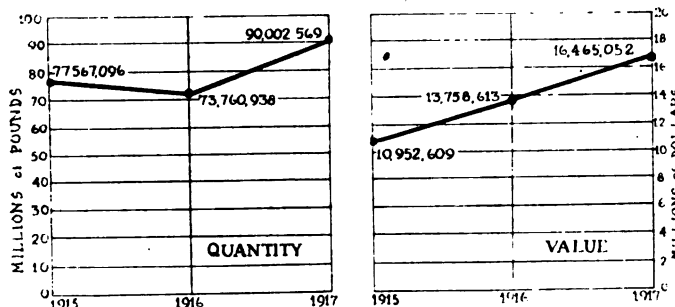
Up River, coarse,	
lb. ....	.40
Island, fine, lb. ....	.59
Shellac (orange), lb..	.70-.72
Spelter .....	.08 1/2-.08%
<b>Steel:</b>	
Angle beams and	
channels, lb. ....	.63
Automobile sheet	
(see sp. table).	
Cold rolled, lb. ....	.06 1/2
Hot rolled, lb. ....	.03 1/2
Tin .....	.71 -.72
Tungsten, lb. ....	2.45-2.50
Waste (cotton), lb. ....	.12%-17

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only per 100 lbs.	Primes when seconds up to 15 per cent are taken per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping .....	6.45	6.35
Hood, flat, fender, door and apron, or splash guard stock .....	6.05	5.95
Crown fender, cowl and radiator casing, extra deep stamping .....	6.55	6.45
Crown fender, cowl and radiator casing, deep stamping .....	6.30	6.20
<b>Automobile Sheet Extras for Extreme Widths:</b>		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
<b>Black Sheet extras to Apply to Narrow Widths:</b>		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Requaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the Invoice Pittsburgh price for corresponding primes.		

## Sheet Zinc Produced in 1917



1917 figures show the effort that has been made in the rolling mills to produce sheet zinc sufficient to meet the demand caused by the necessity of lining packing cases for shipment overseas

## Automotive Securities Quotations on the Chicago Exchange at Close Nov. 30

Bid	Asked	Bid	Asked	Bid	Asked
Auto Body Co. ....	7 10	Mitchell Motor Co. ....	30 35	Willys-Overland, com. ....	23 1/2 24 1/2
Briscoe Motor Car, com. ....	11 ..	Motor Products Corp. ....	38 ..	Willys-Overland, pfd .....	87 89
Briscoe Motor Car, pfd. ....	40 55	Nash Motors Co., com. ....	150 175		
Chandler Motor Car. ....	99 1/2 101 1/2	Nash Motors Co., pfd. ....	85 95	<b>Rubber Stocks</b>	
Chevrolet Motor Car. ....	144 146	National Motor Co. ....	9 12 1/2	Ajax Rubber Co. ....	61 63
Cole Motor Car Co. ....	90 105	Packard Motor Car, com. ....	115 125	Firestone T. & R., com. ....	125 132
Continental Motors, com. ....	8 1/2 9	Packard Motor Car, pfd. ....	92 95	Firestone T. & R., pfd. ....	99 101
Continental Motors, pfd. ....	92 96	Palge-Detroit Motor, com. ....	26 1/2 27 1/2	Fisk Rubber Co., com. ....	60 65
Edmunds & Jones, com. ....	18 ..	Palge-Detroit Motor, pfd. ....	8 1/2 9 1/2	Fisk Rubber, 1st pfd. ....	97 103
Edmunds & Jones, pfd. ....	75 90	Peerless Motor Truck. ....	15 17	Fisk Rubber, 2nd pfd. ....	79 83
Electric Storage Battery. ....	50 60	Pierce-Arrow Mot. Car, com. ....	41 1/2 42 1/2	Fisk Rubber, 1st pfd. conv. ....	90 97
Federal Motor Truck. ....	33 35	Pierce-Arrow Motor Car, pfd. ....	102 1/2 103 1/2	Goodrich, B. F., com. ....	52 53
Fisher Body Co., com. ....	36 40	Premier Motor Corp., com. ....	4 ..	Goodrich, B. F., pfd. ....	102 108
Fisher Body Co., pfd. ....	92 1/2 93	Premier Motor Corp., pfd. ....	75 ..	Goodyear, T. & R., com. ....	225 235
Ford Motor of Canada. ....	215 225	Prudden Wheel Company. ....	15 17 1/2	Goodyear, T. & R., 1st pfd. ....	102 103
General Motors, com. ....	125 1/2 126 1/2	Reo Motor Car Co. ....	21 22	Goodyear, T. & R., 2nd pfd. ....	101 102
General Motors, pfd. ....	81 1/2 83 1/2	Republic Motor Truck, com. ....	35 37	Kelly-Springfield, com. ....	56 58
Hupp Motor Car, com. ....	4 1/2 5	Republic Motor Truck, pfd. ....	88 92	Kelly-Springfield, pfd. ....	88 92
Hupp Motor Car, pfd. ....	81 85	Saxon Motor Car, com. ....	7 1/2 9 1/2	Lee Tire & Rubber Co. ....	20 21
Kelsey Wheel Co., com. ....	28 33	Scripps-Booth Corp. ....	21 25	Marathon Tire & Rubber Co. ....	55
Kelsey Wheel Co., pfd. ....	85 90	Stewart Warner Speed Corp. ....	74 76	Miller Rubber Co., com. ....	142 148
Manhattan Electric S., com. ....	48 ..	Stromberg Carburetor Co. ....	24 28	Miller Rubber Co., pfd. ....	96 98
Maxwell Motor, com. ....	27 28	Studebaker Corp., com. ....	49 50	Rubber Products Co. ....	101
Maxwell Motor, 1st pfd. ....	50 1/2 51 1/2	Studebaker Corp., pfd. ....	92 1/2 100	Portage Rubber Co., com. ....	145 149
Maxwell Motor, 2nd pfd. ....	19 1/2 20 1/2	Stutz Motor Car Co. ....	44 46	Swinehart, T. & R. Co. ....	50 60
McCord Mfg., com. ....	30 35	United Motors Corp. ....	32 34	U. S. Rubber Co., com. ....	62 64
McCord Mfg., pfd. ....	90 95	White Motor Co. ....	44 1/2 45 1/2	U. S. Rubber Co., pfd. ....	104 1/2 105 1/2

\*Ex Dividend.



### German Piracy of American Trademarks (Continued from page 967)

Congress, and to which considerable publicity has been given, appears now likely to be abandoned in favor of the adoption of the simple form of marking, consisting of the words "Made in U. S. A."

The national trademark proposition has been thrashed out from all angles by English commercial organizations and others over a period of years, and the final conclusion has been reached that a mark consisting of a device is likely to be detrimental rather than otherwise in the building up or reorganizing of foreign trade, and the probability is that nothing further will be done along these lines in England.

### Favor Country-of-Origin Mark

It seems now to be generally admitted that the use of a national trademark in the form of a device must of necessity detract from the value of the trader's own mark, and it is believed that the best protection can be secured by endeavoring to obtain the enactment of laws in the United States and abroad which would make it an offense to sell goods manufactured in other countries without carrying thereon a clear indication as to the country of origin. Dumping of goods on the American market without indicating the country in which such goods are made would thus be avoided, and the American manufacturer who desires to see the United States obtain its full share of foreign trade would be encouraged to turn out the best make of goods and thus add prestige to the mark "Made in U. S. A."

## New Loening Plane Breaks Record

### Travels 145 M.P.H. with Full Military Load, Including 4 Guns

WASHINGTON, Dec. 3.—Announcement of a new airplane—the Loening 2-seater monoplane—was made in Washington to-day, together with the information that the plane has developed 145 m.p.h. with a full military load, including 4 guns, which is in excess of any record made by a European single seater combat machine. The Loening plane in its tests also climbed to 25,000 ft. in remarkable time, which has not been made public, carrying 2 passengers and thereby establishing another new record.

The plane is American designed and American built. It is smaller than the DeHaviland-4 of course, and weighs only 2400 lb. loaded for the air, which is practically the weight of a single seater scout. It is driven by an 8-cylinder 300 hp. Hispano-Suiza. The whole power plant is a unit construction and can easily be removed from the body of the plane. There are several original ideas in the under strutting. The arrangement of the seats provides the pilot with 50 per cent more vision than any other combat machine produced prior to or during the war. The plane carries sufficient fuel for 3½ hr.

Grover Cleveland Loening, the designer and builder, is an American, an aero engineer with 8 years' experience, and the

author of several text books used in study by American flying cadets. He is connected with the Loening Aeronautical Corp., 45 West Eleventh Street, Long Island City, New York.

### Co-ordination of Legislative and Operative Functions in Labor

(Continued from page 959)

operating leaders and their subordinates and tending to decrease the operating efficiency.

The attitude of the worker in looking to his occupational labor organization for his advantage in legislative industrial matters tends to destroy any organization incentive which he may have and carries him from place to place upon any fancied grievance, tends to increase his desire to protect his occupation as a class, to enforce his attempt to control the conditions of his work, and makes in other ways for continued strife and industrial inefficiency.

There is no hope in the destruction of labor organizations, even if that were possible, because the present system of organizing the industrial unit has failed to satisfy the requirements in such important particulars that the destruction of the present labor organizations would necessitate a demand for political relief.

As a matter of fact, however, labor organizations are getting stronger, and unless some means are taken to provide proper machinery for the control of the legislative functions of the industrial unit, the outlook is one of increased conflict and increased political interference with industrial operations.

# Calendar

## ENGINEERING

### S. A. E. Meetings 1919

- Jan. 8—Minneapolis Section, S. A. E.—Hotel Radisson. "Governors for Tractors and Truck Engines."
- Jan. 12, 13, 14—New York. Winter Meeting, Society of Automotive Engineers, Engineering Societies' Building.
- Feb. 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Radiator Cooling Fans."
- March 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Tractor Service and Sales."
- April 2—Minneapolis Section, S. A. E.—Hotel Radisson. "Implements Designed for Tractor Belt Power and Their Characteristics."

## MOTOR SHOWS

- January—Detroit, Mich. Detroit Automobile Dealers' Assn. H. H. Shuart, Manager.
- January or February—Milwaukee, Wis. Milwaukee Auto Trade Assn. Bart J. Ruddle, Manager.
- Feb. 15-22—Louisville, Ky. Louisville Auto Dealers' Assn.

- Feb. 15-22—Newark, N. J. N. J. Auto Exhibition Co. Calude Holgate, Manager.
- Feb. 15-22—Minneapolis, Minn. Minneapolis Auto Trade Assn. Walter B. Wilmot, Manager.
- Feb. 17-22—Des Moines, Iowa. Tenth Annual, Des Moines Automobile Dealers' Assn. C. G. Van Vliet, Manager.
- Feb. 17-24—Passenger Cars; Feb. 24-27, Trucks—South Bethlehem, Pa. Lehigh Valley Auto Shows Co. J. L. Elliott, Manager.
- March 3-8—Buffalo, N. Y. Buffalo Automobile Dealers' Assn.
- March 1-10—San Francisco, Cal. Motor Car Dealers' Assn. G. A. Wahlgreen, Manager.
- March—Boston. Boston Automobile Dealers' Assn. Chester I. Campbell, Manager.
- Second or third week March—St. Louis, Mo. St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Manager.
- March 22-29, Passenger Cars; April 1-5, Trucks—Brooklyn. Brooklyn Motor Vehicle Dealers' Assn. I. C. Kirkham, Manager.
- Third week March—Trenton, N. J. Trenton Auto Trade Assn. John L. Brock, Manager.

Probably February—New York. Automobile Dealers' Assn. Charles A. Stewart, Manager.

Probably March—Chicago. Chicago Automobile Trade Assn.

March—Philadelphia. Philadelphia Automobile Auto Trade Assn. A. L. Maltby, Manager.

March—Pittsburgh. Automobile Dealers' Assn. of Pittsburgh. John J. Bell, Manager.

March—Syracuse, N. Y. Syracuse Automobile Dealers' Assn. Harry T. Gardner, Manager.

March—Utica, N. Y. Utica Motor Dealers' Assn. W. W. Garabrant, Manager.

Late March or early April—Cleveland, Ohio. Cleveland Auto Show Co. Fred H. Caley, Manager.

April 5-12—Montreal, Can. Automobile and Used Car Exposition. T. C. Kirby, Manager.

Not decided—Bridgeport, Conn. Auspices of City Battalion. B. B. Steiber, Manager.

Not decided—Harrisburg, Pa. Harrisburg Motor Dealers' Assn. J. Clyde Myton, Manager.

Not decided—Hartford, Conn. Hartford Automobile Dealers' Assn.

Not decided—Indianapolis. Ind. Indianapolis Auto Trade Assn. John B. Orman, Manager.

Not decided—Kansas City, Mo. Kansas City Motor Dealers' Assn. E. E. Peake, Manager.

## TRACTOR SHOWS

Feb. 10-15—Kansas City, Mo. Fourth Annual Tractor Show. Sweeney Building. Kansas City Tractor Club. Guy H. Hall, Sec.

Feb. 18-22—Wichita, Kan. Annual Mid-west Tractor and Thresher Show. Wichita Tractor and Thresher Club. Forum.

## CONVENTIONS

Dec. 16, 17, 18—Chicago. Convention, National Association of Automobile Accessory Jobbers. (Directors and Committees, Dec. 16; General Sessions, Dec. 17-18.)

Jan. 12-14—New York. Meeting, Society Automotive Engineers.

Feb. 25-28—New York. Sixteenth Annual Convention. American Road Builders' Assn.

# Official History of Aircraft Production

(Continued from page 969)

from the United States Government as soon as they had finished their foreign contracts.

"It was clearly apparent that the speediest and most satisfactory method of handling the engine situation would be to develop a distinctive American engine which would adapt itself to American methods of manufacture. Numerous experimental engines had been made by various companies, none of which were adapted to war requirements.

"The Hall-Scott Co., at Berkley, Cal., had for several years been manufacturing aviation equipment for use by foreign governments, chiefly in the Orient, and E. J. Hall, of that company, had traveled in Europe at about the beginning of the war and had inspected the engines made both by the Allies and by the Germans.

## Packard Developments

"The Packard Motor Car Co. had for approximately 2 years been working on the development of an aviation engine of the 200 hp. class. This engine had not been flown in a plane but had been successfully used in racing cars. It was, however, too heavy for war purposes, but represented the farthest advance in this country toward the development of an aviation engine. J. G. Vincent, chief of the engineering forces of the Packard company, had, by reason of this development and of his study of the subject, acquired a large understanding of aviation engines.

"Mr. Deeds, therefore, called Vincent and Hall into conference in Washington in May, 1917, and on May 29 these two men started the design of an American aviation engine to develop approximately 200 hp. with 8 cylinders and 300 hp. with 12 cylinders.

## Organized Staff of Draftsmen

"They organized a large force of draftsmen, and as rapidly as they completed drawings they were hurried to the Packard Motor Car Co. in Detroit, and in its tool room corresponding parts were made.

"This work was expedited so rapidly that on July 4, 1917, a complete 8-cylinder engine was delivered in Washington. It was set up at the Bureau of Standards and ran successfully. The development of the engine was pushed rapidly, both at the Bureau of Standards and at the Packard Motor Car Co. in Detroit, and the developmental work on 8 and 12-cylinder engines was hurried forward by a large corps of expert engineers and mechanics.

"In August, 1917, the production of aviation equipment was constituted in the Equipment Division of the Signal Corps, and the Engine Production Department was created as a portion of that division. On that date the writer was put in charge

of the Engine Production Department and the real work of producing engines was begun. Engines required fell naturally into three classes:

- "1. Elementary training.
- "2. Advance training.
- "3. Combat.

"As to the elementary training, there were available the following engines:

- "Curtiss OX, of approximately 90 hp.
- "A-7A, 4 cylinder engines of approximately 100 hp.
- "Hall-Scott.

## Orders Consummated Rapidly

"Orders were consummated for the production of these engines as promptly as possible.

"For advanced training, there were available the Gnome 110 hp., the LeRhône 80 hp., and the Hispano-Suiza 150 hp. The General Vehicle Co. proceeded with the production of the 110 hp. Gnome.

"The Union Switch & Signal Co. had been persuaded to take the contract for the production of the 2500 LeRhône engines, 80 hp. type. Their contract has been continued and the Union Switch & Signal Co. has delivered up to this date approximately 1200 of these engines. We have had the assistance of Georges Guilhot, the engineer of the French Gnome and LeRhône factories, who pronounces the engines built for the Union Switch and Signal Co. to be the best rotary engine ever constructed.

"We arranged with the Wright-Martin Co. to increase their facilities for the production of the 150 hp. Hispano type, and their work had such good results that in May, 1918, that company delivered 530 of these engines.

"As to combat engines, it was clear that the only one available for our manufacturing purposes would be the Liberty, and the test made of it in the months of July and August showed that it functioned properly, and was a satisfactory engine. We therefore started production of it.

## Contract for 27,000 Engines

"It was estimated that we would require 22,500 of these engines to take care of the requirements of our Navy and Army. We therefore made contracts as follows:

- "Packard Motor Car Co.....6000
- "Lincoln Motors Co.....6000
- "Ford Motor Co.....5000
- "Nordyke & Marmon.....3000
- "General Motors Corp. (Buick-Cadillac) .....2000
- "Trego Motors Corp..... 500

"The first of these contracts was signed in August, 1917, and production work started immediately.

"Difficulties attending production in general grouped themselves as follows:

(a) Machinery—none of the existing motor plants had machinery of sufficient

sizes to handle the parts of the Liberty engines.

"(b) Small tools, fixtures and equipment—To produce every part of the Liberty engine requires between 2500 and 3000 of such small tools, jigs and fixtures.

"(c) Labor—It was soon found that men who were able to make the comparatively simple automobile motors did not have the skill required to machine parts of Liberty engines.

"(d) Unfriendly influence—Some of them were the result of pro-German influence.

"(e) Governmental activities—Every department of the Government was anxious to secure for its special work a large number of tool makers and skilled mechanics.

"(f) The Draft—This took a great many men out of this employment.

"(g) Materials—The materials required for the engines were of a much higher grade than corresponding material in automobile motors and work was required to secure proper production of materials.

"(h) Transportation and Coal—During the winter of 1917-18 the difficulties of transportation and of securing fuel were at times almost insurmountable.

"The Liberty 12-cylinder engine as originally designed was of the 300 hp. class producing approximately 330 hp. All the parts of the engine were designed to stand the stresses incident to this horsepower. An aviation engine is required to have the lightest possible weight with the maximum of power developed; therefore, each part is strained almost to its limit.

## Liberty Horsepower Increased

"When we had succeeded in getting tools and equipment to build this 330 hp. type and had produced approximately 300 of them, we were advised by authorities in France that higher horsepower would be required. By readjustment of the parts the engineers stepped up the horsepower of this engine to 375, with the result that certain of the parts would not stand this strain, notably the crankshaft, and it was necessary to stop productive efforts and increase these parts to stand this additional power requirement.

"After several weeks work this was accomplished and when we had produced approximately 500 of this type we were again notified that an increase in power would be required and that what would be needed for the summer of 1918 would be 400 hp. or over.

"We, therefore, again delayed production while the engineers rearranged the engine parts so that the engine would develop approximately 440 hp. The resulting strain placed on all the parts the engine was too great. We w

obliged to enlarge and strengthen crankshafts, connecting rods, bearings, etc., etc., together with all the adjacent parts.

"It became necessary to change the metallurgical specifications, which resulted in changes in the methods of the steel mills. In increasing the size of the parts all of the jigs, tools and fixtures in the machine building plants, the parts factories, forging ships, etc., were rendered obsolete and we had to construct new equipment to meet all these conditions, in order to meet the requirements as given to us by our aviation authorities in France.

"The extent and magnitude of these changes so required is illustrated by the fact that the engine when competent to develop 330 hp. weighed 785 lb. without water or oil, while when it was competent to develop 440 hp., it weighed 860.

#### 1100 Liberty 12's in a Year

"In spite of this difficulty, on May 29, 1918, one year after the first scratch of the pencil toward the design of the engine was made, we had produced and delivered into service 1100 Liberty 12-cylinder engines. This is an accomplishment which has not been equalled heretofore in this or any similar industry, either in this country or elsewhere.

"Much agitation has centered about the assertion that thousands of changes were made in this engine. This agitation is entirely incorrect and unfounded. The changes arranged themselves in 3 groups:

"(a) Design.

"(b) Increase of power.

"(c) Manufacturing limits.

"As to design—there have been but two changes in design in this engine since it was first laid out in May, 1917. One of these was to change the oil system from the so-called scupper feed to forced feed. Either system worked properly on the engine, but the latter system is fool-proof, while the former is not. We, therefore, substituted the latter system. The other design change was an alteration in one part of the connecting rod to allow the rod to have sufficient play without cracking.

#### Agitation Over Changes Unfounded

"The changes due to increasing the horsepower twice are covered by the foregoing subdivision. These were the results solely of the demands of our Aviation authorities that the power be increased.

"In manufacturing—As the engine was used in service and as the manufacturing progressed, it became evident that some of these limits should be changed and this action has been followed. This is the common practice in all manufacturing establishments. It has always been so on automobile motors and will always be so on any manufactured product. As new manufacturing processes are developed and as experience is gained manufacturing changes are always expected and are always made.

"Therefore, the agitation about changes in the engine, when examined and understood, is unfounded.

"The writer procured an order from

the head of the Equipment Division locking up the development of this engine in the Detroit District in charge of Major Heaslet, formerly vice-president of the Studebaker Corp.; Major Hall and a committee of manufacturers composed of: H. M. Leland of the Lincoln Motors Co., C. Harold Wills of the Ford Motor Co. and Messrs. Bell and Roberts of the Packard Motor Car Co.

#### Ablest Men Concentrated on Engine

"No abler men on engines and motors exist in the industry and it was clear that by devoting their entire time solely to this engine and by avoiding interferences with their efforts, we were adopting the very best possible method of securing quick and reliable results. Resulting production, which will be hereinafter detailed, demonstrates that this course of action was the proper one to be followed.

"The same method of concentrating authority was applied to other engines, including:

Hispano-Suiza .....	150 hp.
Hispano-Suiza .....	180 hp.
Hispano-Suiza .....	300 hp.
LeRhône .....	80 hp.

"During July, 1917, the Signal Corps had purchased a miscellaneous assortment of small engines which could be secured in this country, none of which proved of any substantial benefit.

#### Monthly Engine Production

"Real production began in August, 1917. The following table shows the total production of engines by months from that date to the present time:

1917	
July .....	66
Aug. ....	139
Sept. ....	190
Oct. ....	276
Nov. ....	638
Dec. ....	595
Jan., 1918 .....	705
Feb. ....	1004
March .....	1686
April .....	2214
May .....	2517
June .....	2604
July .....	3151
Aug. ....	3625
Sept. ....	3801
Oct. ....	5297
Nov. ....	3305

Total ..... 31,813

#### Types of Engines Produced

"The production of engines as to types is as follows:

OX-5 .....	8412
Hispano-Suiza .....	4101
LeRhône .....	1178
Lawrence .....	451
Gnome .....	280
A-7-A .....	2250
Bugatti .....	11
Liberty .....	15,131

Total ..... 31,814

"The total amount of horsepower produced up to Nov. 22, 1918, is as follows:

OX-5 .....	757,080
A-7-A .....	225,000
LeRhône .....	94,240
Hispano-Suiza 150 .....	532,350
Hispano-Suiza 180 .....	97,920
Hispano-Suiza 300 .....	2,400
Liberty .....	6,052,400
Bugatti .....	4,400
Lawrence .....	10,824
Gnome .....	30,800

Total horsepower ..... 7,807,414

"The results achieved by the Liberty engine were so satisfactory to the Allies that commencing June, 1918, they were very insistent in placing with us large orders for engines. It soon became apparent that we would need additional sources of engine supply over and above the 22,500 which was originally planned for our own Army and Navy.

#### 5603 Engines Produced in October

"We, therefore increased the number of manufacturers by adding the three plants of the Willys-Overland Co. at Elmira, Elyria and Toledo, and also the Olds Motor Co. at Lansing, Mich., to the list of Liberty producers. We also placed orders for 8000 8-cylinder Liberty engines with Willys-Overland and the Buick Motor Co. at Flint, Mich. When this was completed we had placed orders for engines as follows:

OX-5 .....	9,450
A-7-A .....	2,250
Gnome .....	342
LeRhône .....	3,900
Lawrence .....	451
Hispano-Suiza 150 .....	4,000
Hispano-Suiza 180 .....	4,500
Hispano-Suiza 300 .....	10,000
Bugatti .....	2,000
Liberty 12 .....	51,100
Liberty 6 .....	8,000

Total ..... 95,993

"Our production of engines of all types during October was 5603 of which 3878 were Liberty 12-cylinder. Under the above increased contracts we would have produced during January, 1919, 8000 engines per month which would have increased during the succeeding 4 months to a production of 10,000 engines per month.

#### Rolls-Royce Production

"The best known engine which is comparable to the Liberty is the Rolls-Royce, which is the most prominent English engine. Our advice last summer from the English authorities was that the largest weekly production of Rolls-Royce engines had been 59 and that the average weekly production was 45 engines. It will be noted that during the month of October, we were producing over 150 Liberty 12-cylinder engines per working day.

"The Rolls-Royce engine develops approximately 100 hp. less than the Liberty and weighs approximately 100 lb. more than the Liberty.

"During the month of October we produced of all types of engines a total of 5603. This is more than the total production of France and England during



one month during the four years of the war.

"By following the foregoing method of production, we have achieved the following results:

"1. Designed, developed and put into production during 1 year a 400 hp. type of perfectly satisfactory performance.

"2. Designed, developed and produced within 18 months over 15,000 of these engines.

"3. Produced during 18 months engines of all types totalling 31,814.

#### Liberty Engine Versus Foreign Type

"No production of a foreign type of engine would have produced any corresponding result. The difficulties, troubles and delays would have at least equalled those experienced on the Liberty, and the result would have been much less satisfactory.

"That the result has been satisfactory is apparent from the entire course of aviation during the past few months, which is illustrated by the three following incidents:

"1. The English aviation authorities cabled in June, 1918, that the Liberty engine test had shown it to be a satisfactory aviation engine, and that it was America's greatest contribution to the aviation activities of the war.

"2. Count Poiniatowski, who is the official representative in this country of the Hispano-Suiza Co., stated that Mr. Birkgit, who is one of the leading French aviation engineers, after examining the first 3 Liberty engines sent by us to France, stated that they excelled any engine of that type or size which had been developed in France.

#### Most Satisfactory Engine Available

"3. The experience of the aviators on the front and their opinion of the Liberty engine as given to us by Major Brett on his return from France is that it is the most satisfactory engine to operate that was available to them.

Accessories were discussed by various Army officers as follows:

"The guns on an airplane include a fixed machine gun in front which is aimed by pointing the entire plane and, in case of a two-place machine like the DeHaviland 4, the gunner in the rear has flexible machine guns which he can aim in almost any way.

"These guns are special, different from other machine guns, and to a large extent require special ammunition. There is almost no part of the entire armament equipment of an airplane that is not special.

#### Marlin Forward Gun

"After the declaration of war, the only quickly available arm for the fixed forward gun was the Marlin type. The Browning had not yet been developed; therefore, the Marlin was adopted and has been eminently satisfactory, and, in fact, equals the very best on the front.

"The synchronizing of the gun, that is to say timing the shots from the engine, so that the shot would fire through the

propeller without striking its blades, is a problem never before solved for the Marlin gun and it was necessary to develop the synchronizing device, which permits firing the shots through a propeller revolving at speeds varying from 600 to 1650 r.p.m.

#### Mounting of Gun Complicated Problem

"The mounting of the Marlin gun, including provisions for ammunition, discharge of the empty shells and discharge of the disintegrating steel belt, was in itself a complicated problem.

"For the flexible gun shown on the rear cockpit of the DeHaviland 4, the Lewis gun, the only machine gun not using a bolt, was adopted. This involved re-designing the gun to take U. S. ammunition, increasing ammunition capacity 47 to 97 rounds per container, and part of the problem of the flexible mounting which is before you.

"The gun sights, involved special lenses, previously made in Germany. The development of optical glass in this country is a story by itself.

"The greatest credit is due to the engineers of the Ordnance Department of the Savage Arms Corp. and of the Marlin-Rockwell Corp. for the wholehearted way in which they at their own expense as far as the latter two are concerned, conducted experiments night and day to solve these problems.

#### Airgun Production

"The production question involved in developing from nothing two types of aircraft machine guns to actual shipments in less than 12 months of about 30,000 Lewis flexible type and 35,000 Marlin fixed type is worthy of note.

"The fact that special ammunition is required for aircraft service should be remembered. The special cartridges include armor-piercing, incendiary bullets and tracer bullets, the latter showing a trail of smoke in the air indicating to the gunner the direction of fire.

"Much public discussion is heard of bombing from airplanes. The DeHaviland 4 machine shown may be used as a day bomber. The various bombs and bomb dropping devices are shown at the side of the room.

#### Various Types of Bombs Employed

"Demolition bombs used to destroy permanent structures are made in sizes varying from 50 lb. to 1000 lb.

"Fragmentation bombs are for use against troops. They explode just above the ground and send small fragments in all directions.

"Incendiary bombs are made in two forms: One to scatter small burning particles over a large area, the other for a more concentrated flame.

"Parachute flares are a form of bomb used to light the target in night bombing. They are interesting, as they contain a complete parachute which supports a flare to drop slowly after the explosion of the bomb, and shed a brilliant glare of light.

"The instrument equipment involved a great variety of problems.

"The self-luminous radium dials required for practically all instruments immediately became a production problem.

"How the General Electric Co. in 8 weeks time was producing 250 airplane compasses per week and how the minute chains in the aneroid barometers which serve as altimeters were secured from Switzerland, how the air speed indicators are all calibrated in a wind tunnel and how the National Cash Register Co. developed the tachometer are each stories of absorbing manufacturing interest.

"At the outbreak of the war in 1914 aerial photography for military purposes was a new subject; no special camera equipment was available, neither was the equipment for developing and finishing negatives in the field with the extreme rapidity demanded.

#### Initial Aerial Photography

"The first aerial work was done with cameras held in the hands. These were quickly replaced by cameras attached to the side of the planes, and later working through the bottom of the fuselage.

"The later development consisted of cameras supplied with plate magazines. The power to operate these magazines was furnished from a small windmill.

"This general line of development went on to an automatic camera, which could be put in action by the pilot and given no further attention during a reconnaissance, leaving the pilot free to fly and fight.

"Further development included a film camera for long range reconnaissance work.

#### Cameras Are Developed

"At the outbreak of the war it was possible for the aerial photographer-observer to fly at low altitudes, but as the importance of photography increased the enemy were more aggressive in bringing down photographic observers. This fact greatly increased the altitude from which photographs could safely be taken, and it was frequently necessary to make exposures from an altitude of 17,000 ft. This increase in altitude required lenses of longer focus and a number of cameras having 50 in. lenses were employed.

"Long experience in interpreting photographs has made possible the location with absolute accuracy of concealed batteries, machine gun nests, barbed wire, and even the paths followed by the soldiers.

"The development of cameras and photographic equipment to get these really marvelous photographic results involved the most extensive optical, chemical and mechanical research work. Much of this had been carried to a high degree of perfection by our Allies, who sent the very best men they had to this country to aid in initiating the work in the United States.

#### Development of Radio Apparatus

"Prior to the outbreak of hostilities in August, 1914, radio apparatus had not been used to an appreciable extent on airplanes. The development of suitable radio telegraph apparatus was under-

taken and this method of communication soon became extremely important and valuable in fire control work, where observation planes are used to correct the firing of long range artillery. At the time the United States entered the conflict satisfactory radio telegraph apparatus was in use by the combatant forces. Enormous improvements have been effected, however, by the Signal Corps and the Air Service of the United States, in apparatus designed for fire control telegraph signals. The sets which have been made and supplied in thousands to the American Expeditionary Forces are far superior to any apparatus developed by the other nations at war.

#### Radio Telephone

"In April, 1917, the radio telephone for airplanes was in much the same state of development that the radio telegraph was in August, 1914. The airplane wireless telephone is by far the most striking method of using radio communication on airplanes.

"By means of this device the commander of an Air Squadron can direct by voice the movements of the entire group of airplanes under his command, thereby making the Air Squadron a real military unit. The recent developments in aero fighting abroad indicate the inestimable value of this ability to command the units of a squadron.

"Among other uses for the radio telephone is the communication which can be had between airplanes and ground by telephone, which may become of enormous importance in future use of aircraft. A pilot could thereby talk directly with a general, without intermediate delay and confusion.

#### Radio Compass

"A different type of apparatus recently developed enables the observer in an airplane to locate by means of radio signals sent from a land station his position with reference to certain fixed points. The observer can therefore direct the flight of the airplane in any predetermined manner by means of this radio compass. The uncertainty attached to the use of the magnetic and gyroscope compasses for airplanes makes the use of the radio compass a practical certainty.

"The problems encountered in working out suitable airplane radio apparatus have been principally eliminating the overwhelming effect of the noise of the motor; the reduction of weight to the smallest possible value; the necessity of absolute freedom from fire hazard; simplicity which would enable fliers untrained in the use of radio apparatus to operate the same, and eliminating the vibration of apparatus in the airplane.

#### Maintenance and Care of Fliers

"One of the most important works undertaken by the Department of Military Aeronautics has been the maintenance and care of fliers. This endeavor has been carried on under the direction of Brig. Gen. T. C. Lyster through the Medical Section of the Department of

Military Aeronautics. The most important device for maintaining the health and efficiency of the flier is the oxygen apparatus which is designed to feed oxygen to the personnel of planes and maintain at all altitudes proper atmospheric conditions.

#### Fliers' Fatigue Cause of Most Deaths

"The great necessity of efficiently maintaining fliers was brought about through a study of the English air casualties during the first year of the war. These were about as follows: Two per cent due to the Hun; 8 per cent due to the plane, and 90 per cent due to the men, which clearly indicated that something was radically wrong with the personnel, and immediate action was necessary. A thorough study of this situation disclosed the fact that practically all of the flying personnel was suffering from what was known as oxygen fatigue or lack of oxygen being caused by flying so many hours of the day at high altitudes and not securing enough oxygen to properly feed the body.

#### Oxygen Equipment

"To design an oxygen equipment which would be entirely automatic, one that would be reliable and efficient, necessitated the building of a device which embodied several instruments and one that would overcome many variable conditions.

"It was necessary to have a device that would work under variable tank pressures from 100 lb. to 2250 lb. per square inch with a temperature range of from 70 deg. to 80 deg. F. to 20 deg. or 30 deg. below zero. To overcome these variables necessitated a very thorough study of temperature and pressure effects upon metals and considerable experiment. In addition the apparatus must deliver the required quantity to either one or two men at every altitude from 3000 to 30,000 ft.

"The first apparatus was designed for the British Air Service by Lieut.-Col. Droyer of the British R. A. M. C., and was made at the plant of DeLestang at Paris. The demand for this apparatus was so great that an automobile was kept waiting at the plant for each apparatus as it was finished and was especially rushed to the front.

"An indication of the importance of oxygen is shown by the record of the Twenty-fifth Squadron, Ninth Wing, R. F. C. This was the first squadron to use oxygen equipment on planes in the British service. They were using the original Droyer apparatus and found it efficient, sufficiently at least for Major Birley, who was in charge of the squadron, to state that this squadron, in his opinion, was giving six times the service of any other British squadron.

"An original model of the French-made apparatus was brought to this country to start quantity production. The French apparatus was a hand-made device, each part being carefully fitted by an individual workman. Under the direction of Brig.-Gen. T. C. Lyster, Medi-

cal Research Board of the Medical Section of the Department of Military Aeronautics, and the Bureau of Aircraft Production, the development and engineering of an oxygen apparatus to meet American requirements and to be adapted to American methods of manufacture was undertaken.

"The entire apparatus had to be redesigned, first, to take care of two men instead of one; second, to reduce the weight; third, to meet American methods of manufacture, and fourth, to make the apparatus more efficient and reliable. This work was started about the first of January, 1918.

#### Oxygen Equipment Division Established

"On May 3, 1918, six complete equipments, including apparatus, tanks, masks, etc., were sent overseas by special messenger to be actually tried out on the front. On May 31 the first production shipment of 200 apparatus was made. To date over 5000 have been manufactured and accepted by the Government, over 3600 have been shipped to ports of embarkation and over 2300 have been floated overseas, this production ranging from a rate of about 400 per month in May to 1000 per month in October.

"The importance of oxygen equipment necessitated the establishing overseas of a special oxygen equipment division to take care of the application of these equipments on planes.

"All military planes flying over an altitude of 10,000 ft. are equipped for the application of oxygen equipment. The following type of planes all use oxygen equipment: Day bombing, pursuit and chase planes and a percentage of both night bombing and Army and Corps Observation, this percentage depending on the altitude at which these types of planes will fly."

#### Aero Mail Aerodrome for Philadelphia

PHILADELPHIA, Nov. 29—In an address before the Engineers Club of Philadelphia Charles N. Knight, superintendent of the aero mail division of the Philadelphia post office, said that Philadelphia, or some nearby point in the State, is expected to be selected as the site for an aerodrome that will cover 100 acres.

#### Panama Business Conditions

WASHINGTON, Nov. 29—Panama, which imported \$63,000 worth of automobiles, \$64,000 worth of automobile supplies, \$60,750 worth of automobile tires and \$89,000 worth of gasoline from the United States in 1917, is reported to be suffering from dull business by the American Consul General there. The condition is due to the temporary stoppage of merchandise from the United States, which would indicate that the return to peace times may find a demand for automobiles from that country. The investment of much capital is not advised under the present conditions. General agricultural interests have attempted little or no development.



# AUTOMOTIVE INDUSTRIES

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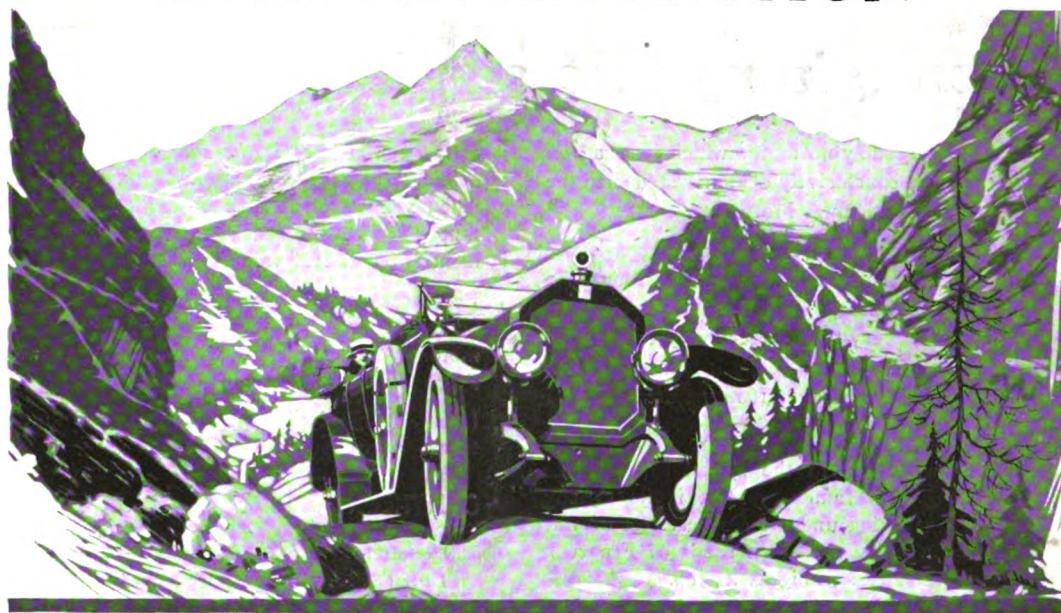
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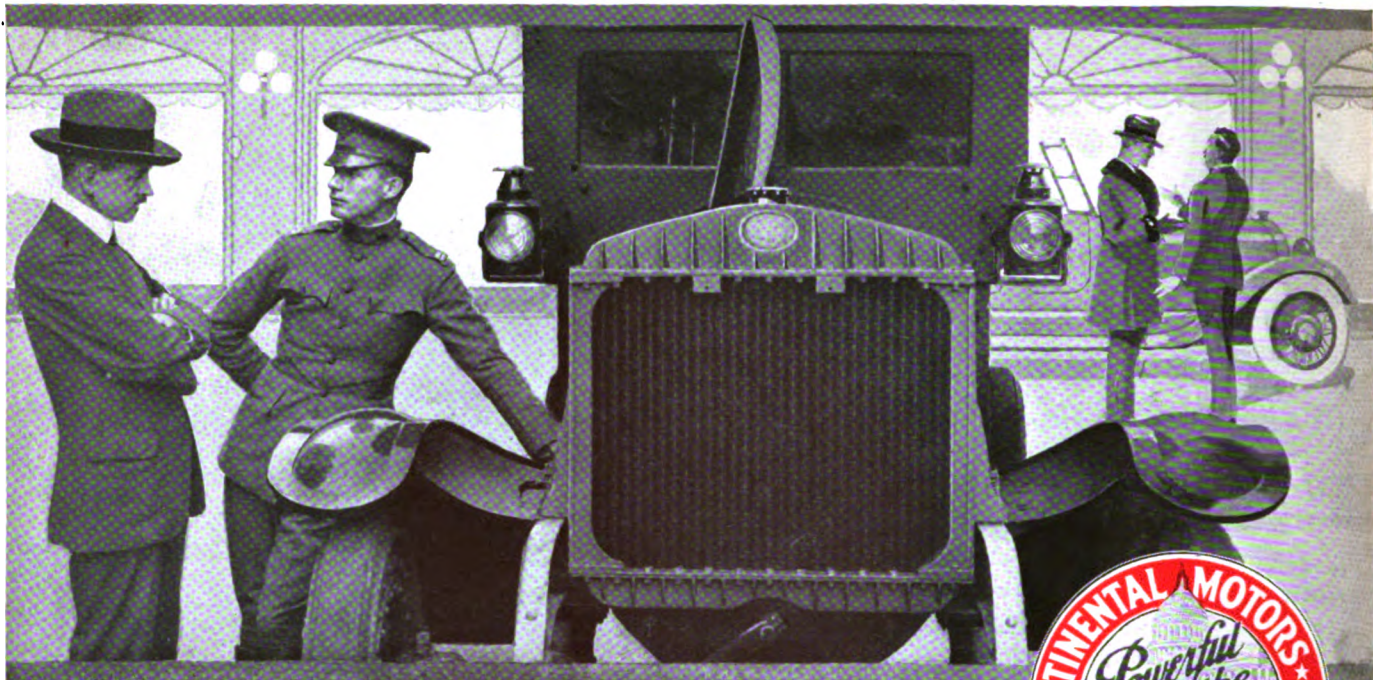
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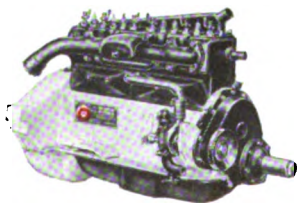
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# AUTOMOTIVE INDUSTRIES

## AUTOMOBILE

Vol. XXXVIII

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No. 24

## Details of the Liberty Engine

First Mechanical Description, Illustrated with Sectional Drawings, Published in the Periodical Press—Same Engine with Cast Cylinders Used for Tanks

By J. Edward Schipper

**I**N spite of opposition during the first months of its production, the Liberty aircraft engine lately has been accepted as representing the highest class of engineering design. A strict censorship has been maintained over its details of construction, though the main specifications have been widely known for some time. It is, therefore, with unusual interest that the drawings, published herewith for the first time, will be scanned by engineers whose interest has been aroused but whose connections have not been such as to permit them to view the prints.

The Liberty engine, used in the DeHaviland and other land planes and a great number of seaplanes, is a 12-cylinder V-type with overhead valves and overhead camshaft. It has individual drawn steel cylinders with cylinder dimensions of 5 x 7 in., giving a piston displacement of 1649.34 cu. in. The cylinders are bolted to the upper half of the aluminum crankcase, the two sets making an angle of 45 deg. with each other. The waterjackets are of pressed steel and are welded to the cylinders and at their own seam. An engine in all respects identical with the Liberty aircraft engine, but having cast iron cylinders, is fitted on "tanks," and one of the sectional views printed herewith shows this design.

The valves are mounted in the heads of the cylinders and are inclined at an angle of 15 deg. to the centerline of the cylinder, so that the angle made by the centerlines of the two valves is 30 deg. The

intake manifold passes between the two rows of cylinders, and the carbureters in most of the installations are mounted in the V. The entire valve drive is housed above the cylinders and can be readily removed without tearing down the engine.

### Weight and Output

The weight of the Liberty engine is approximately 806 lb. and the brake horsepower developed ranges anywhere between 350 and 400 in the army type with the high compression pistons (18 per cent) and 320 to 340 in the navy type with the low compression pistons (20.5 per cent). The center of gravity of the engine is on the centerline of the transverse section, 10 in. above the top of the engine supports and 21/32 in. toward the distributor end of the engine from the center of the middle bearing bolts. The rated fuel consumption is .54 lb. per brake hp.-hour or 36 gal. per hour with wide open throttle at 1700 r.p.m. Under service conditions, about 30 gal. per hour is a fairly representative consumption. The oil consumption is .03 lb. per hp.-hour or 1½ gal. per hour with wide open throttle at 1700 r.p.m. The horizontal flying speed of the engine is 1700 r.p.m. and the ground speed is 1600 to 1625 r.p.m.

The pistons are of aluminum. There are two designs of pistons used, one for the army type and one for the navy. The army type pistons have a crowned head which gives an 18 per cent compression space. The navy type pistons have a flat head which gives a 20.5 per cent compression space. The pistons are 5 in. in length and have 3 rings of the eccentric type.

*Released by courtesy of the Bureau of Aircraft Production.*

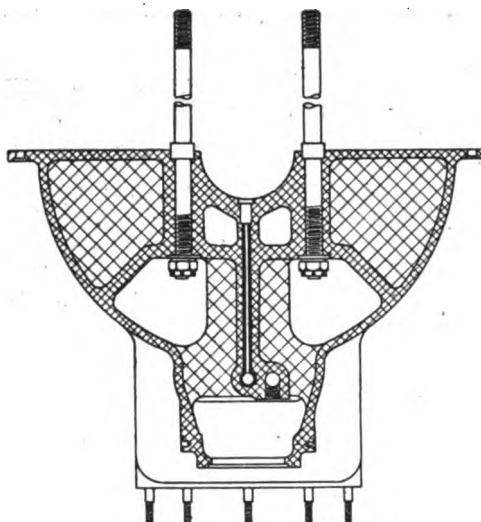
all at the top of the piston. These piston rings are assembled with a gap between the ends of the rings not less than .025 in. The pistons weigh 3 lb. 3 oz., and the number of ounces that the pistons weigh over 3 lb. is stamped in the depression on the side of the piston so that in assembly it is possible to pick out pistons of similar weight. The piston casting has an unribbed section and is fairly heavy, the section being  $\frac{1}{2}$  in. thick at the head and at the rings and tapering to  $\frac{1}{4}$  in. at the end of the piston skirt.

I-beam connecting rods are used, the connecting rod length being 12 in. between centers. The piston pin is a seamless steel tube, the tube being a drive fit into the bosses on the aluminum piston. The tube is of  $1\frac{1}{4}$  in. outside-diameter and is surrounded by a bronze bushing, upon which the upper end of the rod bears. The rod has a solid head and its lower end is either solid or forked, depending on whether it is for the left or right cylinder. The left rods are forked and the right plain. In assembly, the connecting rods are stamped with the serial number of the crankshaft to which they are fitted and also with the number of the cylinder in which they belong. In this way, it is possible to reassemble the Liberty engine and be certain that the rods are returned to the proper cylinders.

The clearance between the lower connecting rod bushings and the crank pin varies from .003 in. to .004 in. The allowable end play is from .010 in. to .020 in. The plain rods have two cap bolts and the forked rods have two for each side, or four.

### Bearings Between Halves of Case

A drop-forged seven-bearing crankshaft,  $2\frac{5}{8}$  in. in diameter, is used. The shaft carries a propeller hub at its forward end and at the rear end carries a bevel gear for driving the valve mechanism. A double row thrust bearing at the propeller hub end of the crankshaft takes the end thrust on the shaft. The shaft is drilled



*Cross section through lower half of crankcase*

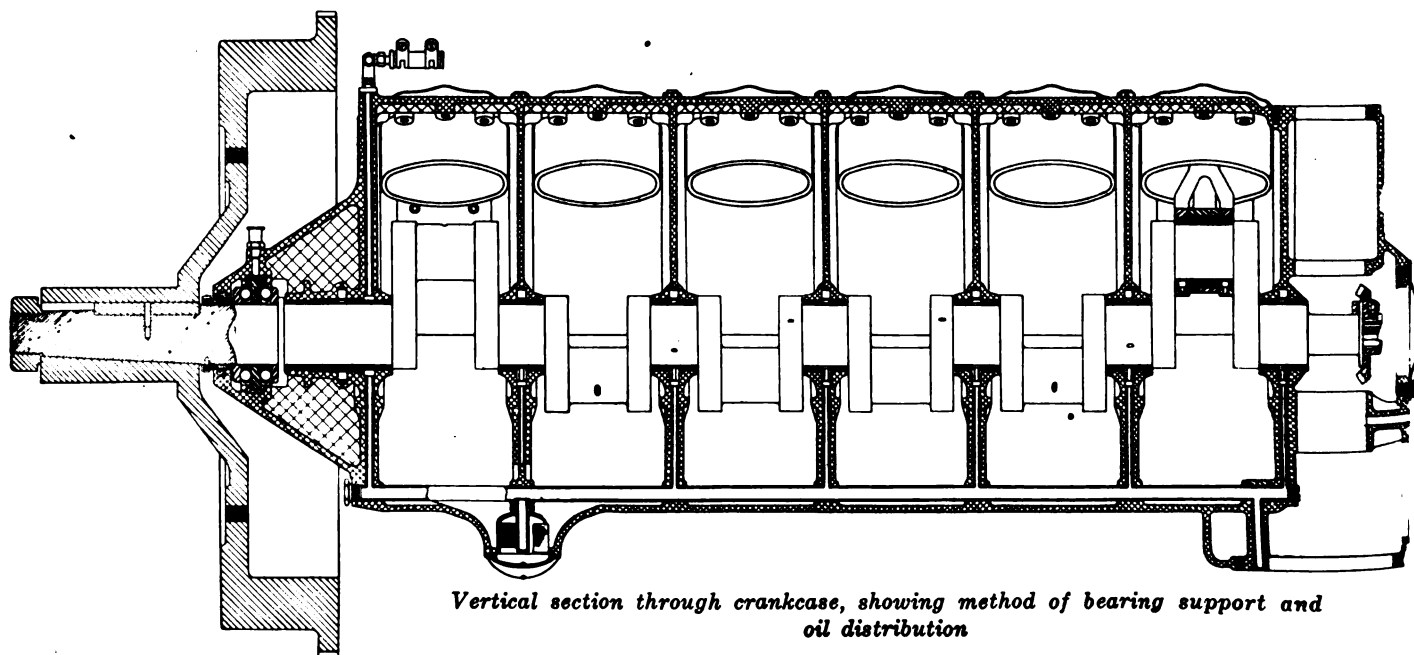
for oil passage, the openings being drilled through the crank cheeks through the crankpins. The propeller hub is lapped to a fit on the shaft, the end of the crankshaft is tapered and when the hub is fitted on it should be about .001 in. tighter at the large end of the taper than at the small end. In addition to the taper fit, there is a key in the end of the crankshaft to take the propeller hub.

The crankcase is in two pieces, both of which are aluminum castings. The crankshaft bearings are on a line with the split in the crankcase, the lower halves of the crankshaft bearings being held in the lower half of the crankcase and the upper halves in the upper half of the crankcase. The two halves are tied together by long bolts or studs which pass through the upper half of the crankcase, through bosses, the nuts being at the top of the upper half of the case. This gives an accessible construction which is at the same time rigid. A careful joint is made between the two halves of the crankcase in order to secure the desired alignment at the main bearings, the joint being lapped.

### Valve Gear

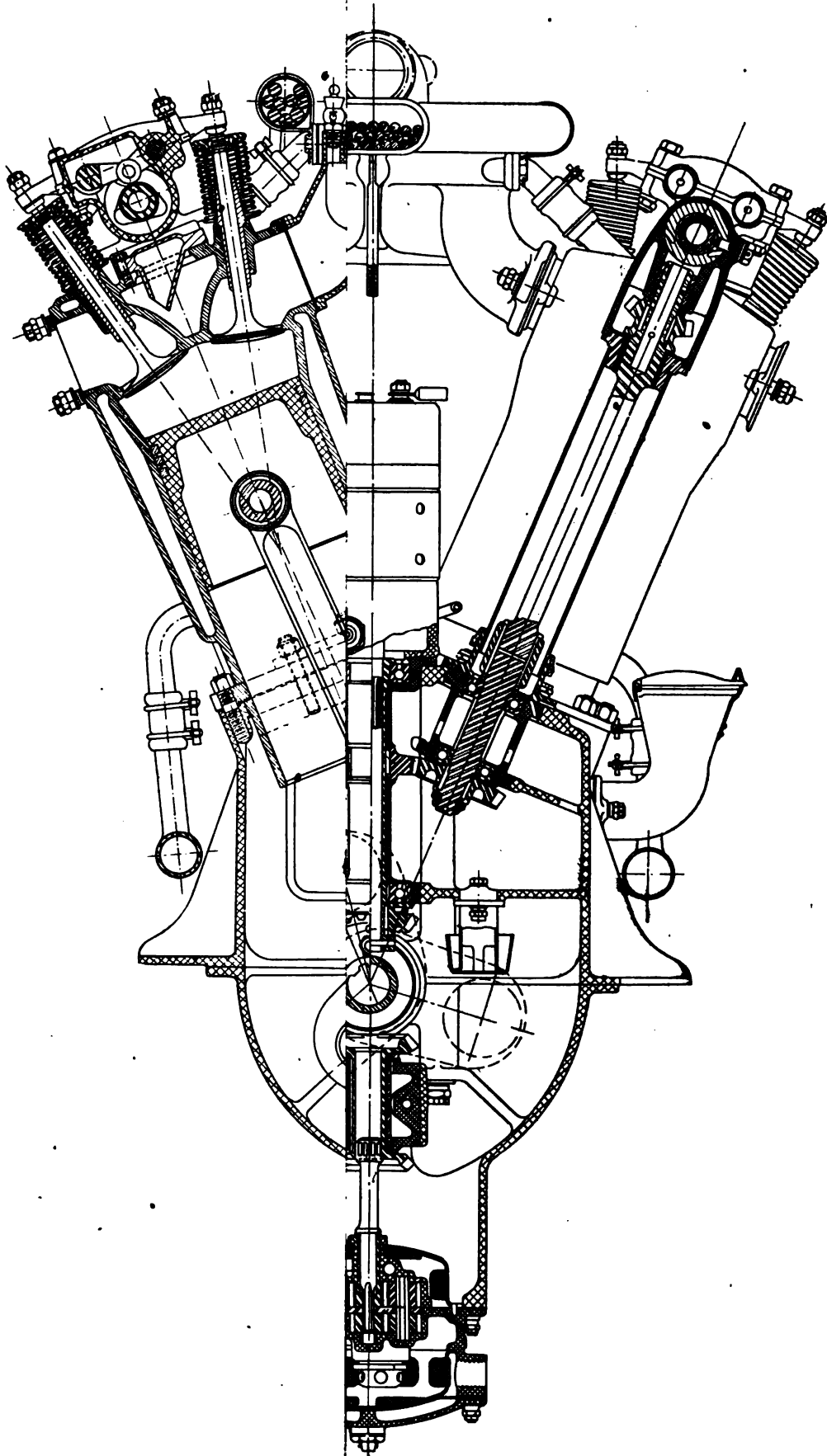
The valve drive is arranged as follows: From the bevel gear on the end of the crankshaft motion is transmitted to a vertical shaft located on the distributor end of the engine, or the end opposite from the propeller hub. This shaft has an intermediate gear which engages with the two cam driving shafts running parallel with the centerlines of the cylinder blocks. The vertical shaft which carries the lower bevel gear and the intermediate gear is carried on a single row ball bearing at the upper end and a single row ball bearing just above the bevel gear at the lower end. The camshaft driving shafts are carried on two single row ball bearings at their lower end and in a bronze bushing at the upper end.

The drive is taken from this point to a bevel gear on the end of the camshaft which actuates the valves. The



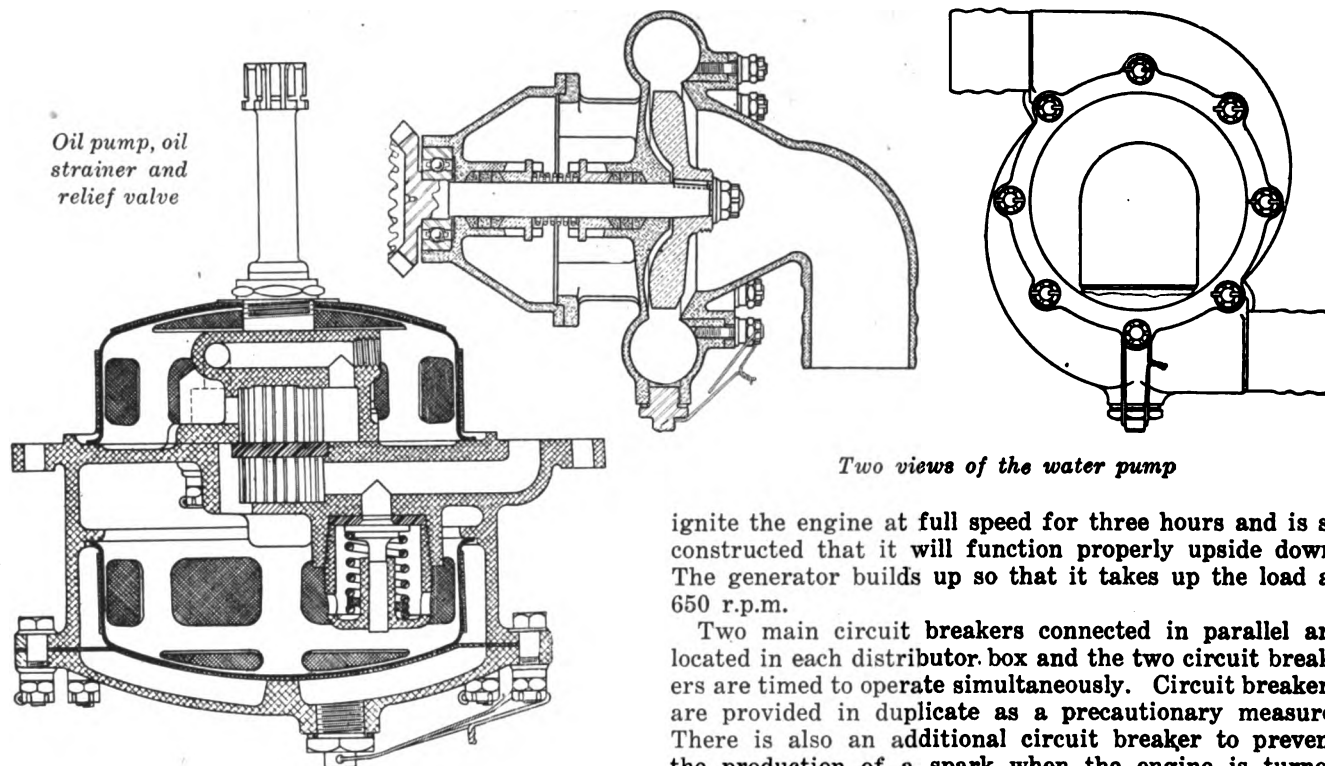
*Vertical section through crankcase, showing method of bearing support and oil distribution*





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Oil pump, oil  
strainer and  
relief valve

Two views of the water pump

camshaft assembly consists of a camshaft with the cams integral, the camshaft bearing, camshaft driving gear, rocker levers, camshaft housing together with the covers, and also the camshaft driveshaft with the gear, bearings and camshaft driveshaft housing. The two camshaft assemblies for the left and right rows of cylinders are identical and are interchangeable, with the exception of the camshafts themselves and the camshaft housing covers. Each shaft is stamped with a serial number on the soft plug in the end of the camshaft opposite the flanged end. The right hand shafts are marked R and the left hand shafts are marked L. The housing covers are machined in place on the housing.

The valves are operated from the camshaft by means of roller cam followers which actuate the rocker shaft and in turn the valve rocker arms. The valve rocker arms bear directly on the valve stems by means of an adjusting bolt directly on the ends of the valve stems. The valves are set into the cylinders on an angle of 15 deg. to the centerline. The valves are the standard mushroom type with 45 deg. seat. The cylinder heads are bushed for the valves and the valve springs are of the double concentric type. The adjustment for the clearance between the end of the valve stem and the valve pushrod is made by turning the screw in the end of the rocker or pushrod and then locking it by means of the nut on the top of the rocker. This nut is locked by a cotter pin and is a castellated type. The clearance on the exhaust valve is .019 to .021 in. and on the inlet, .014 to .016 in.

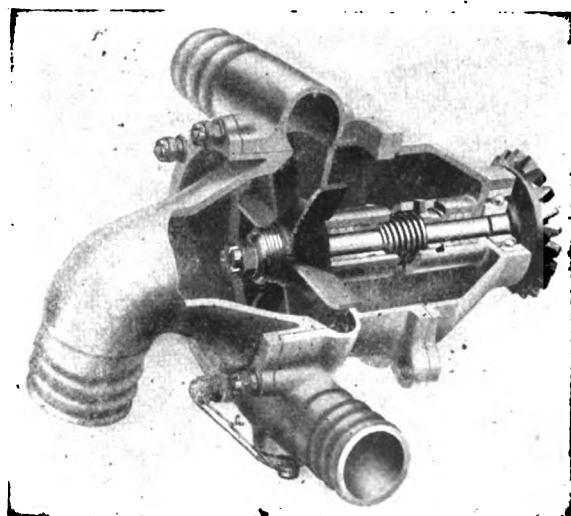
### Ignition System

The distributor is mounted on the ends of the camshaft and arranged to fire 1L, 6R, 5L, 2R, 3L, 4R, 6L, 1R, 2L, 5R, 4L, 3R. The ignition system used on the Liberty 12 is the battery type with two independent breaker and distributor mechanisms, identical in every respect and each one firing all 12 cylinders. These distributors are supplied with electrical energy from two sources. For starting and idling speeds up to 650 r.p.m. current is drawn from the specially constructed four-cell storage battery which has sufficient capacity to

ignite the engine at full speed for three hours and is so constructed that it will function properly upside down. The generator builds up so that it takes up the load at 650 r.p.m.

Two main circuit breakers connected in parallel are located in each distributor box and the two circuit breakers are timed to operate simultaneously. Circuit breakers are provided in duplicate as a precautionary measure. There is also an additional circuit breaker to prevent the production of a spark when the engine is turned backward or rocked. The auxiliary breaker is connected in parallel with the other two through a resistance unit which reduces the amount of current flowing through it. The breaker is so timed that it opens slightly before the other two when the engine is turned in a forward direction. When the engine is turned in a backward direction, the main breakers open first and no spark is produced, because the auxiliary breaker permits the current to continue to flow through the coil but in diminished quantity, owing to the resistance unit. The distributor shaft is carried on two ball bearings.

The generator is driven from the same vertical shaft which drives the two camshaft driving shafts, the drive being taken off the upper end of this shaft. The generator rests in a vertical position above this shaft on the centerline of the engine between the two rows of cylinders. By simply removing one flat head screw the entire generator driveshaft assembly can be lifted out. The mesh between the lower generator driveshaft gear and the crank gear is adjusted by pins between the



Sectioned view of water pump



bearing container at the top of the shaft and the crankcase.

The oil supply for the Liberty engine is carried in a reservoir which is cooled. This reservoir is mounted somewhere in the vicinity of the engine and from it oil is led to the connection on the right side of the oil pump body, which is marked in raised letters Oil In. The oil is filtered at this point through a large-area, fine mesh screen. A delivery pump of the gear type takes the oil after it has passed through the screen and delivers it under pressure to a distributor pipe running the entire length of the crankcase. There is a pressure regulating valve between the pump and the distributing pipe which holds the pressure so that it does not exceed 50 lb. per square inch.

From the distributor pipe there are pipes fitted in the crankcase leading to the main crankshaft bushings. The crankshaft is hollow, and in the center of each main bearing there is a radial hole drilled through the shaft into the hollow center. A passage leads from each hollow main bearing to the adjacent crankpin, which is also hollow. A radial hole is drilled through each crankpin and carries the oil out on the surface of the pin. There are oil grooves and passages in the connecting rod bushings to insure proper lubrication for both the forked and plain connecting rods.

### Lubrication of Piston Pins

The oil spray thrown off by centrifugal force from the ends of the connecting rods lubricate the piston pins and cylinder walls. A part of the oil conducted to the crankshaft main bearing at the propeller end of the engine goes through a passage around this bearing and

up through pipe leads to the propeller end of the camshaft housings. From the end of the camshaft housing it is led around the end of the camshaft bearing through a passage drilled diametrically through the bearing midway of its length. Once every revolution of the camshaft, a hole drilled through the camshaft into its hollow center registers with the oil passage through the bearing.

### Lubrication of Valve Mechanism

Thus once every revolution of the camshaft a small quantity of oil is forced into the hollow camshaft. The oil is led through the camshaft and out through holes drilled in it to each camshaft bearing. The excess works out at the ends of these bearings and collects in small pockets to a depth of about  $\frac{1}{4}$  in. The cams, in revolving, dip into this oil and splash it over the cam rollers and into pockets in the rocker level shafts. From these pockets it is led through the hollow rocker shafts to the rocker shaft bearings.

The excess oil eventually finds its way to the gear end of the camshaft housings, over the gears and down the driveshaft housing into a chamber just above the oil pump.

The excess oil thrown off in the crankcase by the connecting rods collects in this same chamber when the engine is inclined so that the propeller end is high. If the propeller end of the engine is low, this oil collects in a small sump or chamber at the propeller end of the crankcase.

Immediately above the oil delivery pump is located an oil return pump consisting of three gears, and driven by the same shaft as the delivery pump. The function of this oil return pump is to draw the excess oil out of the crankcase and return it to the oil reservoir. One section of this pump draws oil from the sump at the propeller end of the crankcase and the other section draws oil from the sump at the distributor end of the crankcase. Both halves of the pump deliver oil to the connection on the left side of the oil pump body marked Oil Out, from which point it returns to the oil reservoir.

### Cooling System

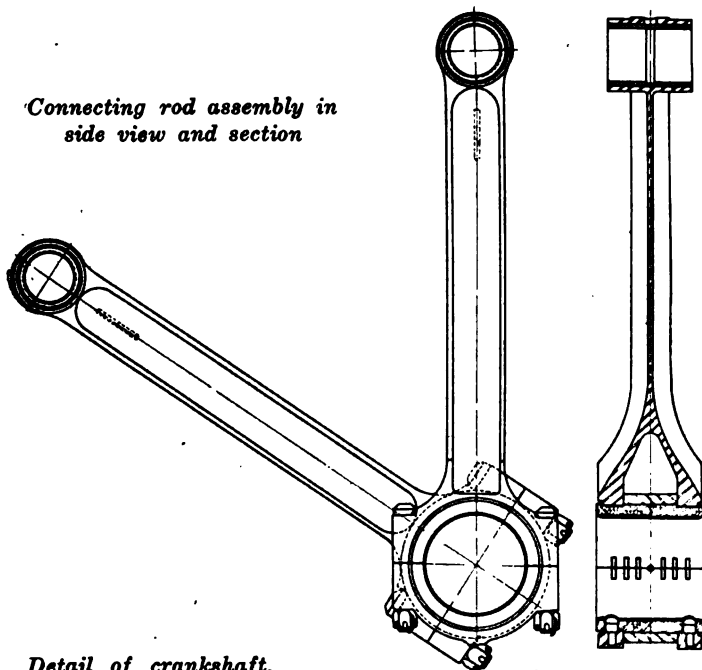
Cooling water is circulated through the Liberty engine by means of a centrifugal pump running at one and one-half times engine speed. The capacity of this pump is 100 gal. per min. at 1700 r.p.m. The cooling system from the pump inlet to and including the water outlet header will hold  $5\frac{1}{2}$  gal. of water.

The water pump is provided with a single inlet, the outside diameter of which is 2 in., and two outlets each one delivering water to a header, the two headers supplying the right and left hand cylinders respectively. Water is forced into each cylinder jacket in a tangential direction. This construction gives the water a whirling motion inside the jacket and insures uniform cooling.

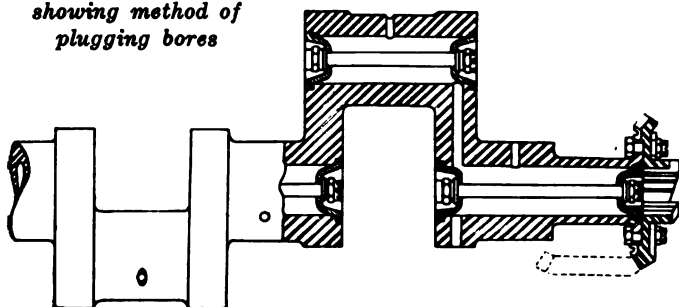
The water outlet pipe for each cylinder extends inside the jacket to a point very close to the exhaust valve chamber, which assures proper cooling of the exhaust valve. The cooling water then passes through a passage cored in the intake headers. This serves to warm and further vaporize the incoming gas as well as to assist in cooling the water. These passages in the intake headers are connected by two water outlet headers, the final outlet of which has an outside diameter of 2 in.

The water pump is driven from a vertical shaft which takes its drive from the same vertical shaft that drives the camshaft driveshafts and the generator. This shaft extends downward and has a bevel gear which meshes with a bevel gear on the end of the pump shaft, thus accomplishing the drive. The vertical shaft extends downward and terminates in the oil pump, carrying the

Connecting rod assembly in side view and section



Detail of crankshaft, showing method of plugging bores



driving gear of the gear type of pump utilized for this purpose.

Two duplex Zenith carbureters are used on the 12 cylinder Liberty aircraft engine. This is equivalent to four single carbureters, each one supplying three cylinders of the engine. Each duplex carbureter consists of a single float chamber and a single air inlet joined to two separate and distinct spray nozzles, venturi and idling devices. (As the V type engine is, in a sense, two separate engines, joined together for greater utility, so the Zenith is built in double form for the purpose of

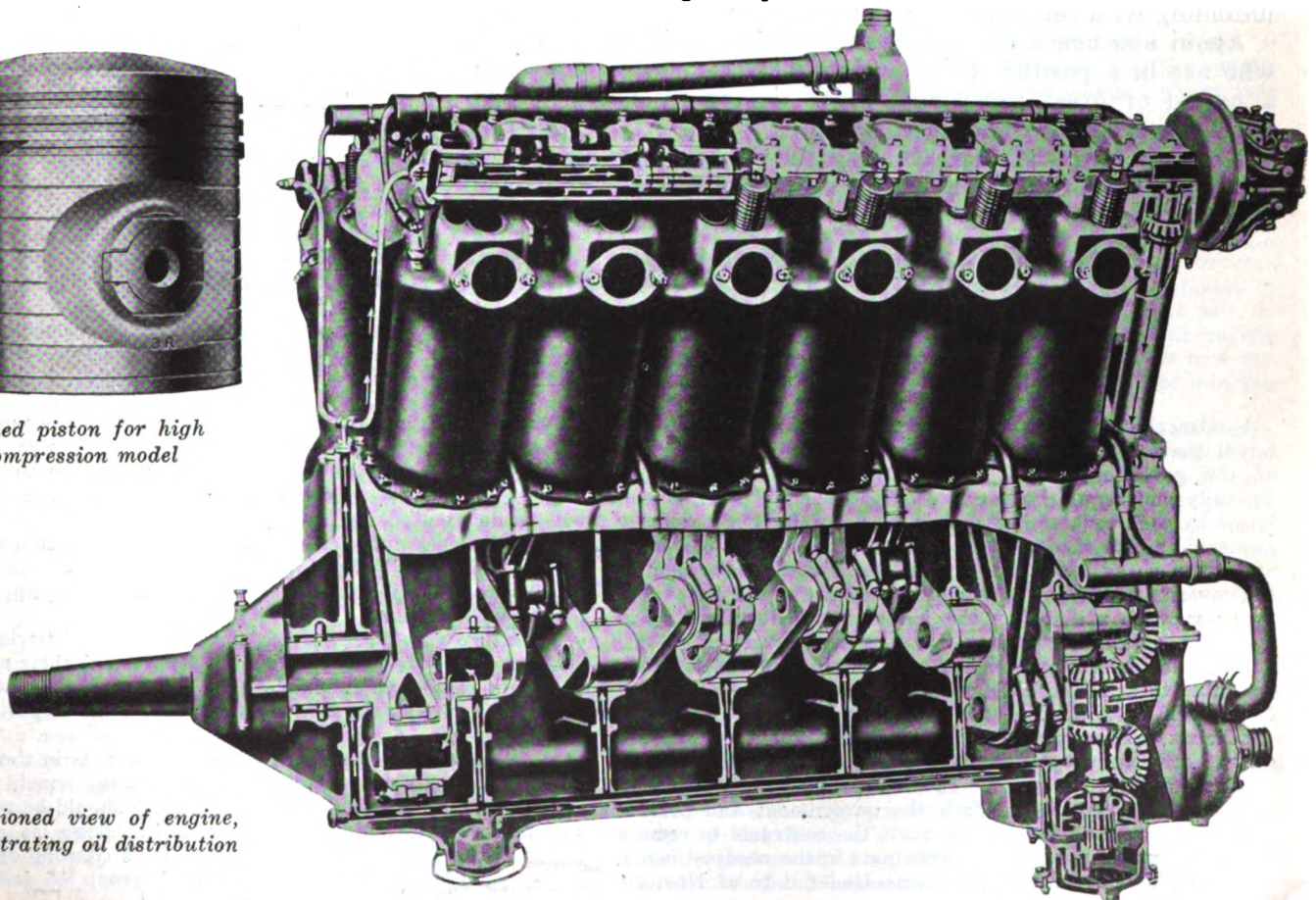
supplying each one of these two engines with its exact requirements.) Each of the two barrels of each carbureter is fitted with a throttle valve of the butterfly type. The shafts of the throttles are parallel with the centerline of the engine, or "fore and aft," and are interconnected by means of gear sectors pinned to the throttle shafts and meshing together. The two pairs of throttles are operated simultaneously by a shaft, provided with an adjustment at each end by means of which the pairs may be synchronized. Each duplex carbureter is fitted with an altitude adjustment which affects both barrels equally.

### Clearances Used in the Liberty Engine

	Minimum	Maximum	Desired		Minimum	Maximum	Desired
<b>Crankshaft:</b>				<b>Rocker levers:</b>			
Diametrical clearance...	0.0025	0.00325		Diametrical clearance..	0.00025	0.00175	Min. 0.001
End play .....	0.0575	0.0775		End play .....	0.005	0.010	0.0075
<b>Connecting rods:</b>				<b>Valves:</b>			
Forked end—				Fit of stems in guides—			
Diametrical clearance	0.003	0.004		Diametrical clearance—			
End play .....	0.008	0.020		Exhaust valve ....	0.004	0.0065	0.005
Plain end—				Inlet valve .....	0.002	0.0045	0.003
Diametrical clearance	0.005	0.0065		<b>Water pump shaft:</b>			
End play .....	0.004	0.008		Diametrical clearance..	0.0015	0.0035	Min. 0.0025
<b>Piston pin:</b>				End play .....	0.006	0.010	0.010
Fit in rod .....	0.00025	0.00125	Select for .001 clearance	<b>Water pump bevel driver:</b>			
Fit in piston .....	0.00025 loose	0.00075 tight	Select for light drive fit	Diametrical clearance..	0.001	0.0025	
<b>Piston rings:</b>				End play .....	0.005	0.008	
Fit in grooves .....	0.00125	0.003	Top 0.003; Mid. and Bot. 0.002	<b>Oil pump:</b>			
Gap .....	0.021	0.041	0.030	Fit of gears in housing—			
<b>Piston:</b>				Diametrical clearance	0.001	0.005	Select for 0.004 clearance
Fit in cylinder .....	0.018	0.022	Select for 0.020 clearance	End play .....	0.002	0.007	Select for 0.003 clearance
<b>Camshaft:</b>				<b>Tappet gap:</b>			
Diametrical clearance..	0.001	0.003		Exhaust valve .....	0.019	0.021	
End play .....	0.000	0.004	Min. 0.002	Inlet valve .....	0.013	0.016	
<b>Camshaft upper driveshaft:</b>				<b>Breaker gap</b> .....	0.010	0.013	
Diametrical clearance—				<b>Spark plug gap</b> .....	0.015	0.015	0.015
Large bushing .....	0.0005	0.0025	Min. 0.0015	<b>Regulator:</b>			
Small bushing .....	0.0005	0.0025	Min. 0.0015	Contact gap .....	0.005	0.007	
End play .....	0.002	0.008	Min. 0.004	Height of pin .....	0.043	0.045	



Domed piston for high compression model



Sectioned view of engine, illustrating oil distribution

# Business Would Be Free to Develop

Desire for Elimination of Burdensome Restriction and Assistance in Building Foreign Trade Keynotes of Reconstruction Conference—Shape 27 Policies for the Guidance of Business

**A**TLANTIC CITY, Dec. 6—American business has indicated the course it would like to pursue in the work of readjusting from a war to a peace basis. At the Reconstruction Conference of War Service Committees of the Chamber of Commerce of the United States here during four days of this week 5000 representative business men adopted twenty-seven resolutions, which are intended to shape and guide the machinery of transition.

Business wants to be free of burdensome restriction. It wants the privilege of holding its own rudder and steering the course that its own experience indicates is the wisest one. And a good part of that course, it is planned, will take American-made goods in American ships to foreign ports.

The convention, representing the allied War Service Committees of some 381 different industries, marks an era in the economic progress of the country. Here were 5000 of the biggest business men of the country gathered together to talk over their past troubles and problems, and to devise ways and means of grasping the trade possibilities that are unfolding with the passing of the world war.

Again and again the delegates heard from those who are in a position to know that business faces a period of great prosperity, that opportunity is knocking at every trade door.

Never before has there been gathered together the business ability and the brains of business that

was drawn to the City by the Sea for this four-day conference. Every session was packed. Interest never flagged. Time and again the delegates rose to their feet and cheered when some speaker touched a responsive chord.

The time has come, it is believed, when the need for restrictive measures has passed, and that business is its own best counsel in developing after-the-war trade. As was told in *AUTOMOTIVE INDUSTRIES* last week, Harry A. Wheeler, president of the congress, uttered the keynote of the conclave:

"Men of business may not be regarded as competent advisors in matters of diplomacy and statecraft as affecting political reconstruction, but as a corollary to this assumption, the diplomat or statesman may not be regarded as a wholly competent advisor in matters of economic reconstruction." The conference cheered that statement.

The matter of foreign trade was an absorbing topic of discussion, and it is significant of the trend of thought that of the twenty-six resolutions unanimously adopted by the conference, nine, or one-third, had to do directly with this subject.

All the resolutions were adopted unanimously. They represent the essence of the American business man's experience during the time the United States was in the war and are intended to be the guiding spirit for American business in the months to come. Here they are:

## The Guiding Spirit of American Business

Resolutions Unanimously Adopted by the Reconstruction Conference of the Chamber of Commerce of the United States

**1—Cancellation of War Contracts**—It is in the public interest that all war orders placed by any contracting agency of the government and accepted in good faith, whether formally and regularly executed or not, should, upon cancellation by such contracting agency, be promptly and equitably adjusted and satisfied as if every formality had been observed, and when so adjusted the amount ascertained to be due by the government should be promptly paid to the end that these funds may be utilized by the industries of the country to speed their transition from a war to a peace basis.

If it should be ascertained that legislation is necessary or desirable to accomplish this end, Congress should forthwith enact such legislation.

Officials dealing with questions of adjustment on account of war orders must necessarily be familiar with all the conditions affecting the order. It will greatly promote expedition and the interests of both the government and private enterprise for the officials who made the contracts to remain in the government service to participate in the readjustments.

**2—Surplus Government Supplies**—Under date of Nov. 29,

1918, the Secretary of War issued a public statement, i. e., "To prevent too violent dislocation of industry from the standpoint of both employee and employer, accumulation by the War Department of either raw material or finished product will be distributed when and where liquidation of such supplies will least interfere with the return of industry to normal condition." Such action would seem to insure the stability of the industries affected which fully appreciate this liberal position.

Therefore the War Service Committees of American Industries hereby tender to the War Department their services for their respective industries for the purpose of advising with and assisting the War Department in the disposition of such materials.

**3—Removal of Restrictions of Industry**—It is in the public interest that all war regulations of industry should be revoked and all war restrictions on industry should be removed as speedily as practicable, save such industries as are engaged in the production, preparation or distribution of foods, feeds, and fuel and such last named group of industries



should be freed from war regulations and restrictions as early as consistent with the welfare of this nation and of the Allies.

**4—Pivotal Industries**—Conditions brought upon us by the European war at its beginning, as well as our national necessities after we entered the war, made it of the highest importance that a number of industries should at once be developed in the United States. Large investments, both of capital and skill, have since been placed in these enterprises. Upon the production of some of them, relatively small in themselves, the continuation of some of our largest industries has depended. Some of the recently developed industries have national importance in fields much broader than the markets of their products; for they may serve, for example, to promote scientific research, which will add to national efficiency, resources, and wealth in many distinct ways.

It becomes essential, therefore, that the government should at once proceed to ascertain the industries which have been developed during the European war and ascertain those the maintenance of which is indispensable for the safety of our industrial structure and our military establishment.

When these pivotal industries have been ascertained, means suitable in view of their nature, and situations should at once be provided for their encouragement and preservation.

**5—Industrial Co-operation**—The war has demonstrated that through industrial co-operation great economies may be achieved, waste eliminated, and efficiency increased. The nation should not forget, but rather should capitalize these lessons by adapting effective war practices to peace conditions through permitting reasonable co-operation between units of industry under appropriate federal supervision. It is in the public interest that reasonable trade agreements should be entered into, but the failure of the government to either clearly define the dividing line between those agreements which are, and those which are not, in unreasonable restraint of commerce, or to provide an agency to speak for it on application of those proposing to enter into such agreement in effect restricts wholesome co-operation and deprives both industry and the general public of its benefits. The conditions incident to the period of readjustment render it imperative that all obstacles to reasonable co-operation be immediately removed through appropriate legislation.

**6—Federal Trade Commission**—The Federal Trade Commission was advocated by the President, and was created as an agency to make the administrations of our trust legislation explicit and intelligible, and to provide "the advice, the definite guidance and information" which business enterprises require. The normal importance of the commission's task is now tremendously increased by the imperative need for whole-hearted and sympathetic co-operation between the government and industry especially during the readjustment period and suggests the desirability of the two existing vacancies in the commission's membership being promptly filled with able men of broad business experience and clear vision prepared to assist actively in discharging these tasks along constructive lines.

**7—Industrial Relations**—The Convention heartily endorses in letter and spirit the principles of the industrial creed so clearly and forcibly stated in the paper read to it Thursday morning by Mr. John D. Rockefeller, Jr., and urges upon all units of industry—where they may not now be employed—the application of such principles. Without approving or rejecting his particular plan or machinery, the principles advanced by Mr. Rockefeller are as follows:

1—Labor and capital are partners, not enemies; their interests are common interests, not opposed, and neither can attain the fullest measure of prosperity at the expense of the other, but only in association with the other.

2—The purpose of industry is quite as much to advance social well-being as material well-being and in the pursuit of that purpose the interests of the community should be carefully considered, the well-being of the employees as respects living and working conditions should be fully guarded, management should be adequately recognized and capital should be justly compensated, and failure in any of these particulars means loss to all.

3—Every man is entitled to an opportunity to earn a living, to fair wages, to reasonable hours of work and proper work-

ing conditions, to a decent home, to the opportunity to play, to learn, to worship, and to love, as well as to toil and the responsibility rests as heavily upon industry as upon government or society to see that these conditions and opportunities prevail.

4—Industry, efficiency and initiative, wherever found, should be encouraged and adequately rewarded and indolence, indifference and restriction of production should be discountenanced.

5—The provision of adequate means for uncovering grievances and promptly adjusting them is of fundamental importance to the successful conduct of industry.

6—The most potent measure in bringing about industrial harmony and prosperity is adequate representation of the parties in interest; existing forms of representation should be carefully studied and availed of in so far as they may be found to have merit and adaptable to the peculiar conditions in the various industries.

7—The application of right principles never fails to effect right relations; the letter killeth and the spirit maketh alive; forms are wholly secondary, while attitude and spirit are all important, and only as the parties in industry are animated by the spirit of fair play, justice to all and brotherhood, will any plans which they may mutually work out succeed.

8—That man renders the greatest social service who so co-operates in the organization of industry as to afford to the largest number of men the greatest opportunity for self-development and the enjoyment by every man of those benefits which his own work adds to the wealth of civilization.

8—Relocation of Labor—The conversion of the industry of the country from a peace basis to a war basis involved a general and important dislocation of labor. This movement was gradual. The end of the war involves a much more rapid change in industry; while there will be a great demand for labor to meet the foreign and domestic requirements there may be for a time in special places a temporary condition of unemployment.

In the new relations of industry to labor we conceive it to be incumbent upon the community affected promptly to meet such conditions.

The local chambers of commerce should be able to contribute in an important way in this work.

9—Public Works—The development of public works of every sort, as recommended by the President, should promptly be resumed, in order that opportunities of employment may be created for unskilled labor.

10—Taxation—The cessation of hostilities brings to business interests a feeling of deep concern in the matter of taxation. The problems of readjustment are made more difficult through inequalities in the present law.

We believe, therefore, that in the consideration of amendments to the present act, or the passage of new revenue legislation, attention must be given to the views expressed by organizations of commerce and industry. Ability to pay, inventory values and proper reserves together with careful survey of the amount of revenue required under the new conditions are matters of vital importance to business interests of the nation during this readjustment period.

11—Inventories—We urge that Congress should give careful consideration to the grave menace now facing all industry due to the fact that both raw materials and finished goods are carried in full measure to meet the extraordinary requirements of the government and of the people, and that in large part the stocks have been acquired at abnormal cost and are therefore carried into inventories at inflated values, thereby showing apparent profits which have not been realized, and which probably will never be fully realized. These are largely bookkeeping or "paper" profits, and should not be used as a basis for taxation.

We therefore recommend that any tax law shall provide that during present conditions the taxpayer shall be allowed to make a deduction from his apparent profit by way of a reserve for a subsequent shrinkage in the value of merchandise.

We believe that the interests of the government can be protected against abuse of this privilege by the fixing of a maximum percentage of deduction to be allowed, and by the use of proper methods of inspection and appraisal.

**12—Railroads**—The Congress of the United States should speedily enact legislation providing for the early return under federal charters to their owners of all railroads now being operated by this government under federal regulations permitting the elimination of wasteful competition, the pooling of equipment, combinations or consolidations through ownership or otherwise in the operation of terminals, and such other practices as will tend to economies without destroying competition in service.

**13—Means of Communication**—We are opposed to government ownership and operation of telegraphs, telephones, and cables.

**14—Merchant Marine**—We recommend that the construction of a great Merchant Marine be continued and amplified, and that its operation under American control be kept safe by such legislation as may be necessary to insure its stability and its lasting value to American industries.

**15—Port Facilities**—The recommendations of the Port and Harbor Facilities Commission of the United States Shipping Board for development of ports are supported. Vessels of foreign register needed for our commerce by sea are attracted to those ports which are best fitted to coal, to load, and to unload cargoes, and thus provide means for a quick turnaround. After ascertaining the port facilities of European countries, and their plans for further development, the commission has recommended that there should be a local port commission at each of the important ports upon our coasts, that upon these commissions there should be representatives of industrial, commercial, and railroad interests centering at the port, that facilities should be installed to meet the needs of the port, and that a zone system should be arranged by which exports and imports would flow through those ports which are within economic transportation distance of the points of origin and destination. There should be co-operation with the Facilities Commission in its task of expanding means which will enhance the position of the United States among maritime nations.

**16—Public Utilities**—Public utilities have faced difficult problems, which have been accentuated by conditions arising out of war. The development and efficiency of such a utility as local transportation has immediate importance for every community. It is recommended that the Chamber of Commerce of the United States should appoint a committee to investigate and study the question of local transportation as it relates to the control of rates and service, franchises, taxes, the attraction of capital into the business, and such other questions as the committee may find pertinent. Such a committee should report its recommendations to the Board of Directors of the National Chamber, and the board should deal with them in accordance with the established procedure of the chamber.

**17—Water Powers**—Industrial activity is dependent upon the available supply of power. A bill which would effect the development of hydroelectric power upon waterways and lands which are subject to federal jurisdiction is now before a committee of conference between the two Houses of Congress. It is important in the public interest that Federal legislation on this subject should be enacted without further delay. We accordingly urge that the conference committee arrive at an acceptable form of legislation in season for enactment at this session of Congress.

**18—International Reconstruction**—In war we have made common cause with the Allies. We should likewise make common cause with them in seeking the solution of the immediate problems of reconstruction which they face, because of the efforts they put forth in the war. These problems peculiarly depend for their solution upon commerce.

Raw materials and industrial equipment which we possess the Allies urgently require, that they may reconstitute their economic life. We should deal generously with them in sharing these resources.

In order that we may share our materials with the Allies, we must also provide them with credits through which they may make the necessary payments.

Our ocean tonnage must supply our troops overseas and help to provision the inhabitants of war-devastated regions. The part of our ocean tonnage not required for these paramount needs, and vessels of associated countries which are in a

similar situation, should be entered into the common service of all nations. This common service should secure to all nations their immediate needs of food, raw materials, and transport for their products.

**19—European Commission**—The business men of the United States, having devoted their energies and resources toward the winning of the war, regardless of sacrifices or burdens, in support of the principles for which this country fought, appreciate the necessity of continuance of unremitting effort in order that the world may be restored to normal conditions as quickly as possible and the blessings of peace brought to all peoples.

In the accomplishment of these results the highest efficiency of the great commercial and industrial powers of our own country and that of the Allied nations will be developed only through co-operative effort and common counsel.

In order, therefore, to contribute to the fullest toward the prompt solution of the problem presented, the Chamber of Commerce of the United States is requested to enlist the co-operation of national bodies devoted to the extension and promotion of American commerce, and particularly foreign trade, in the appointment of a commission representative of American business, which shall proceed without delay to Europe and establish machinery for the following purposes:

**A**—To study at first hand the reconstruction needs of European countries in conjunction with business men of these nations in order to advise the business men of the United States as to how they may be most helpful in meeting the necessities of Europe and caring for the interests of American industry and commerce.

**B**—To be available to the Peace delegates of the United States for any needed information which they may be able to present or for any other aid which may be given by the business men of the United States through the medium of such a commission.

The Chamber of Commerce of the United States also is requested to appoint members of the commission to represent the business men of the United States at the forthcoming meeting of the Permanent Committees of the International Congress of Chambers of Commerce.

**20—Markets for Foreign Trade**—We strongly urge upon our government the vital necessity of encouraging and developing our foreign trade through all appropriate means possible, in order that the production of industry may afford employment to wage earners and prosperity to the nation.

**21—South American Relations**—It has long been the policy of this nation to cultivate relations of close sympathy with the nations of the western hemisphere as expressed in the Monroe Doctrine. We believe that these relations should be supplemented and strengthened by a vigorous development of our commerce and financial associations with our neighbors of North and South America.

The government's control of shipping should be brought to the accomplishment of this purpose as soon as it is consistent with other urgent needs, and the work of the Pan-American Union should be continued and broadened in scope.

**22—Property Rights in Mexico**—By provisions in a constitution adopted while much of the country was engaged in civil strife, and through subsequent legislation, Mexican authorities have threatened rights acquired by Americans in good faith, especially in minerals, including petroleum. Against threatened confiscation the American Government made formal protests. The attitude taken by the American Government is heartily commended as in accordance with obvious justice.

**23—Education for Foreign Commerce**—In the larger opportunities which are to be opened to American business men to play a part in the international commerce of the world the need will be felt for more men who are trained to a knowledge and understanding of the language, the business methods and the habits of thought of foreign lands. Complete success can only come to those who succeed in putting themselves into full accord and sympathy with the peoples with whom they are to deal.

We urge upon our industries that they take steps to provide opportunities to young men to obtain an education in the practices of overseas commerce and finance and in the practical use of foreign languages.

We call the attention of the various departments of government and of educators to the importance of this matter and ask that special efforts be made to supplement the valuable work already done and to open up every facility to the furtherance of a successful prosecution of this educational work.

**24—Forest Products Laboratories**—The Forest Products Laboratories, of the United States Forest Service, have rendered valuable service through scientific investigation of the physical properties of American woods and their adaptability for structural, industrial and ornamental usage. It is of great importance to American industry that the government should extend and adequately maintain the work of the Forest Products Laboratories.

**25—Cost Accounting**—It is the sense of this Convention that uniform cost accounting should be adopted by industries.

**26—Council and Executive Committee**—Your Committee has given serious consideration to the suggestion that following this conference an executive committee should be appointed to relate the efforts of the various war service committees, keep them continuously informed on matters of common interest, and co-ordinate their work on national problems.

It is the conviction of your Committee that it is absolutely essential to the stability of business in this country and the prompt and wise solution of our problems that the war service committees should continue their work in co-operation with government agencies and now turn their attention to the new questions with which the country is faced. We therefore recommend that all present committees so represent their industries and that an Executive Committee be named with as little delay as possible.

At the meeting of the chairmen of the war service committees held in Washington, D. C., on Dec. 12, 1917, the Chamber of Commerce of the United States was requested to undertake the organization of committees in all the industries not then represented.

By vote this conference also requested that the War Service Executive Committee of the National Chamber should act as the executive committee of these committees of the industries.

At the meeting in December, 1917, it was suggested to the War Service Executive Committee of the Chamber of Commerce of the United States that as soon as practicable a council be appointed representative of all the industries which would act as advisory to the War Service Executive Committee.

It is believed that the time has now arrived when such a council should be formed and it is recommended that this council be composed of the chairmen of the war service committees.

The Board of Directors of the National Chamber has stated that if it be the desire of this Convention, the Chamber will be glad to reconstitute its War Service Executive Committee and have it continue to serve in the same capacity in which it has acted during the war, directing attention particularly to the problem of reconstruction affecting all industries.

In this direction the Chamber would wish to make the co-operation of these committees on a national scale as effective as possible, and it will continue to publish such bulletins and reports as may be necessary for their benefit, and place at their service the facilities of its general headquarters in Washington and its branch offices.

It is the opinion of your Committee that this Conference should immediately take advantage of the willingness of the Chamber to undertake this responsibility, and it therefore presents the following resolutions:

*Resolved*, That this conference requests the Chamber of Commerce of the United States to appoint a War Service Executive Committee of such number as may seem best to relate the efforts of all of the War Service Committees, and to aid in making effective the action of this conference and pledges its assistance to the National Chamber in securing the service on the Committee of such leaders of industry as may be called to act.

*Resolved*, That the chairmen of the War Service Committees of the industries shall constitute a Council to be advisory to the War Service Executive Committee, and to meet from time to time at the call of the Executive Committee or any twenty-five members of the Council.

*Resolved*, That new War Service Committees representing industries not now organized may be recognized by the War Service Executive Committee or by the Council.

**27—National Trade Associations**—The experiences of the war have clearly demonstrated the value of national trade organizations and their service to the country as well as to industry.

This conference heartily approves the plan of organizing each industry in the country in a representative national trade association and expresses the belief that every manufacturer, jobber and producer of raw materials should be a member of the national organization in his trade and cordially support it in its work.

## British FE2B Pusher Fighting Biplane



The FE2B biplane is one of the oldest types used by the British army, having been first brought out in December, 1915, and remaining in use up to the end of the war. It is a two-seater machine fitted with 160-hp. Beardmore engine and equipped with two Lewis machine guns. In addition it is designed to carry 300 lb. of bombs. The machine has a total weight of 2827 lb., its ceiling is 11,000 ft. and its endurance at 10,000 ft., including the climb, 3½ hr. At ground level it is capable of developing a speed of 83 m.p.h. and at 10,000 ft. 76 m.p.h. The machine is a product of the Royal Aircraft Factory



# Principles of Tractor Radiator Design

Derivation of Some Simple Equations Showing the Dependence of Radiator Capacity on Temperatures, Rates of Flow and Inherent Characteristics—  
Advantages of Thermo-Syphon Circulation in Tractor Work

By E. Goldberger

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**T**HERMO-SYPHON cooling is more advantageous in a tractor than in a truck or automobile. It does away with the water pump and it gives substantially the same effect as thermostatic control in connection with pump circulation.

Counterflow radiator systems give better results than direct flow systems, because whereas in the direct flow system the temperature in a given horizontal plane is nearly constant in all rows of tubes, in the counterflow system the temperature decreases toward the front of the radiator, allowing the hottest water to come in contact with air that has already been warmed up, while the coolest water comes in contact with fresh, cold air. The result is a greater drop in temperature.

The variable which affects the cooling capacity least is the rate of water circulation. The amount of water carried in the tank can be disregarded from the standpoint of cooling capacity, as is evidenced by the fact that adding water tank capacity to an unsuccessful radiator only delays the time when the water begins to boil.

These conclusions are all reached by calculating the heat flow from basic principles. The results in practice bear out the conclusions arrived at by calculation, and by means of the formula given it is possible to accurately calculate the results that will be obtained from any given radiator having a predetermined cooling coefficient. The coefficient of cooling capacity  $K$  will differ with the type of radiator, and some experiments have been made for determining this coefficient, notably by the Holt Mfg. Co., Peoria, Ill. The method of carrying out these experiments and of making the calculations necessary to arrive at a working formula are outlined below.

The symbols used for the variables in these radiator calculations are as follows:

$H$ , B.t.u./min., heat dispersed by radiator per min.

$W$ , lb./min., water circulated per min.

$A$ , cu. ft./min., air circulated per min.

$T_{w_1}$ ,  $T_{w_2}$ , deg. Fahr., average temperature of water on entering and leaving the radiator.

$T_{a_1}$ ,  $T_{a_2}$ , deg. Fahr., average temperature of the air entering and leaving the radiator.

$v$ , ft./min., average velocity of air just in front of radiator.

$K$ , B.t.u./sq. ft./deg. Fahr./min., specific cooling capacity of the radiator or the B.t.u. carried away per sq. ft. of radiator surface in one minute, when the difference in the average temperature between the water and the air is 1 deg. Fahr.

$S$ , sq. ft., total radiator surface in contact with the air.

The formulæ used in this discussion are given below, and are numbered for reference.

$$H_w = W(T_{w_1} - T_{w_2}) \quad (1)$$

$$H_a = 0.017A(T_{a_1} - T_{a_2}) \quad (2)$$

$$H_s = SK \frac{T_{w_1} + T_{w_2}}{2} - \frac{T_{a_1} + T_{a_2}}{2} \quad (3)$$

$$H_w = H_a = H_s = H \quad (4)$$

$$H = \frac{1}{\frac{1}{SK} + \frac{1}{2W} + \frac{1}{0.034A}} \quad (5)$$

The above formulæ are assumed in the discussion which follows and are the basis for all the conclusions reached. Those who wish to follow up their derivations will find them appended to this article.

I shall not discuss the problem as to how large  $H$  should be in order to permit of cooling a certain size and make of gasoline or kerosene engine; all we care to know at present is how many B.t.u. per minute a radiator can transmit to the air. From the form of equation (5) we can draw some very important conclusions, as follows:

The radiator is only one of the elements affecting the results, and not the most important one either; other elements under our control, such as the quantities of water and air circulated per minute are just as vital as the radiator itself.

## Water Tank Capacity

The amount of water carried in the tank can be disregarded from the standpoint of cooling capacity, and is not a factor in the above equations. This conclusion is not new to many engineers. However, a few years ago one of the most successful tractor concerns persisted in building its water tanks larger and larger in a vain effort to overcome excessive heating of its engines.

To be sure, if we start the engine when the water in the tank is cold, it may take 30 min. before it reaches a constant temperature, and if we double the tank capacity it may take one hour before that condition is reached; if we stop the engine every now and then and give the water a chance to cool down, as in an automobile or a truck, we avoid the overheating, but a tractor that has to stop every hour to take on cold water or wait to cool off is a failure.

## Extreme Summer Conditions

We can also see from equation (5) that after a decision has been made as to the type and size of radiator ( $S$ ), quantity of water circulated by the pump ( $W$ ) and quantity of air circulated ( $A$  and  $K$ ), all of which factors are controlled by the designer, the heat carried away will be proportional to the difference between the highest water temperature and the atmospheric temperature (which can easily be measured). Furthermore, if we expect the tractor to work under the extreme summer conditions of our climate, the atmospheric temperature must be taken at 100 deg. Fahr. and the water temperature somewhat

lower than 212 deg. Fahr. Knowing the features of the cooling system, we can easily foretell whether it will work or not under extreme summer conditions of any climate.

There is, nevertheless, the coefficient  $K$ , which has to be determined, and this can only be done by field or laboratory test (once for all) with every type of radiator, varying the velocity of the cooling air.

Such experiments for tractor radiators were undertaken (for the first time as far as the writer knows) by the Holt Mfg. Co., of Peoria, Ill., in 1915.

A water meter was built into the circuit between the radiator and engine, and temperatures were measured at the inlet and outlet of the water, to and from the radiator. These quantities being known,  $H$  can easily be figured from equation (1). However, care must be taken to determine the average temperatures by taking observations after the motor has reached a constant working temperature; the quantity of water circulated per minute will not necessarily be the same when the water meter is removed from the circuit.

#### Engine Measurements

Measurements made with the engine running steadily at full load will be more accurate than measurements at half load or less, since in the former case the temperature range of the water is greater, and any error made in the observations has a lesser influence on the error in the final results.

To solve equation (2) the quantity of air can be arrived at by measuring the air velocity with an anemometer placed a few inches in front of the radiator (in order to avoid obstruction of the air current) and multiplying it by the section of the air passage. It is a good plan to build a hood or shroud in front of the radiator, from 6 to 10 in. deep, of the same section as the radiator air passage, as this insures greater accuracy in the measurement of air flow. It is easy to measure the temperature of the air drawn in, but it is very difficult to obtain a correct average of the air temperatures as measured behind the radiator. These temperatures naturally decrease toward the bottom of the radiator, and they are not constant on a given level, so the best that can be done, if it is desired to avoid the use of special apparatus, is to figure  $T_{a1}$  from equation (2),  $H$  being known from equation (1) and the other variables measured.

By substituting in (3) all variables as measured or calculated, the correct value of coefficient  $K$  is found.

Fig. 2 shows that this coefficient increases directly with the air velocity, with practically all types of radiator, although there are great differences between the values of  $K$  for different types.

#### Example from Practice

Let us now figure out the following example:

A radiator is built with 28 sections of 3 tubes each, 26.35 in. long, of which 23.75 in. is covered with spirally wound fins. The total cooling surface figures out to  $S = 156$  sq. ft. Other factors may be assumed as follows:

$W = 270$  lb./min.

$A = 8500$  cu. ft./min.

$v_1 = 1480$  ft./min.

$v_2 = 100$  ft./min.

$v = v_1 + v_2 = 1600$  ft./min.

$K = 0.255$  B.t.u./sq. ft. deg. Fahr./min.

Water per min.

Air per min.

Air velocity with tractor stationary

Average increase in air velocity due to tractor speed

Corrected air velocity for traveling tractor

Under extreme summer conditions this radiator equipped with water pump and fan will radiate:

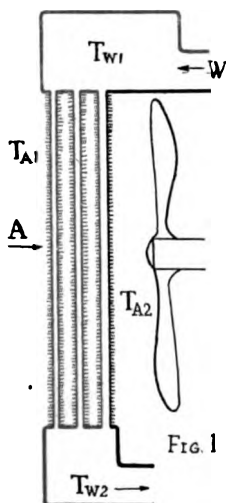
$$H = \frac{205 - 100}{\frac{1}{156 \times 0.255} + \frac{1}{2 \times 270} + \frac{1}{0.034 \times 8500}} = \frac{105}{\frac{2.500}{100} + \frac{1.85}{100} + \frac{.346}{100}} = \frac{10,500}{3.031} = 3450 \text{ B.t.u./min.}$$

On the basis of 80 B.t.u./hp./min. to be radiated, this radiator would take care of a  $\frac{3450}{80} = 42$ -hp. tractor engine.

#### Comparative Effect of Variables

In order to see to what extent either one of the fundamental variables ( $S$ ,  $W$ ,  $A$ ) affects the quantity of heat radiated, let us increase the value of either  $S$ ,  $W$ , or  $A$  by 20 per cent.

	$S$	$W$	$A$	$K$	$H$	Per Cent $H$
1....	156	270	8,500	0.255	3,450	100
2....	187	270	8,500	0.220	3,570	103.5
3....	156	325	8,500	0.255	3,500	101.5
4....	156	270	10,200	0.300	4,020	116.5



Illustrating notation

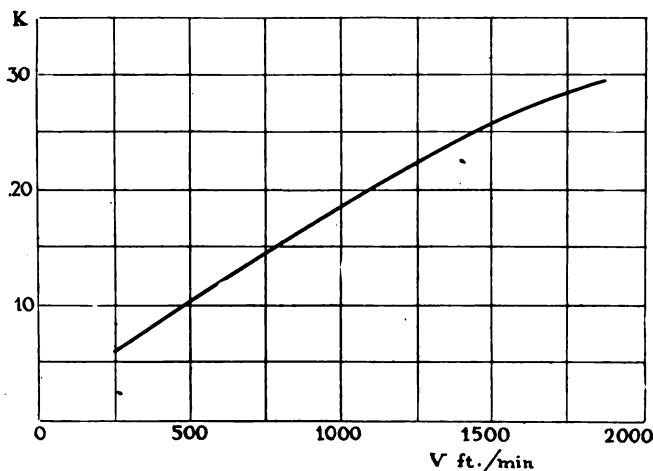


Fig. 2.

Variation of radiator coefficient  $K$  with air velocity

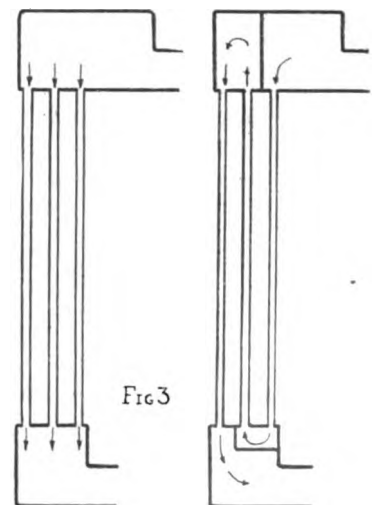


Fig. 3

Direct and counterflow circulation systems

It will be easily seen that the most important element of a cooling system is by no means the radiating surface but the quantity of air drawn in; it is therefore permissible to say that if the quantity of air passed through the radiator is increased considerably, the cooling surface can be decreased until the radiator manufacturer is left very little to do. This, however, would not be economical.

#### Thermostat and Thermo-syphon

The variable which affects the cooling capacity of the above system least is the quantity of water circulated per min. Yet, as soon as the water circulation is stopped or considerably reduced the cooling system will not transmit any heat. Upon this principle is based the thermostat used so extensively in automobiles. Making an exception of thermostatically controlled systems, the water circulation can be reduced considerably, if the air circulation is slightly increased, yet the cooling system will be just as efficient as before. This leads us to the question of the advisability of using the thermo-syphon system of water circulation in tractors.

The circulation of air through the radiators of automobiles and trucks is due chiefly to the comparatively high speed on the road, while the fan is supposed to take care of the reduced need for cooling when the car is stopped and the motor runs idle; in this case, if in addition to the reduced air supply the water supply were small, the system would not be able to cool the engine even at that reduced load, and much less when a truck is running at low speed with a full load. Therefore most of the automobiles have a forced, large water circulation. Conditions are entirely different on a tractor. The fan is supposed to furnish all or nearly all of the air necessary for cooling, and if the thermo-syphon system is built to work satisfactorily at full load, it will work just as satisfactorily when the tractor is not traveling at all. The thermo-syphon system is, therefore, more advantageous in a tractor than in a truck or automobile; it does away with the water pump and gives the same effect as thermostatic control.

#### Specific Cooling Capacity

Special attention must be called to the fact that what distinguishes a good radiator from a poor one is the value of  $K$ , the specific cooling capacity at varying air velocities; this curve is the characteristic of the radiator. Radiators should not be bought per pound or per square foot or per foot, but per unit of cooling capacity.

The radiator above referred to and its specific cooling capacity ( $K$  curve) did not prove entirely satisfactory, and the new size of tractor manufactured by the concern is fitted with a honeycomb radiator.

#### Direct and Counterflow Radiator System

Even with a given type, size and number of tubes, etc., the results can be changed by varying their distribution. Experiments were made with a radiator having its tubes arranged in three rows. The first time, the water passed downward through all of them, while the second time the section headers were cast so that the water passed downward in the tubes nearest the engine, upward in the middle ones and downward again in the front ones. The specific cooling capacity  $K$  was increased and the cooling effect was generally improved, the explanation being as follows:

In the first case the water temperature in the same horizontal plane is nearly constant in all three rows of tubes, while in the second case the temperatures decrease toward the front; i.e., the hottest water comes in contact with the air that has already been warmed up some-

what, but the coolest water in the front rows comes in contact with the fresh cold air. The result is a greater drop in the temperature. This principle has been applied successfully to steam engine condensers for a long time, and because the air flow and water flow have opposite directions it is called the counterflow system.

With tubular types of radiator based on either the direct or counterflow system, the cooling capacity of the front tubes is the highest, and the capacity of succeeding rows decreases step by step.

#### Number of Rows in Tubular Radiators

This is due to the fact that the temperature of the cooling air increases as it penetrates the radiator. Therefore, the average cooling capacity ( $K$ ) of the whole radiator is smaller the greater the number of rows. Whether three or four or five rows are the most economical, depends upon the type of tubes and available frontal area.

The equations given above are based on the laws of physics and have been verified by test. The physical laws involved are as follows:

a. The rise or drop in the temperature of liquids is proportional to the heat absorbed or lost. Thus the temperature of 1 lb. of water increases 1 deg. Fahr. for every 1 B.t.u. absorbed; hence for our case:

$$H_w = W(T_{w_1} - T_{w_2})$$

b. The same law applies for the air, the temperature of 1 cu. ft. of air increasing 1 deg. Fahr. for every 0.017 B.t.u. absorbed, hence:

$$H_a = 0.017A(T_{a_2} - T_{a_1})$$

c. When a fan is used to move the air, as in the case of radiators, all heat is transmitted from the water to the radiator wall, then through the wall and finally is given up by the wall to the air and dispersed by convection. Thus the amount of heat that passes through the wall increases in direct proportion to the cooling surface and to the difference in temperature between the water (inside) and the air (outside).

$$\text{The average air temperature is } \frac{T_{a_1} + T_{a_2}}{2}$$

$$\text{The average water temperature is } \frac{T_{w_1} + T_{w_2}}{2}$$

Hence the average difference is

$$= \frac{T_{w_1} + T_{w_2}}{2} - \frac{T_{a_1} + T_{a_2}}{2}$$

In order to express the heat that passes through the radiator walls in B.t.u. per min., the product of radiator surface and average temperature difference must be multiplied by a coefficient  $K$ , which expresses the amount of heat transmitted to the air in one min. per sq. ft. of cooling surface and for 1 deg. Fahr. difference in temperature. The equation then reads:

$$H_s = SK \left( \frac{T_{w_1} + T_{w_2}}{2} - \frac{T_{a_1} + T_{a_2}}{2} \right)$$

This coefficient varies with the type of radiator, but once the type is determined, it is found to be independent of either temperature of air or water, or the rate of water circulation, the only factor affecting it being the speed of the cooling air, as will be described later.

d. Since the amount of heat lost by the water ( $H_w$ ) is the same as that passing through the radiator walls ( $H_s$ ) and also the same as that finally carried away by the air ( $H_a$ ), we can write:  $H_w = H_s = H_a = H$ .

e. In the following formulas eliminations and substitutions will be made in order to express the quantity of heat in terms of such variables as are under our control. Eliminating  $T_{w_2}$  and  $T_{a_2}$  from (1) and (2) we find:



$$T_{w_2} = T_{w_1} - \frac{H}{W}$$

$$T_{a_2} = T_{a_1} + \frac{H}{0.017A}$$

and substituting these values in (3) we get:

$$H = SK \left( T_{w_1} + \frac{T_{w_1}}{2} - \frac{H}{W} - T_{a_1} + T_{a_1} + \frac{H}{2} - \frac{0.017}{2} \right)$$

$$= SK \left( T_{w_1} - \frac{H}{2W} - T_{a_1} - \frac{H}{0.034A} \right)$$

$$\frac{H}{SK} = T_{w_1} - T_{a_1} - H \left( \frac{1}{2W} + \frac{1}{0.034A} \right)$$

$$H \left( \frac{1}{SK} + \frac{1}{2W} + \frac{1}{0.034A} \right) = T_{w_1} - T_{a_1}$$

$$h = \frac{T_{w_1} - T_{a_1}}{\frac{1}{SK} + \frac{1}{2W} + \frac{1}{0.034A}} \quad (5)$$

This formula can be transformed to apply to 1 hp. developed by the engine by denoting by  $h$ ,  $s$ ,  $w$  and  $a$  the heat radiated, radiator surface, quantity of water and quantity of air per horsepower respectively. The formula will then read

$$h = \frac{T_{w_1} - T_{a_1}}{\frac{1}{sK} + \frac{1}{2w} + \frac{1}{0.034a}}$$

This formula can be easily transformed to give the radiator surface  $s$  as a function of all other variables.

An expression for the radiator frontal area has been derived by A. B. Modine, of the Modine Radiator Co., and was given by him in a paper read at an S. A. E. Minneapolis Section meeting. The expression is derived from equation (2) above, and does not take into consideration the influence of the rate of water circulation and its temperatures. Every one of these variables affects the difference between the air temperatures in a way which cannot be expressed easily, except through the above equations.

## Counting Engine Parts

Editor AUTOMOTIVE INDUSTRIES:

I have read with interest the article on the Hispano-Suiza motor. It seems to me that the introductory paragraph is a slight indulgence in "sharp practice." I quote the following: "It is said that the Mercedes aircraft engine has approximately 900 parts to 400 in the Hispano-Suiza." This sentence does not say that 900 parts is approximately the total pieces composing the Mercedes, or that 400 pieces is the total making up the Hispano-Suiza motor. But how many will read this sentence in terms of total instead of a ratio?

I will assume that reference is made to the Mercedes six-cylinder dual or four-valve motor, and to the Hispano-Suiza eight, as per illustration.

It is possible that I do not know how to count parts of a motor; therefore, I will state my idea on this matter. Motor parts must include, in addition to the special parts, all screws, studs, nuts, lockwashers, cotterpins and gaskets. We will count the connecting-rod staff as one part, for the benefit of the pressed steel rodmaker as an encouragement to him. I think it proper to exclude all accessories, except the radiator fan, for the reason of making a fair comparison between the gear-driven and the belt-driven fan.

Let us now count a few of the parts of the Hispano-Suiza motor: Bolting the cylinders to the crankcase, it appears from the illustration, requires eight studs per cylinder.

For 8 cylinders equal a total of .....	64
Lock washers or cotterpins .....	64
Nuts .....	64
Cylinders .....	8
Valve assembly (5 pieces), 16 assemblies .....	90
Connecting-rod and piston assembly per units in pairs equal .....	156
Total .....	428

You will admit that the above items are only a starter as compared to the total parts actually required to make a complete assembly of the Hispano-Suiza motor.

My interest in this article is due to the fact that I expect to soon announce a twelve-cylinder design, on aircraft lines, that requires about 800 pieces to make a complete assembly, counting as above stated.

C. M. MOHLER.

## Book Review

*The Gasoline Automobile*. Volume 3, Electrical Equipment. By P. M. Heldt. P. M. Heldt, Nyack, N. Y.

The third volume of the *Gasoline Automobile*, dealing with the electrical equipment, follows closely the style of the two previous volumes, which dealt with the engine and chassis construction, development and design. In the present volume, all sorts of ignition, starting, lighting and other electrical equipments are gone into in the most minute details, and not only the action and operation of the device is described, but also a considerable amount of engineering information, formulas, shorts, etc.

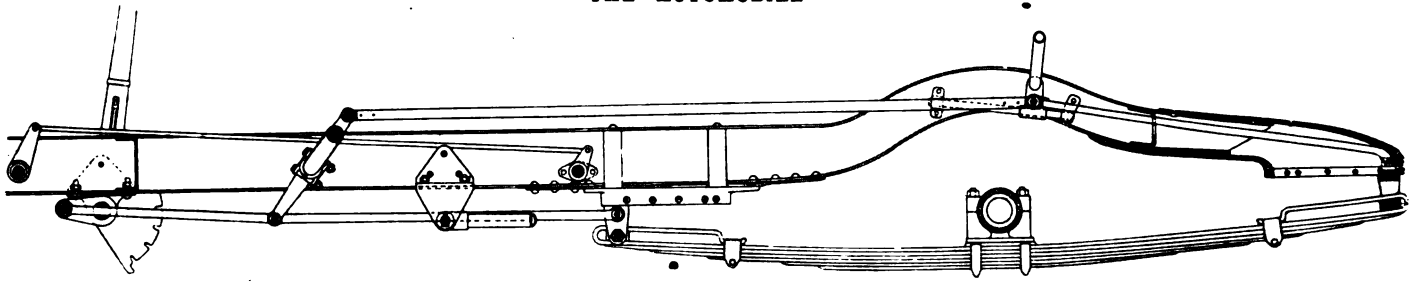
Like the other two volumes in the set, the present volume was written mainly to meet the needs of automotive engineers and students of the science and art of automotive engineering. However, the third volume differs somewhat from the two preceding ones both in method of treatment and in the scope of its appeal. There are in the country at present a large number of managers and employees of garages and service stations who have to take care of electrical apparatus, and it has been the author's aim to incorporate in the book such material as is required to make it serve them as a practical hand-book of their trade.

What will probably appeal most to the reader, who is connected with a garage or service station, are the sections on the maintenance, care and repair of the different items of electrical equipment. In dealing with these subjects the aim has been to make the information given of as wide application as possible, and always to explain the underlying reasons for defective operation observed and for remedies applied.

Much of the material in this book was originally prepared and run as a series of articles in *Horseless Age* during 1914 and 1915. The publishing rights have now been secured, and the material has been revised and brought up-to-date.

## Paper Driving Belts

PAPER substitute driving belts are now being introduced into German workshops, and some particulars of them are given in the *Bulletin des Usines de Guerre* for July 1. The paper is cut into narrow bands, which are then spun. The belts are made by weaving or braiding. Woven-paper belts are of two kinds—paper fabric belts and paper thread belts, the former type being the most frequently used. The fabric is first cut into bands 40 m. long, which are subsequently made up according to the desired width and thickness. A core of strengthening material is interposed, either cotton or sheet metal, though more recently these cores have consisted of paper thread and metal wires interwoven. The core is surrounded with the paper strips and the whole sewn with strong thread. Belts so prepared are said to be very flexible and to wear satisfactorily. Woven paper belts have a tensile strength of from 100 to 125 kilos. per centimeter of width.



## Houdaille Brings Out Adjustable Car Suspension

Inventor of Shock Absorber Fame Turns His Attention to the Spring Suspension Problem—By Moving the Points of Attachment of the Springs to the Car Frame, Car Suspension Can Be Rendered Independent of the Load

By F. W. Bradley

ONE of the greatest obstacles to obtaining perfect car suspension is that road springs have of necessity to be calculated for a fixed load, while in practice they work under constantly varying conditions. The best suspended car is a racing machine, for here the distribution of weight is calculated to a nicety and modified by practical tests on the road and, with the exception of the gasoline in the tank, the load on the springs is constant. At the other end of the line is the 5-ton truck, the springs of which may be carrying a load of 18,000 pounds at one moment and at the next not more than half this amount. This explains why, even with the addition of springs and pneumatic tires, it is difficult to make a truck or a motor omnibus as comfortable as a touring car.

But even in the touring car class conditions are not ideal, and the lighter the car, or the lower the ratio of dead load to useful load, the more difficult is the task of the spring maker and designer. Every driver is aware that in practically all cases a car with its full complement of passengers rides more comfortably than when only the driver is aboard. So important is this that under certain road conditions the maximum average speed is determined more by the suspension than by the engine. Examples of this can readily be found on war-worn French roads. One particular instance may be cited. On a certain stretch of hard macadam road which had been badly worn by heavy army traffic and scarred by an occasional shell, the fastest cars were not those with the highest maximum speed, but those with the best suspension. In other words, certain cars with small engines but excellent general suspension made better time over this bad stretch than other cars with bigger engines but poor springs.

Usually, in touring car practice, the bigger the car the better the suspension. This arises from the fact that the variation in spring loading is much less in the case of the big car than for the small

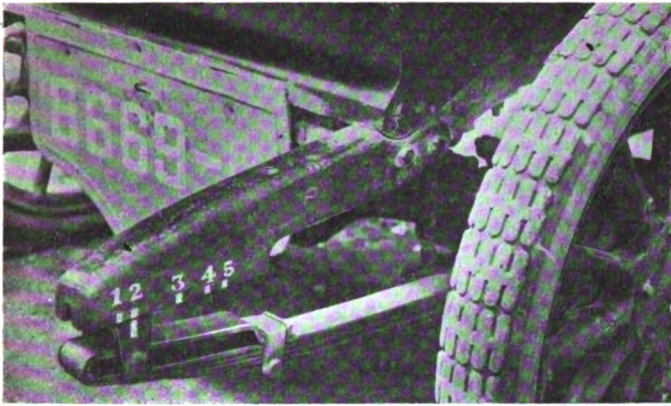
vehicle. A very light five-passenger touring car, having a load on the springs of 1700 lb. (this comprises frame members, engine, transmission, body and accessories) will carry a useful load of 750 lb. (five passengers at 150 lb. each). The maximum useful load put on the springs is about 44 per cent of the fixed load, and the minimum useful load is about 9 per cent of the same.

### How Load on Springs Varies

In the case of the big, powerful car, carrying a heavy limousine body, the fixed weight on the springs may run as high as 4000 lb., while the useful load, as represented by five passengers, will still be 750 lb. This represents 18.7 per cent of the invariable load. With only the driver in the car the useful load of 150 lb. represents 3.7 per cent of the fixed load. This difference, in the case of the big car, is of such small proportions that if easy riding is obtained with the maximum useful load aboard, the riding will not be appreciably hard when only one man is carried. In the case of the light car, however, it is practically impossible to assure easy riding with the



Ten-horsepower Renault car fitted with Houdaille adjustable suspension (adjusted for full load)



*Showing numerals on spring horn by which adjustment for different numbers of passengers can be made*

maximum load and the same degree of comfort when 35 per cent of the load has been removed.

With a view to securing the same degree of comfort, whether the load be the minimum of one passenger, or the maximum of five or six, M. Maurice Houdaille has produced a device which was patented in all countries before the war, and has been brought to the production stage during the past few months. Mr. Houdaille is a French inventor well known beyond the limits of his own country by reason of his shock-absorbing devices.

### Stiffness of Spring Varied

By this device Mr. Houdaille increases the stiffness of the spring as the load is increased; inversely, he renders the spring more flexible as the useful load is decreased. The adjustment is so made that the vertical distance between the spring center and any fixed point on the chassis frame is invariable, whatever the load.

This result is obtained in a very simple manner. Instead of a fixed eye at each extremity of the master leaf of the spring, there is an elongated groove within which the spring bolt can be moved by means of a suitable mechanism (lever or wheel) placed conveniently to the driver's hand. A glance at the illustrations will make the construction clear. With the minimum load the two eye bolts of each rear spring are at the outer extremities.

As passengers are added, the two bolts are brought closer together, that is to say, nearer the axle, thus stiffening the spring. Thus, instead of the spring "flattening" as passengers get into the car, it retains the invariable curvature at which it can best do the work required of it. The invention does not change the appearance of the car to any appreciable degree. The links by means of which the spring eye bolts are moved in their grooves is carried inside the frame members and connected up to a lever placed near the driver's right hand. It is obvious, however, that there are several mechanical means of obtaining this movement, and that a wheel might be used instead of a lever.

This device is not an accessory to be added to the car in the same way as a shock absorber or a spring buffer. It is necessary for it to be incorporated in the design, in order to get the best results. Also, it does not allow of the drive being taken through the springs.

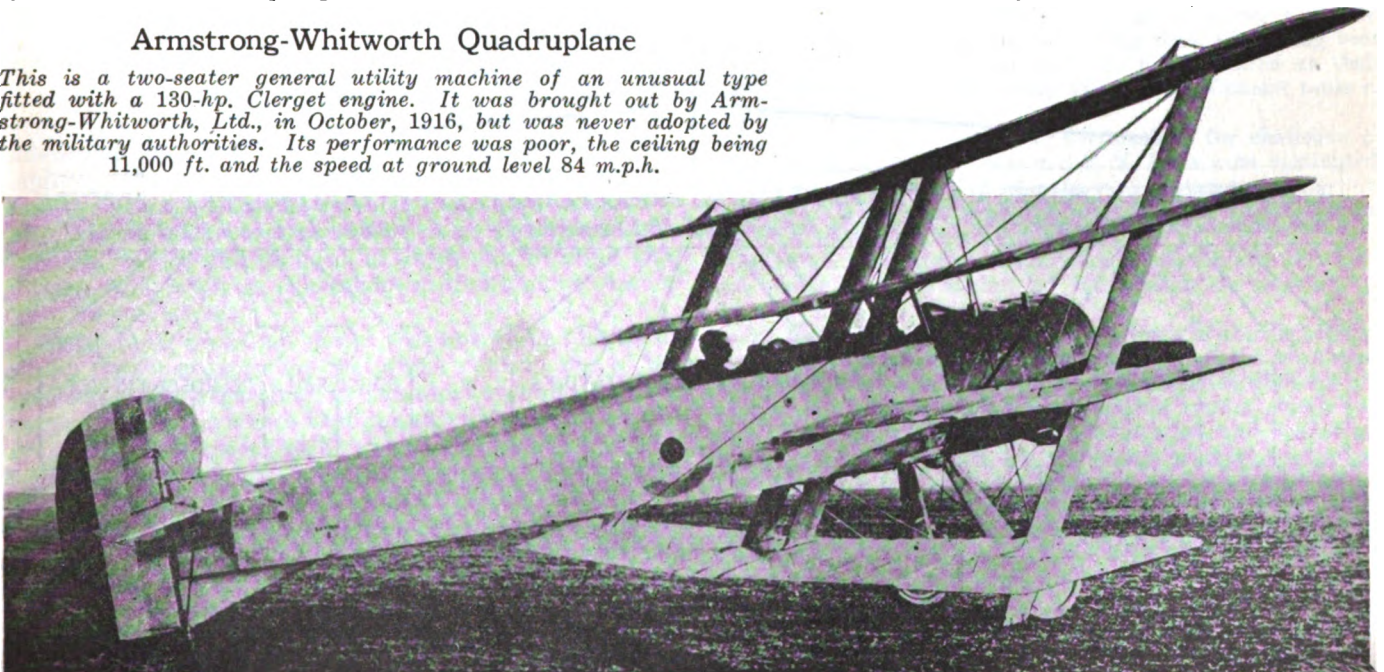
### Device Tried Out on Renault

All the experimental and demonstration work in connection with this invention have been carried out on a Renault 10 hp. light touring car. The front springs remain unchanged; the rear springs have had the fixed eye changed for elongated grooves and the main bolts are movable in these grooves by means of suitable links and a side lever. Five positions are obtained, corresponding to 1, 2, 3, 4, 5 passengers. As a practical demonstration, I took this car on some of the granite paved roads in the suburbs of Paris, these being roads paved with rough granite blocks laid on a poor foundation and constituting, undoubtedly, the most destructive road surface to be found in Europe.

With only two persons aboard the lever was set so as to give the springs their maximum degree of stiffness; in other words, the springs were in the condition designed by Renault and were suitable for carrying 5 passengers. With this setting the car rode "hard" on the better stretches of road, while on the rough stretches it danced about in a manner painful for the riders and destructive to the whole mechanism. Pulling over the lever so as to correspond to the two passenger position, the same stretch of road was covered at the same average speed. The difference was so pronounced as to leave absolutely no doubt as to the efficiency of the device.

### Armstrong-Whitworth Quadruplane

*This is a two-seater general utility machine of an unusual type fitted with a 130-hp. Clerget engine. It was brought out by Armstrong-Whitworth, Ltd., in October, 1916, but was never adopted by the military authorities. Its performance was poor, the ceiling being 11,000 ft. and the speed at ground level 84 m.p.h.*





# Real Labor Representation

Plan of the Midvale Steel & Ordnance Co. Analyzed and the Reasons  
for Its Success Pointed Out—Based Upon  
Political Organization

By Harry Tipper

**I**N CONSIDERING the type of organization which should be created within the industrial unit to exercise those judicial and legislative functions which cannot be taken care of adequately by the executive organization, it is evident that the character of the industry and the different occupational requirements of its work will have considerable bearing upon the actual plan.

The contracting field, with its movement from job to job, and the difficulties attending the maintenance of the stable organization, presents an entirely different problem from the iron and steel industry, or the machine shop.

Where the labor problem is concerned with large industrial units governing to a considerable extent the local social conditions, the breadth and simplicity of the requirements will enable the manufacturer to establish an organization made up along somewhat similar lines to the political organization of this country.

Where the occupational requirements are sharply divided within the organization, and there is considerable social difference corresponding to these definitions, the organization which shall treat all employees with proper regard to the requirements of the case must take on a more complex character.

Where the character of the industry is such that there are no local units around which all or most of its productive activities center, the requirements of the matter

will favor a different type of organization from either of the preceding.

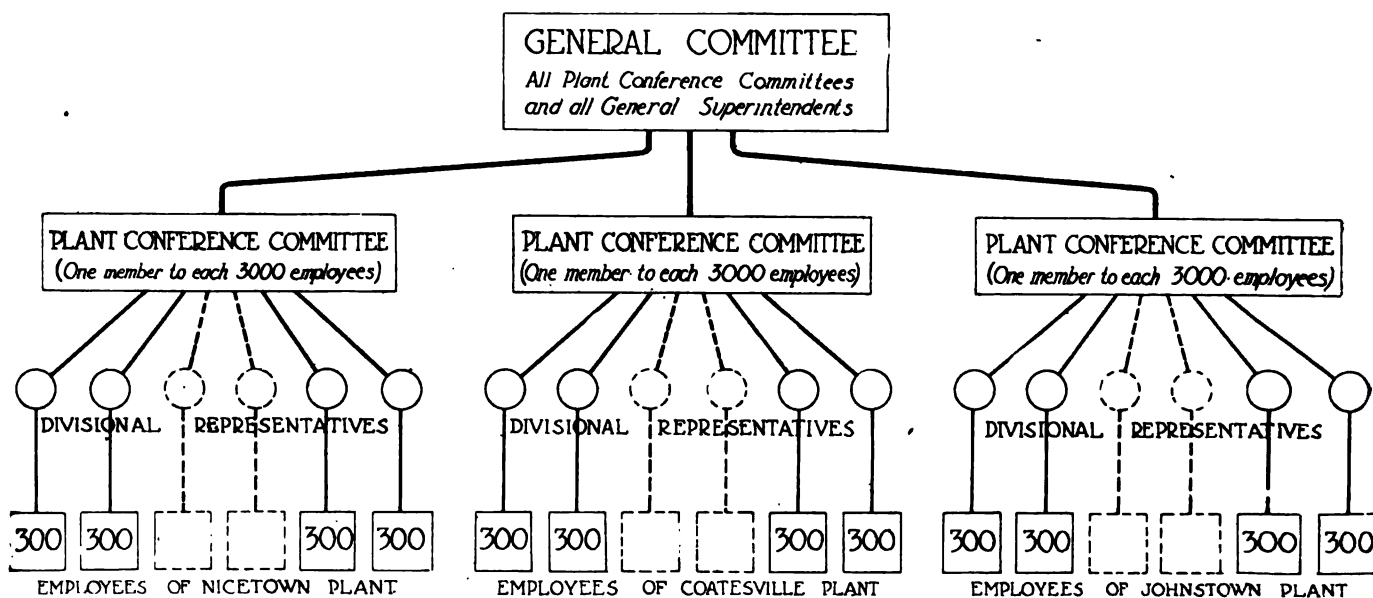
In the railroad field, for example, where one industrial organization deals with many localities, and where the very character of the business removes it to some extent from local considerations, methods which can be employed by factory units would not meet all the requirements of the case.

It is logical that in this field occupational labor organizations of a national character should secure great power, as the very character of the business ties the local bodies together in common desires and necessities to a much greater degree than in other industrial operations.

## Conditions Govern Organization

In considering specific plans which have been worked out by a particular manufacturing organization, it is necessary to pay some attention to the conditions in the industry with which the organization in question is concerned. What may be of value in the iron and steel industry would probably require modifications in order to be put into practice in the textile field.

The governing principles, of course, are the same no matter what varying forms individual practice may have suggested, but a proper distinction must be made between the principles involved and the modifications in the application of the principle which have arisen out



### GENERAL PLAN OF THE MIDVALE STEEL & ORDNANCE CO.

For general legislative purposes, joint quarterly meetings of all elected representatives and officials of the company are held. Judicial procedure in the adjustment of special grievances is from the employer to Division Representative, from Division Representative to Plant Conference Committee, to Joint Committee of Plant Conference and General Superintendent and from this committee to the General Committee

of the traditions of the organization and the special requirements of the industry.

For this reason a discussion of any plan which has been instituted as the result of experiments in any individual industrial organization will be accompanied with some comment from the conditions in that particular field, and the effect which such conditions may have had upon the application.

It is usual, however, for the differences in application to emphasize themselves in the consideration of changes or departures from custom, and it will be found that the similarities will greatly outweigh the differences in all cases. It should be thoroughly understood, therefore, that the details of the plan presented for consideration, which may not be applicable in any one's case, should not be allowed to militate against the value of the general experiment, or to obscure the fundamental character of the changes.

### Organization Must Start Small

It is perhaps wise at this time to point out that organization as a growth must have its beginnings in the small thing. The machinery of a new organization should be founded so solidly upon known principles of organization that it will be capable of adapting itself to the larger requirements. But it is wise that the work specifically called to its attention should be of such a character in the beginning that it will have an opportunity to stabilize itself, strengthen itself, and carry its roots firmly into the business, before requiring it to attempt the solution of the largest and most difficult problem.

Some little time ago in the first part of this series of articles reference was made to the announcement of the Midvale Steel & Ordnance Co. in regard to its plans for the establishment of a co-operative organization within its own industrial unit. Since that announcement was made the first meetings have been held, the machinery of the organization has been established, and a part of its work begun. While the machinery of this organization differs in some important particulars from experiments established at an earlier time, it will be seen that it provides the opportunity for the settlement of the matter specifically mentioned, not only but also for the disposition of many other matters as the organization welds itself together and develops its functions through the process of its own operations.

### Better Operating Discipline

It is also necessary to point out that such machinery properly organized and operated so as to gain the confidence of the workers results in a better operating discipline. The fear which is frequently expressed by the employer that the establishment of legislative machinery and the allowance to the worker of a share in the responsibility for the decision affecting his working conditions, will result in a breakdown of discipline, has no basis in fact at all.

Instead of breaking down the operating discipline which is so necessary for the proper continuance of the production, the experience of individual organization contains plenty of evidence that the discipline has been increased by the incentive of responsibility and the consent which comes from a larger measure of understanding.

In the plan of the Midvale Steel & Ordnance Co., which is shown graphically in connection with this article, the only stated purpose is to provide a judicial means for taking care of the individual grievance and the individual complaint. There is nothing in the announced constitution of this machinery which specifically concerns itself

with the settlement of the wage question, the hours, and other general economic conditions about which the labor union has so far concerned itself almost entirely.

It should be noted, however, that the organization as it has been established does provide machinery thoroughly applicable to these larger necessities. The fact that these matters are not mentioned in the plan should not therefore be allowed to limit its usefulness in the eyes of those who are primarily interested in the provision of organization machinery to dispose of these important questions.

It is evident that the Midvale Steel & Ordnance Co. has had in mind the necessity for limiting the purposes of the organization in its early stages so that it shall have an opportunity to get together and operate upon questions which are comparatively small; that is, upon questions which do not affect the general body of the workers, and upon which the habit of free discussion and proper agreement can be developed without some big question wrecking the newly formed organization machinery.

### May Be Grave Mistake

It would be a grave mistake if such an organization were formed during the heat of controversy upon a general grievance and expected to deal properly with that grievance. The matter would touch the newly elected representatives too nearly. It would be affected too seriously by the strangeness of the individual in his new surroundings, and it would be too crucial a test. It is much better that the organization should be formed for stated purposes which are just as important, but which do not immediately affect the general welfare of the whole body of workers, nor the general financial development of the whole industrial unit.

The plan adopted as a result of the announcement made by the Midvale company to its workers was the final agreement of a conference between a committee of workers chosen from among the elected representatives of the employees, and the vice-presidents and general superintendents of the three plants of the company. The record of this meeting is sufficiently interesting to be included in this article.

The proceedings at these meetings were as set forth in the following extract from the minutes:

The meeting was called to order by Mr. Wm. B. Dickson, vice-president of the Midvale Steel & Ordnance Co., who addressed those present congratulating them on having been honored by their fellow-workmen by being elected as their representatives; and welcoming them to the Council table of the company.

Mr. Dickson then called for nominations for chairman of the meeting. John E. Koontz and F. X. Faas were nominated. On a show of hands Mr. Koontz was declared elected. On motion of Mr. Faas, properly seconded, the nomination of Mr. Koontz was declared unanimous.

Mr. Koontz called for nominations for secretary. Mr. Faas was nominated and elected for the position as secretary of the meeting.

For the purpose of facilitating the work of the conference, Mr. Dickson presented for the consideration of the employees' representatives, a tentative draft of a proposed plan for the purpose of establishing a representative system, which will provide a regular means of communication and conference between the officials and the employees of these companies. (In presenting this tentative draft, Mr. Dickson made it plain to the representatives that this was done not with any purpose of unduly influencing their action, but only to give some basis on which to proceed with the work in hand. As a matter of fact, the draft was amended in several important respects before final adoption.)

This draft was submitted, item by item, to the votes of the

(Continued on page 1010)

# Apparatus for Checking Screw Threads

## Machines Used in Inspecting Plug and Ring Thread Gages and Similar Threaded Parts Requiring Great Accuracy—Methods of Operation

**O**WING to the exigencies of war, much work has been done in recent years in the development of devices for inspecting and checking the accuracy of screw threads. The need for close inspection arose from the fact that threaded parts made in one factory had to fit parts made in another factory, and unless the threads were held within very close limits, this requirement could not be met. In the shop it is customary to use "go" and "no go" plug gages and ring gages and these gages necessarily must be subjected to a very rigid inspection.

The first instrument used for checking threaded parts as to diameter was the thread micrometer. However, as the Government departments used a more refined system of measurement, many thread gages which had been inspected by means of the thread micrometer and passed at the factory were rejected. The next step in measuring pitch diameters was the use of the wire system, two or three wires of standard sizes being placed in the thread on opposite sides of the screw, and a micrometer measurement taken over them. However, the way this system was applied in the beginning, by fastening the wires in place by means of rubber bands strung over their ends, which bent or bowed them, not sufficiently accurate results were obtained.

Gradually machines have been worked out by means of which the various systems of measurement evolved can be applied so as to insure the most accurate and rapid results. The angle of the thread is now generally measured and its contour studied by means of a projection machine. This consists essentially of a fixture for holding the thread profile in front of a stereopticon lamp, so that a greatly magnified shadow of it is thrown upon a screen, where it can be carefully studied and the angle accurately measured.

### Two Types of Projection Machines

There are two general types of machines of this kind on the market. One of them is a machine of great length, in which the projecting apparatus is mounted at one end, and the screen upon which the shadow is cast, at the other, some 25 ft. away. In the other type of machine the image of the screw profile is thrown upward against a reflector suspended from the ceiling, this reflector throwing the image down onto a screen located close to the operator. The advantage of this type of machine is that one man can at the same time adjust a specimen, focus the light, and read off the result on the screen close to him. It is also obvious that much less floor space is required with a machine of this type.

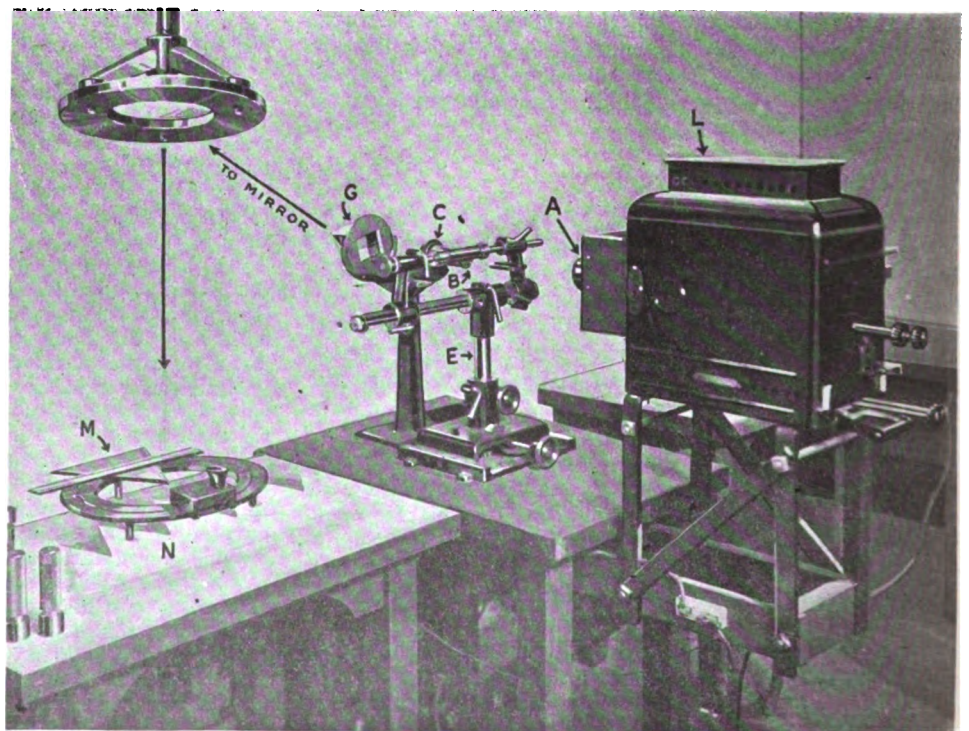
A projection apparatus of a type designed by the Bureau of Standards, Washington, D. C., is manufactured by the Arthur Knapp Engineering Corporation, New York. An illustration of this device is shown herewith. The general principle of the device is as follows:

The threaded part (gage) to be examined is placed in a beam

of parallel light, and by means of a suitable lens system, the shadow cast by the part is projected on to a screen. The field of parallel light rays is obtained from an inclosed arc lamp in a lamp housing *L*. The light from this lamp passes through the condensing lens *A* in the direction of the projecting lenses *B* and *C*. The screw to be examined is placed at the focus of the compound lens *B-C*, and the light is directed upwards by means of prism *G* to the mirror which is supported about 10 ft. above the prism. The mirror throws the beam of light down onto the top of stage *N*, which forms the screen and carries the standard angle *M* used in the examination of the thread form. In order that the shadow cast by the screw will be a true cross-section of the thread form, it is necessary that the parallel beam of light pass through the thread at the helix angle. To make it possible to give the beam of light the proper direction, the lamp housing carrying the condensing lens *A* is pivoted about a point beneath the lens *B*. This insures that the beam of parallel light from lens *A* will always be directed at and fill the lens *B*.

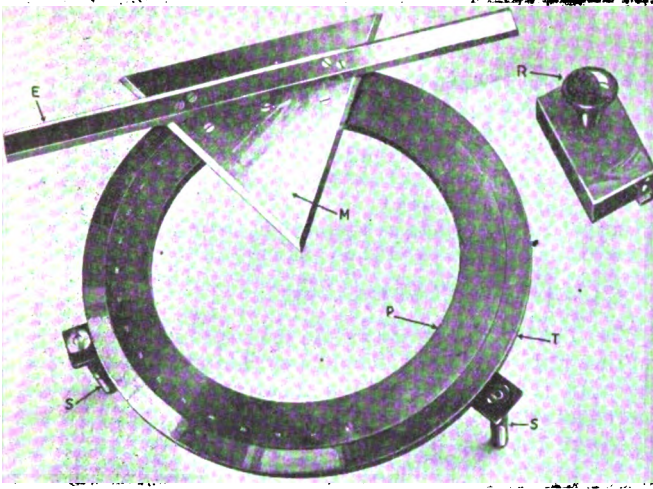
### Method of Adjusting Test Gage

Three different adjustments are provided on the stand *E*, one for raising and lowering the screw or thread gage, to be inspected, another for focusing the thread, and a third for moving the thread in the direction of its axis, so as to permit various portions of it to be brought into the center of the screen. The gage to be examined is supported on spring centers on the stand *E*. For convenience in making observations, the gage is raised until the center of the beam of light passes the under side of the thread. Lamp *L* is then turned about the axis of its support until the parallel rays of light from lens *A* pass through the helix angle, which is the case



Set-up of projection machine. Notice the shadow of the thread on the table under the protractor





*Bevel protractor used with projection machine*

when the fringe pattern, formed about the image of the screw owing to imperfect focus, is symmetrical. The gage is then brought into focus by a slow motion device, and the required adjustments are complete.

#### Bevel Protractor

In the examination of the thread angle, use is made of a bevel protractor, also designed by the Bureau of Standards. The standard 60 deg. angle *M* is supported by three columns *S* on the stand *T*, on which rests a protractor ring *P*, carrying the standard angle *M* and the straight edge *E*. In making an inspection of the angle, the standard angle *M* is so adjusted that its shadow coincides with the light space of the projected image, on the surface of the table below. The standard angle *M* is revolved until one of its sides coincides with the shadow of the thread, and the reading of the graduated head is taken through a magnifying glass *R*. By means of a slow motion device on the stand *E*, the gage is then shifted parallel to its axis until the image of the other side of the thread approximately coincides with the other side of the standard angle. By means of a slow movement of the graduated ring, the standard angle is then revolved until it lines up with the other side of the thread, after which a reading of the graduated circle is again taken. The difference between the two readings shows directly the error of the included angle of thread.

By means of the protractor arrangement it is also possible to determine whether the thread is symmetrical about a line perpendicular to its axis. To this end the standard angle is revolved until either side is parallel with the crest of the threads, or else the straight edge *E*, which is perpendicular to a bisector of the standard angle, is placed parallel with the crests of the thread.

#### Accurate Results Claimed

It is claimed that by means of this shadow protractor very much better results can be obtained than by means of a protractor placed directly on the shadow. The reason for this is that by this method two objects of similar character, viz., two shadows, are presented to the eye. In adjusting the gage for a reading, the shadows of the thread and gage are made to approach, and the protractor is angularly adjusted until only a faint, even thread of light remains between the two. Under these conditions, an inaccuracy of a few minutes is easily detected. As regards the quickness with which observations can be taken, it is stated that it requires from one to 10 min. to measure the angles of the thread, depending upon the finish and straightness of the size of the threads being examined. Where the threads are particularly defective, their projection may be recorded on photographic developing paper in order to obtain a permanent record. For this the required time of exposure must be determined experimentally.

Another use to which this projecting lantern may be put is that of measuring profiles and determining the radii of circular arcs. In doing this kind of work, the image of the

profile is thrown on a sheet printed with concentric circles, with radii varying by tenths of an inch. The shadow can quickly be matched with the proper circle, and the radius can then be determined by dividing the reading taken by the scale of magnification. The method is especially applicable to the determination of small profiles having angles which cannot be read by any other means. Irregular shaped profiles may be checked up by means of the micrometers on the gage holder, the result being plotted on a large scale with the co-ordinating dimensions of the two micrometers. The object is moved so that its projected outline passes over a point on the screen, and micrometer readings are taken for any required number of positions.

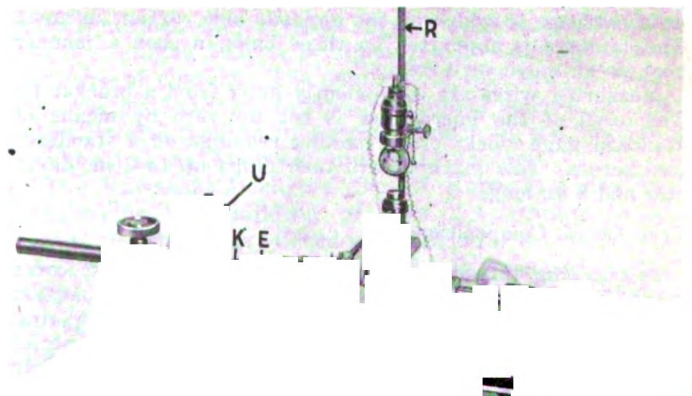
#### Determining Scale of Magnification

The scale of magnification may easily be determined by throwing the image of an object of known dimensions on the screen and measuring the same. Thread measuring wires will serve this purpose very well. For instance, if a wire of 0.1 in. diameter casts a shadow of 5 in. diameter on the screen, the magnification is 50. Therefore, the dimensions of any other object projected on the screen can be determined by dividing the size of the image by 50.

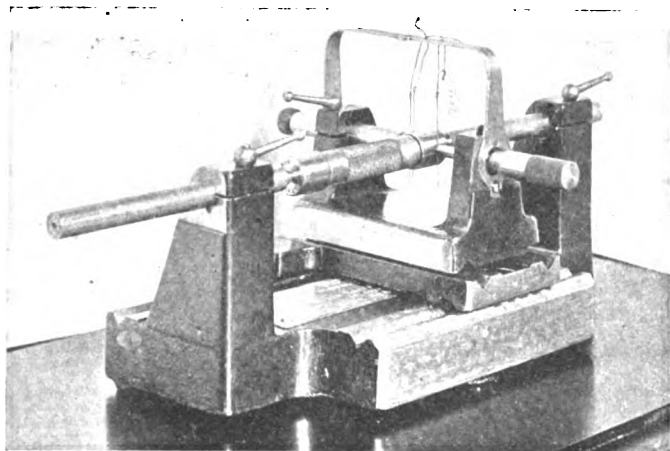
In order to obtain the most accurate results, everything must be properly adjusted. The reflecting mirror should be directly above the image which it throws on the screen, and this point can be verified by means of a plumb line. By means of the adjustable prism mounting, the light beam can be moved over a wide area, and no difficulty is found in throwing it directly on the mirror above. In order to obtain a parallel beam of light from the condensing lens *A*, the latter must be properly adjusted with respect to the arc lamp. To test this, a cloud of smoke from a pipe or cigar is blown into the beam emerging from the condensing lens. If this beam is of even size, as far as can be determined by the eye, the rays are sufficiently parallel for the purpose of a measurement. When the lamp is improperly adjusted, the smoke reveals diverging or converging rays. The proper condition is arrived at by moving the condensing lens closer to or farther away from the arc lamp.

It is also necessary that the table or screen be perpendicular to the central line of the projection system. This can be determined by removing the projection lenses *B* and *C* and allowing the light from the latter through the condensing lens to pass straight through. An ordinary mirror should be placed on the table or screen to reflect the light thrown on the screen. When this light is thrown back into the latter, the table is perpendicular to the rays. To test this, a card is held at the condensing lens so as to cut off one half of the beams from it. When the back of the card is lighted by the returning beams, the correct adjustment has been obtained.

The Arthur Knapp Engineering Corporation also manufactures an optical lead testing apparatus based on designs



*Machine for optically determining the lead of*



*Machine for determining pitch diameters*

furnished to the Bureau of Standards by the National Physical Laboratory of England. Measurements are magnified about 20 times by a double armed lever, one arm of which is in the form of a stylus which, as the screw is moved in the direction of its axis by a micrometer device, follows the thread outline; they are further multiplied about  $17\frac{1}{2}$  times by an optical device. At the farther end of the lever is carried a lens located underneath an incandescent bulb. A fine line is ruled in silver on the bottom of this bulb, and the lens throws an image of this line onto a ground glass screen in front of the instrument.

#### Testing Pitch of Gage

In testing the pitch of the gage, the stylus *A* is brought to the bottom of the thread, the image of the line on the ground glass is brought to a fixed mark and the reading of the micrometer *S* is taken. Then the micrometer is rotated, the stylus moving to the next thread, the image is brought again to the mark, and another reading of the micrometer *S* is taken. The difference in the micrometer readings is the pitch. The machine will take a plug up to  $3\frac{1}{2}$  in. diameter and about 8 in. long.

When it is desired to measure the lead of a ring gage an equal-armed auxiliary lever is used. This is swung around so that the stylus rests in a V at one end of the lever, and an additional stylus at the other end enters the ring clamped on a face plate and is moved from thread to thread, the same as in measuring a plug gage.

Another machine manufactured by the same concern is used for measuring pitch diameter with the aid of measuring wires. The screw gage to be measured is held between centers, which in turn are held in clamps at the heads of pedestals on a base casting. A micrometer screw 9 is carried on a carriage 10 which on the opposite side carries an anvil. The carriage is supported on three balls in such a manner that it can move very freely.

Measuring wires are conveniently hung from a bracket 15. The anvil of the micrometer is set for zero by means of standard gage blocks or by making readings on a standardized screw. This machine will take plugs up to 3 in. diameter and 8 in. long.

#### Core Check Composition

In checking thread ring gages use is made of cast cores made from a composition having a known heat expansion coefficient. For examining the thread form of the ring gage, a cast is made of a segment of the gage. A special core composition is furnished for this purpose by the Arthur Knapp Engineering Co. This composition is melted in any convenient manner and by means of a ladle is then poured into the lower side of the ring gage, which for the purpose is held in a vertical position in a vise the jaws of which have been faced off so the composition cannot escape. Before pouring, the threads of the gage must be carefully cleaned with benzol in order that the cast may accurately represent the form of the thread.

## Real Labor Representation

(Continued from page 1007)

employees' representatives and, as finally amended by them, on motion duly made and seconded, was adopted in the form as shown on copy attached hereto, marked "A," and, for the purpose of identification, initialed "A," and, for the purpose of identification, initialed on each sheet by the chairman and secretary of the meeting.

On motion duly made and seconded, the meeting adjourned, to meet again, if necessary, on the call of the chairman.

#### Each Clause of By-laws Discussed

The draft of the plan for the establishment of the representative system which was adopted by this meeting was referred back to a meeting of the employees' representatives in each of the three plants. At these meetings the discussion of the by-laws was made upon each clause so that the matter was thoroughly canvassed by the representatives in each of the works and finally approved.

It is too early yet to talk about the results which have accrued from the adoption of this system by the Midvale Steel & Ordnance Company, but it is possible to discuss the plans which were adopted as to their prospective strength and weakness in the light of other developments in organization methods.

The representation of the company upon the joint committees in the different plants is confined to the general superintendent of that plant. In general industrial work such a method would be likely to result in a weakening of the organization because of the limitation of the discussion to the man who while he is responsible for the general operating policy of the plant, cannot be acquainted with all the details which might be necessary to such a discussion.

Neither is it apparent that the general superintendent has the liberty of appointing a representative to be present at a joint conference where some unforeseen circumstances prevent his own attendance. In the average factory in the automotive field it would be desirable that department managers in the plant should grow up as a part of the legislative machinery, adding their value to its discussions and gathering increased effectiveness from the understanding which comes with such discussion.

#### Should Have Regular Meetings

There is nothing stated in the organization plan as presented providing for regular meetings of the representatives or the joint conference committees in the various plants.

This must be regarded as a grave mistake because the value of the whole machinery will depend upon the establishment of confidence and mutual esteem in the minds of the men who comprise the machinery, so that as the organization is called upon to discuss the larger questions at issue, the basis of understanding so established will permit it to come to a full measure of agreement.

This is partly taken care of by the provision for quarterly general meetings, although these general meetings do not entirely fulfill the purpose. It is interesting to note that there is contained in the plan for the election of representatives a provision for the recall of a representative by the employees of any division, where two-thirds of the employees sign a petition that the representative has ceased to be satisfactory to them. It is also important to note that one of the requirements for the election as representative is that the nominee shall have been in the employment of the company for at least one year in the aggregate.

# Cultivating Japanese Automotive Field

## PART IV

### Government Is Most Successful Truck Builder—Industrial Companies Are Experimenting—Mechanical Difficulties Encountered—Shipping Charges and Customs Regulations

By Tom O. Jones\*

**T**HE most successful motor-car building in Japan to date has been the work of the Government at the Osaka arsenal in its production of twenty army trucks. In an effort to further the industry the Government has turned over its drawings to a large firm in Osaka, the Neohon Heiki Seizo Kabushiki Kaisha, a firm formed solely on the strength of an order for munitions from Russia, which has now been filled. The Government has asked this company to build one or two sample trucks, guaranteeing an order for a considerable number if they are satisfactory. The equipment of the plant, while very complete in the way of machine tools for finishing parts, is by no ways adequate for motor production. Foundry and forge facilities are not such as are needed for automobile units, while none of the special equipment for finishing special parts has as yet been installed.

The greatest argument for motor-car building in Japan is that the cost of labor is so much less in the Empire than in America that production could be carried on at much less expense, and that costs would be reduced by the saving in freight. The question of labor was referred to Dr. Ito, who has charge of the work being done by the Mitsubishi Dock & Engineering Co. at Kobe. In his opinion the low cost of labor will not offset the efficiency of the skilled American workman. Even with the highest type of automatic machinery he doubts whether equal results could be obtained.

#### Experimental Work by Industrial Companies

The Mitsubishi Dock & Engineering Co. is one of the largest industrial firms in Japan, and should it engage in motor-car manufacture would have a big advantage. It is going forward very slowly on its work. The company has bought a Buick and a Fiat car for experimental and pattern purposes. If steel is available, an effort will be made to bring out the first experimental car during 1918. Dr. Ito has studied many of the larger English and German motor-car plants, and if the company does enter the field its policy will probably be modeled after

that of the Europeans. Several points have a bearing on the indefiniteness of the company's position. An important consideration is whether there will be a large enough market to warrant the outlay necessary. There are hopes that trade can be developed in China through branches and business connections in that country. At the present time the company is more interested in the development of airplane and marine engines. New buildings have been constructed and some special machinery required in engine building ordered or installed. Probably the outcome of this motor work will influence the decision for or against the building of automobiles.

The Tokyo Gas & Electric Industrial Co. has placed orders for a considerable amount of machine equipment for motor-car production, with a view to entering the manufacturing field on a large scale. Within the last six months this company has taken the Japanese representation for several American cars, or at least has had a considerable number of sample cars sent out. Though very serious in its plans to manufacture motor cars, probably more serious than any other organization in

Japan, Goto Matsukata, the president, declares that the newly established motor department will continue to import American cars without regard to its manufacturing plans, realizing that it is impossible to build more than one type of chassis. The engineer of this firm, I. Hoshiko, is a graduate of Japanese technical schools and has spent several months in America, much of the time as a workman in an American motor-car factory.

The Kawasaki Dockyard Co., of Kobe, has also been considering the building of cars. According to one rumor, the firm was offered a contract for a considerable number of trucks by the Japanese Government, but no definite information as to the position of the company in regard to the matter could be obtained.

#### Difficulties in Engine Construction

The men interested in these companies realize some of the difficulties that face them in starting motor production, but it is doubtful if they realize them fully. One of the big troubles will be engine production, for engines built in Japan to date are not up to the standard required by the hard usage entailed by a motor-car installation. Magnetos, starters, and carbureters will without doubt have to be imported for some time, although

**L**OW cost of labor in Japan will not offset the efficiency of the skilled American workman.

One of the principal reasons why car-building may not meet with success in Japan is the anticipated difficulty in engine construction.

Japanese companies would like to secure building rights on American cars and have many parts sent ready for assembling.

Japanese body builders are experts in the production of handmade enclosed bodies. Tools are primitive and wood is used exclusively.

\*EDITOR'S NOTE—Mr. Jones was formerly with the J. B. Crockett Co., New York, and was given a special appointment by the Bureau of Foreign and Domestic Commerce to investigate automotive conditions in Japan, China, the Philippines and Hawaii. This story is taken from the advance proof sheets of Mr. Jones' report to his departments. Part V will deal with tires, accessories, etc.



efforts to make them are now in progress. Almost without exception, the Japanese companies who plan to build would prefer to secure building rights on American cars, using the drawings of the American manufacturer from whom they secure rights, and have most parts sent from America ready for assembly. The simple castings and forgings would be made in Japan and the assembly completed and the bodies built there.

There is one point that should be considered by an American manufacturer who is approached with such a proposition. These companies are ambitious and will doubtless seek full export rights for the Far East, going even as far as India. If the parts were entered and assembled in bond under the supervision of the Japanese customs authorities, the American cars could be landed at any of the Far Eastern ports more cheaply because of the reduced freight cost on knocked-down shipments, the difference in labor costs, and the lower customs duty on parts. If the car is to bear the name of the American manufacturer he assumes responsibility for the assembly workmanship. If any American manufacturer has such a problem for consideration it would be well for him to consider, in connection with Japan, a China port such as Shanghai, a city with great American influence and in which there are many automobiles and a great number of trained mechanics.

Body building is practically the only branch of motor-vehicle construction that has been developed to any considerable extent in Japan, and it is shipping expense more than anything else that has brought about development along this line. Closed cars are by far the more popular type, and with shipping rates mounting as they have been in recent years the cost of importing complete vehicles from America would have been almost prohibitive, because of the impossibility of packing in a compact space.

#### Nearly All Bodies of Limousine Type

The bodies that are built in Japan show little or no variation. Practically all are of the limousine type. Wood is used exclusively in the construction and every one could be advertised as hand-made, the tools used being primitive indeed from the American standpoint, consisting of adz, saws, planes, and scrapers of various kinds. The wood most generally used is known as "katsura," fairly hard and capable of being worked to a very smooth finish. The cowl is cut from a large block of timber, roughly shaped at first with an adz-like tool, and later planed, scraped, and rubbed to the required form and finish.

The interior finish shows careful attention to detail. Upholstery is usually of light-colored Bedford cord, with braid trimmings and silk window and door curtains to match, although in the case of limousine bodies on low-priced cars leather is sometimes used.

The bodies are built wide enough so that three persons may sit on the rear seat, with two auxiliary seats facing back. Small armrests are provided for the auxiliary seats. Door fittings are of Japanese manufacture with nickel finish. Ash receiver and electric cigar lighters are fittings generally applied. The weight of such a body for a car of 116-in. wheelbase will be approximately 600 pounds.

The workers in the factories receive approximately 50 cents United States currency per day, but there doubtless will be a demand for higher wages in the near future, if an advance has not already been made, as increased cost of living has brought about labor troubles in Japan within the last year. The price of such a body fitted to a car of the size above mentioned is \$700.

The finish is of Japanese lacquer, which gives a glass-

hard finish of good luster. This finish stands well in ordinary use, that is, in its resistance to scratching, but if given a blow hard enough to crack or chip the lacquer, the repairing is an operation that entails considerable labor, more than the repair of a scraped finish on a metal body.

Do these bodies stand up? You can hear various opinions on this point. They certainly look well enough when turned out and some over a year old are in good condition. One American dealer said that he would not allow such a body to be fitted to the high-priced American car he handles. The main fault is that the wood is not properly seasoned.

#### Shipping Routes and Costs

Practically all motor-car shipments to Japan go via Pacific coast ports, either Vancouver or San Francisco. The following tables give a comparison of freight costs for shipments via Panama and direct from San Francisco. The car selected for this purpose is one selling for approximately \$1,000 and weighing in the neighborhood of 3000 pounds, with a case measuring 320 cubic feet. The point of origin selected is in the Middle West, near the center of the industry. These figures are based on rates quoted about March 1, 1918, and are submitted only for the purpose of comparing transportation costs on eastward and westward shipments in carload and less-than-carload lots.

Transportation of 1 car from factory to Yokohama via San Francisco:	
Inland freight to San Francisco.....	\$133.53
California toll tax.....	.40
Ocean freight.....	144.00
Consular fees.....	3.00
Insurance.....	12.20
<b>\$294.13</b>	
Transportation of 1 car from factory to Yokohama via Panama Canal:	
Inland freight to New York.....	\$45.98
Cartage to steamer.....	12.00
Consular charges.....	4.00
Forwarding charges.....	3.00
Ocean freight.....	260.00
Insurance.....	7.80
<b>\$332.80</b>	
Transportation of 4 cars from factory to Yokohama via San Francisco:	
Inland freight to San Francisco.....	\$334.35
California toll tax.....	1.60
Ocean freight.....	576.00
Consular fees.....	3.00
Insurance.....	49.50
<b>\$973.45</b>	
Transportation of 4 cars from factory to Yokohama via Panama Canal:	
Inland freight to New York.....	\$137.34
Cartage to steamer.....	48.00
Consular fees.....	4.00
Forwarding charges.....	3.00
Ocean freight.....	1,040.00
Insurance.....	30.00
<b>\$1,262.34</b>	

There is no great obstacle in the customs requirements confronting either the Japanese dealer or the American manufacturer, but care should be taken in the preparation of invoices. At the present time France has a commercial treaty with Japan which gives French manufacturers special concessions in what are known as the conventional duties. These same privileges are extended to the American manufacturers under the most-favored-nation clause, but to secure them the manufacturer must attach a certificate of origin to each group of invoices covering shipments. These certificates may be secured from the Japanese consul nearest the manufacturing city. (In the case of manufacturers in Michigan, Indiana, Ohio, and Wisconsin this is Chicago.) As the general rate of duty is 50 per cent ad valorem and the conventional duty but 35 per cent, the saving on such certificates at \$2 each is manifest. Under the conventional

(Continued on page 1036)

# History of Cotton Airplane Fabric\*

## A Successful Substitute for Linen Developed by the Bureau of Standards in Collaboration with Airplane Engineers and Cotton Mill Experts

THE design of heavier-than-air machines during their early stages of development was arrived at by cut-and-try methods. The wings of such machines were covered with plain cotton fabric, much the same as an ordinary sheeting material, coated with a beeswax compound or some form of glue. The wing surfaces were then rubbed and polished to present a surface having a comparatively low skin friction. Such a covering was not very strong and sagged very materially when subjected to pressure and when exposed to weather.

As the application of science produced planes which were capable of much higher speeds, smaller wing surfaces, and a constantly increased loading per square foot of wing surface, it became necessary to cover them with a material having a high strength and a low weight.

It was generally known that flax spun into yarns and subsequently woven into fabrics produced a very tough material having little stretch and the property of withstanding shocks with very little permanent set.

### Linen Sheeting Very Satisfactory

Accordingly, unbleached linen fabric was used to cover the wings of planes, and found to be very satisfactory. The structure of the linen fabric is that of an ordinary fine linen sheeting. No attempts had been made to study the requirements of the covering material or to design a fabric meeting those requirements which might possibly be lighter and more resistant than the linen fabrics.

During the present crisis it became evident that the available supply of linen would not suffice the demands of the military programs of the countries at war, and it became necessary to find materials which could be used in place of the satisfactory linen.

As early as January, 1916, the Bureau started investigating the possibilities of substituting cotton for linen airplane fabrics, and found that the general consensus of opinion among airplane manufacturers and investigators here and abroad was that the use of cotton fabric for wing coverings was out of the question, as many experiments had already been made to substantiate these opinions.

However, we were certain that not all the possibilities of structure of fabric had been considered, and we began an investigation to study the stresses in a fabric on a plane and to thoroughly determine by actual measurement the properties of the linen fabric and to incorporate the desirable properties of the linen in a cotton fabric suited for the purpose.

The difficulties experienced in the experiments on cotton fabrics previous to the time of our investigations were: (a) low strength per unit of weight; (b) low tearing resistance; (c) little shrinkage upon application of dope; (d) little tendency to retain what little shrinkage they had after doping.

It was not until March 18, 1917, that we were in a position to issue instructions covering the construction of cotton fabrics for the experimental fabrics which proved to be quite successful. These instructions were sent to the various fine-goods cotton mills and were supplemented by visits of our textile experts to the mills.

At the mills our textile men sat down with the practical men and evolved the present cotton airplane fabrics. At this point I wish to mention the name of Mr. Richartson, agent of the Ponemah Mills, as he did much to make cotton fabrics a success.

The first fabrics of this series were received at the Bureau on or about the first of April, 1917, and as the series pro-

gressed we suggested changes, and during the early part of May, 1917, a fabric had successfully passed our laboratory standards. The next important problem was to determine the actual performance of these fabrics. To this end samples were placed on Army planes at Langley Field and Navy planes at Pensacola during August, 1917. Similar fabrics were later sent by the Signal Corps to the Canadian Aeroplane Company, of Toronto, Canada, and they were placed on planes the middle of October, 1917.

The results of the service tests demonstrated that the fabrics were satisfactory and that service results could be reliably predicted in the laboratory. In view of this we felt justified in modifying the structure of these fabrics, and in co-operation with R. L. Kingston, then with the Curtiss Aeroplane Co., and with A. R. Pierce of the Pierce Mfg. Co. the present Grade A cotton fabric was evolved.

It was not until August that the military authorities were becoming concerned with the scarcity of linen, and on or about the 23d of August the Joint Army and Navy Aircraft Board called the Bureau into a conference regarding cotton fabrics for airplanes, and we were able to say with a great degree of certainty that we had a fabric ready for their needs.

On Aug. 24, 1917, a conference held between the military authorities and representatives of the Bureau resulted in the Signal Corps Equipment Division ordering that the Bureau of Standards supply the necessary specifications covering the purchase of 500,000 yd. of airplane cotton fabric. The specifications were transmitted by the Bureau of Standards on Sept. 5, 1917, covering the fabrics now known as Grade A and Grade B as used by the Signal Corps and Navy. A few days later the Bureau supplied the necessary information regarding the apparatus and methods of testing and inspection.

The Department of Agriculture was invited by this Bureau to assist in further development, and the experiments were started during September, 1917, but because of some unfortunate circumstance we were unable to keep in touch with the work. During April, 1918, the Signal Corps submitted samples which we understood to be the result of these investigations. They dealt with the use of the various cottons and the experiments were very valuable.

### Adopted by the English

Recently the standard fabrics were submitted to the English airplane authorities and their comments were to the effect that the results of their tests were astonishingly successful. Since that time the English have adopted the standard Grade A fabric.

At the time we were making our field tests at Langley the Italian Aviation Mission was there. One of their planes was covered with a cotton fabric which they had used successfully on the battle front, and the members of that Mission offered the opinion that our fabrics were better than their own successful fabric. It is a peculiar thing that upon analysis this fabric differed but slightly from our own as far as thread count and yarn number were concerned. Here were two people working on the same problems, on opposite sides of the water, and having no information regarding each other's work, and the results were practically the same.

LEON MORANE, a famous French pioneer in aviation, died in Paris last month. Morane first came into prominence as a pilot of Bleriot monoplanes, and had a bad crash when starting off for a flight for a Michelin prize from Issy to the Puy de Dome in October, 1910. Later he designed a monoplane on Bleriot lines, which he built in conjunction with M. Borel.

\*From a paper by E. Dean Walen presented to the American Society of Mechanical Engineers at New York.

# Fuller & Sons Tractor Transmission

A Three-Speed Transmission with Direct Drive on Second Speed—Belt Pulley Drive Through Bevel Gears

**F**ULLER & SONS MFG. CO., Kalamazoo, Mich., a firm well known in the automobile and truck transmission field, has recently brought out a transmission gear for tractors, known as model TR-2. It is of the unit power plant type, and is designed to be fitted to four-cylinder engines up to 326 cu. in. piston displacement, which makes it suitable for both two and three-plow tractors.

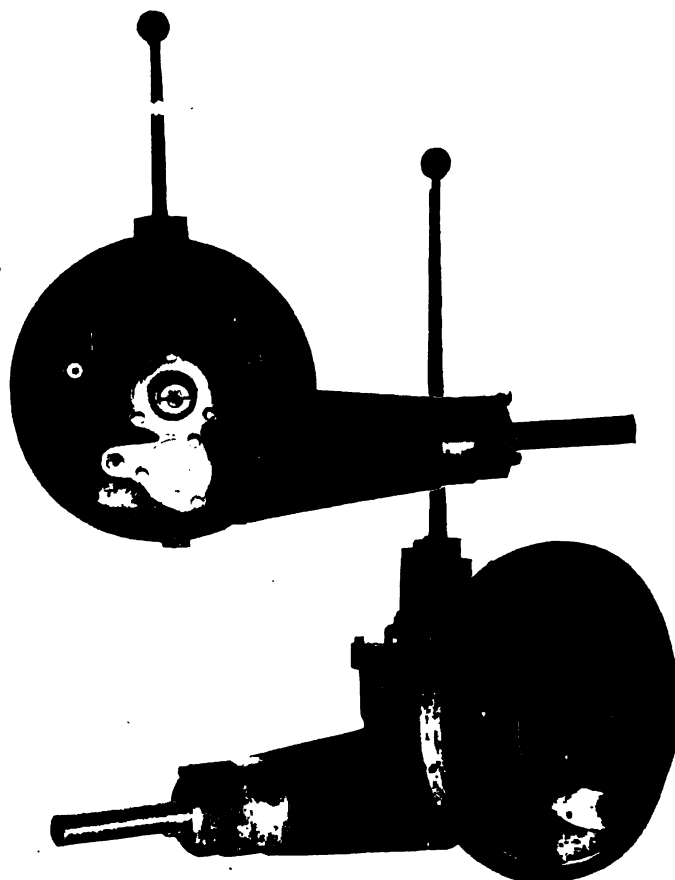
In a general way the transmission is of the automobile type, and is complete with clutch and control devices. It affords three forward speeds and one reverse, but instead of the high speed being a direct drive, the intermediate speed, which is the normal plowing speed, is made the direct drive. On the first speed there is a gear reduction in the transmission box of 1.7:1; the second speed is direct, and the third speed is a geared up speed in the ratio of 1:7.

The clutch is of the multiple disc-in-oil type, and drives through case hardened nickel steel studs. The shafts are made of chrome nickel steel, of extra large diameter, and are hardened and ground. The main shaft is of the four-spline type, 1½ in. over the keys. All shafts are mounted in annular ball bearings. The reversing pinion is extra large, having 23 teeth and runs on a solid roller bearing.

All gears are made of nickel steel, case hardened. They are controlled by means of a ball-mounted, ball-handled control lever. This is made from a drop forging, and can be bent to suit customer's requirements. The shifting mechanism is so designed as to give a positive interlock, in addition to being provided with position finders.

The belt pulley shaft is driven from the secondary shaft of the transmission through bevel gears and runs at 85 per cent the speed of the crankshaft. A choice is offered of three types of bell housing—No. 2 S.A.E., No. 3 S.A.E., and Continental type N.

Both the transmission housing and the clutch housing are oiltight. The former is kept half full of heavy oil, while the clutch housing is kept one-quarter full of motor oil. Self-adjusting stuffing boxes over bearings prevent leakage of oil.



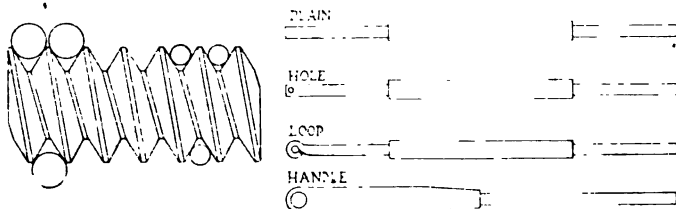
Two views of the Fuller transmission

## Fortney Measuring Wires

**T**HE Fortney Mfg. Co., 13 Franklin St., Newark, N. J., manufactures standard wires for checking up the pitch and angle of thread of screws and screw gages. In the use of these wires, two wires of a given size are placed in the thread on one side of the screw, another wire is placed in the thread at the opposite end of the screw, and a measurement over the wires is then taken by means of a micrometer. For each pitch two sizes of wires are made, a maximum wire and a minimum wire.

These standard measuring wires are used particularly in manufacturing thread gages. We understand that they are approved by the U. S. Bureau of Standards, and that of a lot of 1500 recently furnished the U. S. Ordnance Department not a single one was rejected.

The wires are guaranteed to be straight, round and accurate within .00002 in. of the required size. They are made for both U. S. Standard and Whitworth threads for all pitches from 80 per inch up.



In the line cut on this page are shown four styles in which the wires are furnished, the differences being in the ends by means of which they are handled.

The common way of using the wire, in measurements with an ordinary micrometer, is illustrated by the photograph. These wires are, however, also used with measuring machines, in which case they are suspended from a bracket or yoke, and to this end they are provided either with a hole, loop or drilled handle, as shown. The method of placing the wires in the thread is also shown in the line cut. Two wires are placed parallel in adjacent threads on the same side of the screw and the third wire is placed on the opposite side.



Using wires with micrometer on screw gage





# The F O R V M



## Universal Joints as Shock Reducers

By C. A. Schell

Chief Engineer, The Thermoid Co.

IN addition to the fact that fabric disk universal joints and couplings require no lubrication or attention, engineers who are experimenting along these lines find they have many other advantages over the metal construction. The two most dominant are their shock absorbing and sound insulating qualities. No better argument for the shock absorbing or reducing ability need be cited than their adoption by the manufacturers of so many of the military tractor units both here and abroad. The great majority of these were of the caterpillar type, and in many of these positive types of clutches were used causing a great amount of shock to be transmitted throughout the unit. Some of these machines were used under the worst possible conditions and flexible disk connections acting as shock reducers between motor and tread were of great help.

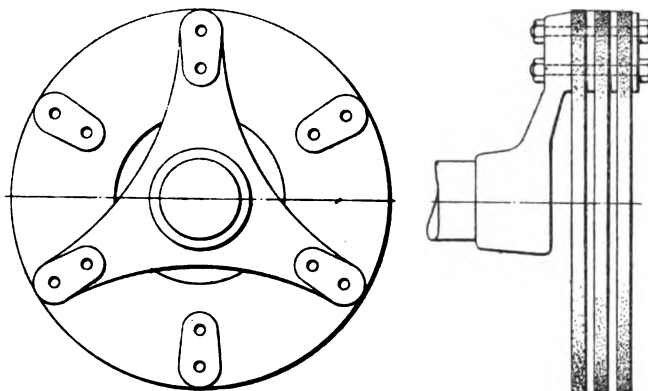
The conditions encountered in military use are very severe, but the average motor truck is subject at times to conditions which are very trying and costly. One of these is the application of heavy chains for winter driving. Invariably five or six pieces are wrapped around a solid tire and the wedging action, especially on hard frozen ground or brick, causes a reversal of stresses from the tire to the motor which can be nothing but very harmful. Of course when a flexible connection is inserted between the two positive units, the wheel and the motor, these two can be regarded as independent or floating, as the flexibility of the disk allows this. When the wheel strikes stiff, unyielding obstacles in the road or when the clutch grabs quickly these same conditions take place, but in the writer's opinion the action of heavy chains is the worst, owing to its severity and continuity.

### Tried Out on 3-Ton Truck

In an effort to determine what effect driving chains would have on the chassis, the writer carried out several interesting road tests. Several transmission main shafts were obtained for a 3-ton truck on which the rear ends were turned down from a 1 1/4 in. S. A. E. taper to a 1 1/4 in. size. Some of these were installed in this truck and ran several thousand miles over smooth brick roads very well when no chain equipment was used on the tires. With the application of chains, however, these shafts were all fractured in less than 1000 miles each when the truck was driven over snow-covered brick and frozen dirt roads. Of course, the shafts were made small purposely for this particular unit in order to get quick comparative data. In the first runs the truck was equipped with all metal joints on both propeller shafts. In following tests the same unit was driven with chains attached under similar conditions, but equipped throughout with flexible disk joints. The shafts in these tests stood up over a mileage several times greater than with the metal joint equipment, showing conclusively the shock reducing ability of this construction. In laboratory tests also, shafting, gears, splines, etc. are found to stand several times the number of sudden shocks when transmitted to these parts through a disk connection than when run through an all metal unit.

### Seven Degree Flexing Range

In these tests disks made up by the Hardy laminated construction and consisting of 60 per cent fabric and 40 per cent rubber were used. The wind resulting from application of maximum torque was 7 deg., which can be used with good results for all automotive work. The above figures leave no question but that disk joints made up elastically enough in torsion can be used as shock reducers in addition to their function as joints, and will add much life to the chassis. The great majority of trucks equipped with worm driven and



Layout of flexible universal joint

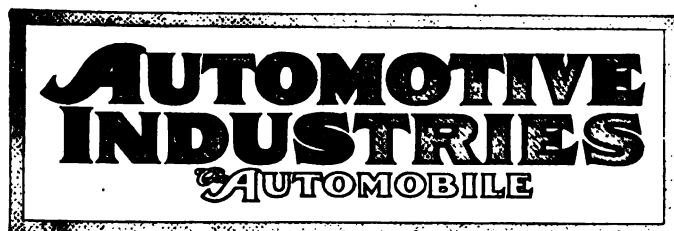
double reduction axles have comparatively straight line drives, the shaft angle never running over 7 deg., and on such layouts the flexible joint is ideal. With the low angle the lateral movement is very small and no spline is required, consequently no lubrication whatsoever is needed. If time and care are taken in designing the metal parts and a well constructed disk is employed, a long-lived trouble-proof assembly is the final result.

### Advantage of Silent Operation

Passenger cars are not subject to the severe conditions encountered with commercial vehicles, but, nevertheless, flexibility in the drive is of great benefit. Aside from the shock resisting function the strongest argument for this construction is the elimination of greasing and all noise and backlash. Axle noise is not so objectionable at the axle in itself as is the multiplicity of the noise as it is transmitted through the propeller shaft to the frame. This can in most cases be dampened with a fabric disk so that it is practically unnoticeable. At the present time one of the five largest passenger car makers, who has been having trouble of this kind in the past, is adopting this construction on a new model, after going into this phase of it very thoroughly. Many of the lower-priced cars develop considerable backlash between clutch and wheels after about 15,000 miles of use, owing to the wearing of so many connections. This is especially noticeable when engaging the clutch. Not only does the flexible joint eliminate nine of the wearing parts, but it also makes the clutch engagement feel much softer. In other words, all this backlash is unnoticeable because the slack in all the metal parts is taken up between the two positive units (motor and wheels) gradually. The maximum load is only applied after the disk has stretched the allowable amount. This factor can best be appreciated by equipping a car with both types of joints after it has been run 15 or 20,000 miles. With the flexible disk installation it is practically impossible for the most expert drivers to detect any backlash.

### Will Be Much Used in Post-War Models

Both abroad and in this country a large number of makers have concluded tests and will use this construction on post-war models. Some of the smaller chassis will be equipped with assemblies consisting of three 6 1/2 by 1/4 in. disks, while some of the larger cars will require three disks 8 in. in diameter. For passenger car work this joint should not be used where the maximum shaft angle exceeds 10 deg. After the angle runs beyond this point the disk is under considerable lateral stress and will not have the proper life. In some cases, however, where the shaft angle is too severe for this construction some of the makers will use a flexible fabric joint at the axle end of the propeller shaft with the metal joint forward.



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## The Future of Engineering Standardization

IN the past practically all engineering standards have been national standards, being used only by the nation which originated them. As a result of the war, however, it now looks as though standardization work in future would assume an international character. We need only refer to the work of the International Aircraft Standardization Committee, which bears out this point. At the present time a movement seems to be on foot to unify the screw thread systems of the United States and Great Britain. Each of these nations lately has evinced considerable interest in the other's standardization work, and at the recent meeting of the American Society of Mechanical Engineers in New York a paper on the work of the British Engineering Standards Committee was presented by Secretary Le Maistre of that committee, and a paper on the work of the committee on screw threads and limit gages was presented by Sir Richard Glaze-

brook, director of the National Physical Laboratory of Great Britain.

These events seem to forebode an extension of the scope of future standardization work. It seems logical that if there are benefits to be derived from the use of certain standards throughout a nation, the benefits would be greater if these standards were in universal use. This argument may possibly be controverted on commercial grounds. But the same objection has been made to standardization on a narrow scale and has proven entirely untenable. Some manufacturers object to using standards because it enables the customer to purchase repair parts in the open market instead of compelling him to buy them from the maker of the machine. The customer, however, objects to being limited to a single source for parts of such character as are in general use. Thus, while the exclusive use of special, non-standardized parts may result in increased parts sales it introduces a certain amount of sales resistance which outweighs the advantage accruing from it. It has thus been proven conclusively that national standardization will not act to the detriment of the individual firm and similarly it may be assumed as certain that international standardization would not result in the injury of any nation.

### English and Metric Standards

The great obstacle to the adoption of universal standards at the present time is the use of two different systems of weights and measures, the English and the metric system. Of course, it is quite possible to express any standard whatever it may be in both systems of measures. For instance, the S. A. E. screw standard can be readily translated into metric measures, but whereas in the inch system most of the figures used in the enunciation of this standard are integers or common fractions, in the metric system irrational fractions would have to be used. The standard is therefore distinctly an inch standard, though it can be expressed in metric terms.

In the aircraft standards published by the International Aircraft Standardization Committee while it was sitting in Washington last winter, all dimensions, stress allowances, etc., are given in both inch and metric units, but whereas many of the English dimensions are in round figures all the metric dimensions are in three-place decimals. Many of these aircraft standards had been worked out by the S. A. E. and merely adopted by the International Committee. It appears that the International Committee has been dissolved and that what aircraft standardization work is being done now is being carried on by national committees. Another international meeting is planned for next year, however, at which time the standards adopted by the various national committees will, no doubt, be proposed for adoption as international standards.

International standardization work will undoubtedly receive full consideration during the period of readjustment. It will probably take one or the other of two possible forms: Either the standards will be formulated in metric measures and will find substantially universal application, or the two countries using the English system of measures, Great

Britain and the United States, will unite in evolving a common system of engineering standards, to strengthen their commercial position in competition with metric countries in the export fields. The move to unify the screw thread standards of Great Britain and the United States is indicative of the tendency in the latter direction.

Probably the closest approach to a universal engineering standard to be found at the present time is the annular ball bearing standard. This is a combination metric and English standard, as the ball diameters are given in fractions of an inch, whereas all dimensions of the races are given in millimeters. The chief magneto dimensions, so far as mounting is concerned, including shaft height and location of base screw centers, are another instance of a universal standard. On the whole there seems to be greater readiness to adopt metric standards in countries using the English units than English standards in metric countries.

## "The Spirit Maketh Alive"

THE attitude of capital and labor toward each other changes slowly. But that it is changing, and changing for the better, there can no longer be any doubt. Until the change becomes universal we will always have internal strife and a high rate of labor turnover.

That apt old adage to the effect that "you can't teach an old dog new tricks" probably fits the case better than any other homely analogy, and accounts in no small measure for the slow shift in attitude which is apparent.

It is the new blood, the younger generation that has seen the situation in its true light and that is leading the procession toward a true recognition of the rights—or better let us say, the just due—of both.

These are the men who are first to recognize that workers are not slaves, that they are human beings with human cravings and human grievances.

And it is these men who are slowly but surely opening the eyes of their predecessors to the need of applying the Golden Rule in the treatment of men.

John D. Rockefeller, Jr., voiced the modern attitude of capital toward labor when he said last week at Atlantic City: "*The letter killeth; the spirit maketh alive.*" The older generation of employers did not, and in too many cases do not, believe this truism—or it may be they have never thought about it. At any rate, theirs has been the law of the letter rather than the law of the spirit.

"... only as the parties in industry are animated by the spirit of fair play, justice to all and brotherhood, can any plans which may be mutually worked out succeed," said Mr. Rockefeller.

That is not only good sentiment to subscribe to; it is an economic truth. Confidence is the basis of all work which requires mutual operators, and it is established not by control but by understanding.

Only the tradition of the years prevents this universal belief becoming universal practice.

## Tractor Engine Cooling

IT is not an uncommon sight to see a tractor steaming at the radiator while hauling a plow, indicating that its cooling system is of insufficient capacity. Designers do not always realize that on a tractor an unusual amount of radiating surface is required. This is so, partly because the speed is very low and does not induce appreciable air circulation through the radiator, and partly because kerosene is usually the fuel burned, which, on account of incomplete vaporization previous to ignition, is slower-burning and entails a greater loss of heat to the water jacket. Not only must a tractor radiator have more cooling surface per engine horsepower than an automobile radiator, but it must be of more robust construction, owing to the severe vibration to which it is exposed. Owing to the need for heavier construction it is impossible to get as much cooling surface into a given space, and a tractor radiator is not only heavier but also bulkier than an automobile radiator.

In the past radiators have been fitted to tractors largely by the cut and try method. The problem of radiator size required is naturally a rather complex one, as a considerable number of factors are involved, and the lack of experimental data made it almost impossible to determine the proper size without extensive experimentation. What was needed was the development of a rational formula permitting of expressing the capacity of the system for dispersing heat as a function of factors which are easily fixed or determined. Naturally such a formula would involve a constant, the value of which would depend upon the core construction employed.

In an article in another part of this issue by Mr. Goldberger a formula intended to serve this purpose is derived, giving the cooling surface required per horsepower under different conditions of operation. The equation is simpler than most radiator capacity formulæ that we have seen. The only difficulty we can see in connection with its application is that the rates of air and water circulation cannot be predetermined with any degree of accuracy without having a radiator of the type to be used available for tests. This, of course, means that we must still cut and try, though the formula ought to be an aid to our judgment after the constant for the type of core to be used has once been determined.

Undoubtedly considerable opportunity for the immediate sale of automobiles is offered by the small neutral countries of Northern Europe. During the war these countries prospered materially, but owing to embargoes and scarcity of shipping they were unable to secure all the cars they wanted from abroad. These countries do not have to face the same problems of reconstruction and readjustment as the belligerents and they will therefore be first in the market for cars.

Already there are signs that these opportunities are not being neglected by our export houses and manufacturers.



# □ Latest News of the

## 50,000-Mile National Highway Proposed at Chicago Conference

Cost to Be \$25,000 per Mile and Road System to Reach Fully 90 Per Cent of the Population—Federal Money to Be Furnished and Administered by National Highway Commission

CHICAGO, Dec. 11—*Special to AUTOMOTIVE INDUSTRIES*—A National Highway Commission to build with Federal money a system of national highways was the proposal made to-day before the joint meeting of the association of State Highway officials and the Highways Industries Association. The meeting is the first of a series extending over three days, and held for the purpose of placing the doctrine of Federal Highways administered by a Federal Commission before Chambers of Commerce, Rotary Clubs, State Highway officials and the general public.

The meeting has drawn together nearly one thousand delegates, and from the sentiment apparent at the initial sessions the conference will go on record as strongly favoring the appointment of a National Highways Commission with power to allocate Federal money for a system of interconnecting state roads which shall in effect become a great national highway.

The meeting applauded loudly and long when E. J. Mehren, vice-president of the Highway Industries Association, laid down as the platform of the gathering the building with Federal money of a national highway embracing fifty thousand miles, to cost twenty-five thousand dollars a mile and to reach fully ninety per cent of the population of the United States. It was brought out that such a system would give each state at least two highways and that the entire cost might be spread over a period of twelve and one-half years. The opinion of the meeting is that the importance of our highways has reached the point where it requires the attention and administration of a National Highways Commission.

The sentiment is strong that both our legislators and the public have reached the place where the development of good roads cannot be stopped, and in view of that fact the most rational course is to so direct such a move that the maximum benefit may be realized. This it is believed, can only be brought about through the appointment of a National Highways Commission. Both Fourth Assistant Postmaster Blakslee and Roy D. Chapin, former chairman of the highways transport committee, strongly favored the development of national highways by the Federal Government. Chapin urged the necessity of adequate regulation of

rural motor express lines which might use such highways, and came out in favor of exclusive franchises for individual lines. He carried the matter up a point further by suggesting that the National Highway Commission should have as one of its jobs the investigation of the use of public roads with a view to educating the public to their advantages and stimulating their use.

At a preliminary meeting of the Association of State Highway Officials action was taken empowering a committee to prepare a bill comprehensively covering the entire road program and advocating the appointment of a National Highways Commission. In the meantime this association will get behind the matter of Federal aid for state road building.

At to-day's session George M. Graham, president of the Pierce-Arrow Motor Car Co., will present a draft of a uniform vehicle law to cover both motor and horse drawn vehicles and including regulation, registration, weights and so forth. The measure is intended to eliminate present difficulties when vehicles cross state lines and thereby become subject to entirely different sets of state laws. Following is the text of a resolution presented before the meeting to-day which typified the prevailing sentiment. It will come up for action at to-day's session:

Resolved that a Federal Highway Commission be created to promote and guide this powerful economic development of both highways and highway traffic and establish a national highways system.

Be it further resolved that the present appropriations for Federal aid to the States be continued and increased and the States be urged to undertake extensive highways construction so as to keep pace with the development of this country and its transportation needs.

Be it further resolved, that all Governmental aid with respect to highways be administered by the Federal Highways Commission.

### Patternmakers' Wage Scale Agreed

WASHINGTON, Dec. 12—The National War Labor Board, following the review of the case between the Patternmakers Association of Detroit, and the 19 firms involved, which include Maxwell Motor Co., Swedish Crucible Steel Co., Wolverine Pattern Works, and 16 other pattern

companies, has ordered a wage scale of 95 cents per hr., dating from Aug. 29, 1918, to the journeymen patternmakers, with the recommendation that this rate be increased to \$1 per hr. following Nov. 22, 1918, actual payment to be made accordingly not later than Jan. 1. The board further suggested that both employers and employees be governed by the right of workers to organize in unions and bargain collectively and the right of employers to organize associations and bargain collectively. That employers should not discharge workers for membership in trade unions. That workers should not use coercive methods or measures to induce people to join their union. That in establishments where union shops exist, they be continued and the union standard maintained throughout.

### New Washington Section S. A. E. Criticizes Army Truck Methods

WASHINGTON, Dec. 11—Col. James Furlow presided at the first meeting of the newly established Washington section of the Society of Automotive Engineers held to-night.

A. A. Gloetzner, chief engineer of the Covert Gear Co., who was a member of the Commission sent to France to aid the A. E. F. Motor Transport Corps, told of truck experience overseas and criticized the methods of shipment, the shortage of trucks and the scarcity of skilled drivers. He stated that 214 makes of trucks embodying 600 types and more than 4,000,000 parts formed the American Army equipment and that it was almost impossible to provide efficient repair service.

Trucks in great numbers, said Gloetzner, were always laid up waiting for repairs; thousands were smashed owing to the fact that they were carried overseas as loose deck cargo and many were ruined through the ignorance of their drivers. He added that trucks played a vital part in winning the war, instancing the fact that at Chateau Thierry 81,000 men were hauled 175 miles in 32 hr. in convoys of as many as 500 trucks each.

### Roy D. Chapin Resigns from Highway Transport Committee

WASHINGTON, Dec. 11—*Special to AUTOMOTIVE INDUSTRIES*—Roy D. Chapin has resigned as chairman of the Highways Transport Committee, a position he has held for more than a year. He is leaving immediately for Detroit to take up again his duties as president of the Hudson Motor Car Co. His work on the Highways Transport Committee will be taken up by John S. Craven. George H. Pride has also resigned from the committee.

# Automotive Industries □

## Truck Parts Makers' Position Critical

**Heavy Stocks Have Been Bought and Paid For—Government Settlement Delayed**

WASHINGTON, Dec. 10—The situation with truck parts makers is particularly critical inasmuch as many of them, after receiving their orders for the last series of 25,000 B trucks, purchased large quantities of supplies for which they have paid and settlements for which will probably not be made by the Government for 6 or 8 months. This means that unless a part of the order for this last series of B trucks is revived, and at least 7500 allowed to be made, parts makers must wait until probably the summer or fall of 1919 before they can receive the money they have invested in anticipation of Government work.

In order to overcome this the parts makers and truck assemblers have organized and are placing their case before Government authorities and particularly before the Motor Vehicle Section of the Quartermaster Department. There are reports current that orders for 7500 B trucks applying to the last series may be revised, but there has been no action in this connection yet.

### Selden Revises Truck Prices

ROCHESTER, N. Y., Dec. 11—The Selden Truck Sales Co. has revised its present list prices, the new schedule coming into effect on Jan. 1, 1919. Present and new chassis prices follow:

Model	New Price	Present Price
TXR 1-ton; int.-gear drive..	\$1,900	.....
TWL 1-ton; worm drive.....	2,200	\$2,100
JCB 2-ton; int.-gear drive..	2,750	.....
JWB 2-ton; worm drive.....	3,050	2,950
NL 3½-ton; worm drive.....	3,850	3,650
DL 5-ton; worm drive.....	5,000	4,950

### War Industries Board to Quit

WASHINGTON, Dec. 6—That the War Industries Board will be completely abolished on Jan. 1, 1919, was made evident by the release of Bernard M. Baruch's letter of resignation by the White House. In this letter Mr. Baruch advised President Wilson that the War Industries Board would terminate all activities on Jan. 1, turning over those divisions which should continue permanently. The Conservation Division, which has had charge of such work as limiting the sizes of automobile tires, will come

under the Department of Commerce. The division on petroleum and its products will be turned over to the Bureau of Mines. It can be expected, therefore, that all restrictions on industries of whatever nature excepting those which were formulated by the Conservation Division, will be terminated and that 100 per cent production can be engaged in by all industries and companies.

## Tractor Makers Free from Restriction

**All Curtailments of Material and Limitations on Manufacture Are Removed**

DETROIT, Dec. 11—B. F. Sprankle, president of the American Tractor Association, has received a wire from Judge Edwin B. Parker, Priorities Commission, Washington, D. C., which authorizes him to notify the members of the American Tractor Association that all restrictions on the manufacture of tractors and all curtailments on tractor material have been removed from and after Dec. 9.

### Control of Steel to Cease Jan. 1

WASHINGTON, Dec. 12—The Government control of steel, including price regulations, will be entirely removed Jan. 1, the War Industries Board announced definitely to-day, following conferences with the American Iron & Steel Institute. Steel prices after that date will be determined by the industry on the former competitive basis. Foreign shipments of steel and the present embargoes are likely to be kept up.

### 80,000 Trucks Sent Abroad

NEW YORK, Dec. 9—Approximately 80,000 American motor trucks have been sent abroad, and it is believed unlikely by the National Automobile Chamber of Commerce that any of these will be returned to this country. At present there are about 45,000 trucks en route or on order for the Government and about 7500 in use by the Army and Navy in this country. The N. A. C. C. believes that few, if any, of these will be offered for sale, and that if they are offered the sales will be widely distributed to prevent disturbing conditions in any one locality. Similarly, it is believed that no more passenger cars will be required by the Army and equally unlikely that any of those now in use will be disposed of.

## Truck Orders Not Canceled

**Post Office Increases Requisition from 10,500 to 15,700 Vehicles**

WASHINGTON, Dec. 10—The Post Office Department has increased its requisition with the War Department for motor trucks from 10,500 to 15,700, and as a result it is now expected that the orders for commercial trucks placed with the Locomobile, Pierce-Arrow, Packard, Garford and White companies will not be canceled.

Truck orders placed by the Government and still in force include the second series of B 3-ton standardized trucks, totaling 8000; trucks for Nash Quads and 4-wheel-drive trucks, totaling 12,000; orders for Locomobile, Pierce-Arrow, Packard, Garford and White, total approximately 18,000 trucks, and other contracts for 10,000 trucks placed with the Federal, Gramm-Bernstein, Hurlburt, International Harvester, Kelly-Springfield, Moreland, Republic, Standard and Velie companies. It is now reported that the 18,000 commercial trucks on order with the first five named companies will stand and the 10,000 on order with the last named concerns will be allowed to run to Jan. 1, 1919, and those not completed at that time will be canceled. It is also expected that the orders for Nash and Four-Wheel-Drive trucks will be reduced somewhat.

The contract for the 800 B trucks will be completed.

Many of the truck manufacturers and also a number of the parts makers who have been particularly interested in the standardized trucks are facing serious troubles if cancellations are further engaged in.

### Appropriation for Post Office Aerial and Truck Services Recommended

WASHINGTON, Dec. 10—An appropriation of \$2,185,000 for purchase of airplanes and maintenance of air line mail service for the Post Office Department is recommended in the Post Office Appropriation Bill reported to the House to-day. This is an increase of \$1,185,000 over the \$300,000 originally estimated by the Department. The committee also recommends an appropriation of \$1,000,000 for motor truck mail service, which is \$700,000 more than the \$300,000 authorized in the act of June 2, 1918. The Post Office authorities asked for \$1,500,000 for motor truck service.

## Highways Transport Work Reviewed

### Annual Report of Council of National Defense Deals with Automotive Section

WASHINGTON, Dec. 6—The annual Report of the Council of National Defense which is just out includes a review of the work of the Highways Transport Committee, the Automotive Products Section, the Commercial Economy Board, and other divisions, some of which were later in the year made a part of the War Industries Board. The review of the work by the Highways Transport Committee includes complete discussion of the assistance between that committee and the War Department in convoy service, its development of highways transport resources, activities for snow removal from highways, expansion of store-door delivery and return loads bureaus, and its co-operative work with the Food Administration in the development of rural motor express.

#### Control of Products Section

The Automotive Products Section, the report states, controlled during the year the allocation of Government business and purchases of the Government and the Allies of motorcycles, motorcycle side cars, motor cars, motor trucks, motor truck bodies, motor truck tractors, motor truck trailers, armored cars, military tractors, military tanks, marine gas

engines, automotive accessories and airplane parts.

The report tells in detail of the development of the class B truck, drawings of which were started in December, 1917, as a result of the co-operation between the Quartermaster Corps and the Society of Automotive Engineers.

The first two of these trucks, says the report, were completed and run on their own power to Washington on October 10, arrived October 14, and were accepted by the Secretary of War on October 19. The Automotive Products Section advised the Government and the Allies as to the allocation of more than \$400,000, 000 worth of apparatus.

#### Shortages Caused Trouble

During the year two shortages occurred, one of magnetos for trucks, tractors and airplanes, due to shortage of platinum, and, second, a shortage of wireless apparatus, due to lack of mica. Producers, importers, jobbers and users of this were called together and steps were taken to conserve the platinum, while at the same time domestic mica was discovered which was equivalent to any India mica for electrical apparatus.

On April 18, says the report, the Conservation Division arranged with the rubber industry for a reduction in the numbers, sizes and types of automobile tires from 287 to 282 immediately, and by gradual steps during the next year to 9 sizes and types. This, adds the statement, will result in economy in production and make a large reduction in the quantity of inactive stocks in the hands of manufacturers and dealers.

## U.S. October Exports Show Decrease

### Limitation of Ocean Transport Undoubtedly Chief Cause—Improvement Anticipated

1918					
Cars	Value	Trucks	Value	Parts	Value
Oct. 1,708	\$1,881,462	737	\$2,192,556		\$3,709,687
Sept. 3,305	2,593,236	1,280	3,215,206		3,441,758

1917					
Oct. 5,536	4,581,127	1,359	4,422,268		3,045,192

WASHINGTON, Dec. 9—Exports of automotive products—cars, trucks and parts—during the month of October were valued at \$7,774,705 as against \$9,250,200 for September and \$11,848,577 for the month of October, 1917.

There are several reasons for the drop. Consignments which were shipped in October were, obviously, ordered long before there were indications of a cessation of warfare, and even during the month of shipment ocean transport was much restricted, the bulk of available tonnage being diverted to the carrying of men, munitions and food. This was the case, in a measure, a year ago, when our exports were much greater than recently. On the other hand, a year ago there was a much more urgent need of both cars and trucks for war service and to relieve railroads of congestion.

Investigation has shown that the falling off in automotive products export has not been caused by lack of orders but by the strict limitation of shipping facilities.

### Exports of Automotive Equipment for October and Nine Previous Months

	Month of October				Ten Months Ending October, 1918			
	1918		1917		1918		1917	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	1	\$800	.....	.....	29	\$418,255	138	\$1,065,707
Airplane parts	.....	790,262	.....	\$1,028,027	.....	11,162,210	.....	4,077,741
Commercial cars	737	2,192,556	1,359	4,422,268	8,434	21,450,901	12,176	31,624,278
Motorcycles	626	157,112	460	97,731	8,072	1,889,580	12,499	2,604,878
Passenger cars	1,708	1,881,462	5,536	4,581,127	33,576	31,498,013	54,303	41,671,965
Parts, not including engines and tires	.....	3,700,687	.....	3,045,192	.....	29,248,820	.....	24,137,118
Total (trucks, cars and parts value only)	.....	\$7,774,705	.....	\$12,048,587	.....	\$82,197,734	.....	\$97,433,361
ENGINES								
Automobile gas	3,297	\$417,177	2,714	\$311,171	26,321	\$3,449,161	27,066	\$3,073,241
Marine gas	310	296,021	631	134,206	4,350	2,297,736	8,886	1,728,305
Stationary gas	2,892	368,080	1,534	187,438	24,361	2,857,350	22,606	2,601,364
Tractor gas	1,214	1,586,188	1,799	1,608,680	20,941	22,184,240	10,222	12,896,414
Total value	.....	\$2,667,466	.....	\$2,234,495	.....	\$30,838,487	.....	\$20,299,324

#### EXPORTS BY COUNTRIES OCTOBER, 1918

	Passenger Cars		Trucks	
	No.	Value	No.	Value
Argentina	2	\$14,345	.....	.....
Australia	73	73,897	.....	.....
British India	1	6,648	.....	.....
British South Africa	103	111,707	.....	.....
Canada	397	352,754	115	\$152,519
Chile	9	16,341	.....	.....
Cuba	45	88,644	41	67,393
Denmark	30	54,047	.....	.....
Dutch East Indies	218	229,808	.....	.....
France	10	27,238	392	1,552,520
Mexico	83	82,827	.....	.....
New Zealand	48	48,697	.....	.....
Norway	55	98,415	.....	.....
Philippine Islands	135	129,607	.....	.....
Russia in Asia	.....	.....	15	18,200
Russia in Europe	.....	.....	.....	.....
Spain	50	93,290	.....	.....
United Kingdom	51	24,300	42	144,290
Uruguay	27	39,730	.....	.....
Other Countries	371	389,079	132	257,634
Totals	1,708	\$1,881,462	737	\$2,192,556

#### TEN MONTHS ENDING OCTOBER, 1918

Passenger Cars		Trucks	
No.	Value	No.	Value
1,433	\$1,496,575	43	\$39,863
3,312	2,803,526	.....	.....
57	50,146	.....	.....
915	774,979	.....	.....
8,936	6,778,073	1,349	1,658,263
1,582	1,998,422	.....	.....
1,638	2,215,257	471	962,641
32	58,147	.....	.....
927	1,064,047	.....	.....
997	1,115,328	2,564	9,428,955
1,668	1,253,030	.....	.....
1,207	1,022,231	.....	.....
181	399,989	.....	.....
1,632	1,400,523	.....	.....
.....	.....	15	18,200
10	8,325	2	5,454
723	899,376	.....	.....
391	983,344	2,222	6,585,105
1,216	735,047	.....	.....
6,889	6,441,648	1,768	2,752,420
33,756	\$31,498,013	8,434	\$21,450,901



## October Exports from New York

### Great Falling Off in Cars and Trucks—Parts Show a Slight Increase

NEW YORK, Dec. 9—October exports of automotive products from this port are disappointing when compared with those for the previous month. In September the total value of cars, trucks and parts exported was \$4,721,391; the figure for October being but \$3,266,216. This represents a drop of \$1,455,175, equal to approximately 30.8 per cent.

Passenger cars show a decrease of almost 43 per cent in number for the month and their value is nearly 30 per cent below that of the cars exported in September. Trucks have fallen off to an even greater extent, the reduction being over 61 per cent in number and over 57 per cent in value. Parts have increased 22 per cent in value in comparison with September figures.

Under present shipping conditions it is hardly fair to compare any individual month with another. As a matter of fact it would be quite correct to state that at this time our exports are restricted by lack of transport rather than by any shortage of orders.

In considering the October figures it is of interest to observe that automotive products have been exported during the month to Iceland, Morocco, Japanese China and Portuguese Africa. Russia in Asia and Turkey in Asia are also buyers for the first time for a considerable period.

#### 65,870 Cars in Kentucky

LOUISVILLE, Dec. 6—The motor car in Kentucky experienced its most prosperous year in 1918, despite the war and restrictions on production. The actual increase in registration was 18,454 for the year. There are now 65,870 motor vehicles in use in the Bluegrass State. At present there is one car for every thirty-five persons in Kentucky.

To give an idea of the growth in Kentucky the passenger car and truck registrations by years since 1911 are given herewith:

1911.....	2,868	1915.....	19,500
1912.....	5,147	1916.....	31,700
1913.....	7,210	1917.....	47,416
1914.....	11,746	1918.....	65,870

#### 500-Mile Race May 30

INDIANAPOLIS, Dec. 7—There will be a 500-mile race at the Indianapolis Motor Speedway this coming year. May 30 is the date; \$50,000 is the purse. This announcement comes from C. G. Fisher, J. A. Allison and A. C. Newby, owners of the Indianapolis course.

## Modify Australian Import Rules

### Exporters Must Give Value of Products "for Home Con- sumption"—Other Rules

WASHINGTON, Dec. 8—Passenger car and truck makers exporting to Australia should prepare immediately, states a commerce report, to comply with the requirements concerning invoices and customs declarations which go into force on Jan. 1, 1919. After that date all invoices for goods dutiable at an *ad valorem* rate from all countries other than China and Japan must contain a separate column showing the fair market value for home consumption in the country of export, at the date of invoicing to Australia, of similar goods in similar quantities. The heading of this column should be as follows:

Domestic value f.o.b. ("port of export" or "factory" or as the case may be) at date of invoicing to Australia, subject to .... per cent discount for cash and in(ex)cluding cost of domestic outside casing.

The prescribed form of declaration of value to accompany the invoice, as given in Statutory Rules No. 216 of 1918, varies only slightly from that given in Commerce Reports of Feb. 16, 1918, but it should be used in preference to that previously given, and for convenience it is here reprinted in full. Correction should also be made of paragraph 3 of the form of declaration printed on page 19 of Tariff Series No. 37 (Customs Tariff of Australia). The declaration is to be written, stamped, typewritten or printed on the back of the invoice.

The complete form of the declaration of value is as follows:

I, ..... (here insert manager, chief clerk, or as the case may be), of ..... (here insert name of firm or company), of ..... (here insert name of city and country), the manufacturer or supplier of the goods enumerated on this invoice, amounting to ..... (here insert value), have the means of knowing and do hereby declare:

1. That the said invoice is in all respects correct and true;

2. That the said invoice contains a true and full statement showing the prices actually paid or to be paid for the said goods, the actual quantity thereof, and all charges thereon;

3. That the price shown in the invoice in a separate column represents the actual price at the date of this declaration of equal quantities of identically similar goods to any purchaser for home consumption in this country;

4. That no different invoice of the goods mentioned in said invoice has been or will be furnished to anyone; and

5. That no arrangement or understanding affecting the purchase price of the said goods has been or will be made or entered into between the said exporter and purchaser or by anyone on behalf of either of them either by way of discount, rebate, salary, compensation, or in any manner whatsoever other than as shown in the said invoice.

Dated at ..... this ..... day of ..... 19...  
Witness ..... Signature .....

In the case of goods covered by an invoice being consignment (not an outright sale), the following clause should be substituted for paragraph 2:

2. That the said invoice contains a true and full description of the goods, the actual quantity thereof, the amount debited therefor, and all charges thereon to free on board at port of shipment as known up to the date of invoice.

#### AUTOMOBILE, TRUCK AND PARTS EXPORTS FROM NEW YORK FOR OCTOBER

	Cars		Trucks		Parts
	No.	Value	No.	Value	Value
Argentina .....	2	\$14,345	..	.....	\$52,247
Australia .....	..	.....	..	.....	25,616
Barbadoes .....	..	.....	..	.....	705
Bolivia .....	..	.....	..	.....	350
Brazil .....	19	22,764	..	.....	9,649
British East Africa .....	..	.....	..	.....	369
British East Indies .....	..	.....	..	.....	3,331
British Guiana .....	3	4,490	..	.....	6,750
British India .....	1	6,648	..	.....	21,200
British South Africa .....	103	111,707	7	\$4,125	82,244
British West Indies .....	2	1,172	1	454	1,090
Chile .....	9	16,341	5	19,000	40,876
China .....	23	20,644	1	800	3,441
Colombia .....	4	3,601	..	.....	483
Costa Rica .....	..	.....	..	.....	527
Cuba .....	17	38,404	16	40,077	76,866
Danish West Indies .....	1	500	..	.....	302
Denmark .....	30	54,047	..	.....	774
Dutch East Indies .....	25	44,787	4	7,975	32,158
Dutch Guiana .....	..	.....	..	.....	269
Dutch West Indies .....	..	.....	..	.....	553
Ecuador .....	..	.....	..	.....	592
England .....	51	24,300	37	126,840	201,154
France .....	10	27,238	215	797,198	840,153
French Africa .....	1	1,885	..	.....	170
French West Indies .....	3	2,172	..	.....	1,762
Guatemala .....	..	.....	..	.....	501
Haiti .....	1	1,800	..	.....	168
Honduras .....	..	.....	..	.....	1,023
Iceland .....	10	9,582	..	.....	.....
Italy .....	1	800	..	.....	1,796
Jamaica .....	1	1,022	2	800	407
Japan .....	2	1,470	..	.....	.....
Japanese China .....	25	16,500	..	.....	4,854
Mexico .....	13	15,490	..	.....	96
Morocco .....	..	.....	..	.....	291
Newfoundland .....	7	7,805	..	.....	868
New Zealand .....	..	.....	..	.....	41
Nicaragua .....	1	1,448	..	.....	19,259
Norway .....	55	98,415	8	18,000	3,133
Panama .....	2	2,550	14	18,512	6,310
Peru .....	17	26,269	..	.....	.....
Philippine Islands .....	10	5,000	..	.....	.....
Portugal .....	1	3,743	..	.....	.....
Portuguese Africa .....	6	4,308	1	1,725	310
Russia in Asia .....	..	.....	15	18,200	.....
Salvador .....	..	.....	..	.....	.....
Santo Domingo .....	5	3,862	1	2,297	2,390
Spain .....	50	92,290	..	.....	5,568
Switzerland .....	1	1,646	..	.....	.....
Trinidad .....	..	.....	..	.....	4,641
Turkey in Asia .....	6	3,965	..	.....	3,764
Uruguay .....	27	39,730	..	.....	8,998
Venezuela .....	2	2,313	1	1,000	6,115
	557	\$735,5F8	328	\$1,057,003	\$1,473,655

## Report on Transport and Aviation

### 82,500 Trucks, 16,000 Cars and Many Trailers Completed for Army

WASHINGTON, Dec. 9.—The annual report of the Secretary of War for the fiscal year ending June, 1918, includes in its statement reports on the Motor Transport Corps, tractors and aviation. The Motor Transport Corps personnel, states the report, totals 2700 officers and 77,000 men. This is exclusive of the Motors and Vehicle Division of the Quartermaster Corps, which is in charge of purchase and procurement. Automotive equipment carried over for the fiscal year 1918 amounted to \$353,000,000.

The appropriations for motor transportation for the fiscal year ending June 30, 1919, totaled \$886,000,000, of which \$350,000,000 has been expended or will be expended on contracts which cannot be canceled. A further expenditure of \$29,000,000 will be necessary for the repair-shop and equipment program and additional expenses incident to demobilization and liquidation of the vehicles left on hand are estimated at \$6,000,000. Equipment which will be carried over into the fiscal year 1920 represents an expense of \$732,000,000.

#### 55,000 Motor Vehicles Overseas

To date, states the report, 82,500 standardized and commercial types of trucks, 16,000 motor cars, 27,000 motorcycles, 22,000 bicycles and a great number of trailers have been completed for the Army. There are on hand overseas more than 55,000 motor vehicles. Seventeen thousand five hundred motor vehicles were shipped to the American Expeditionary Forces in October, while there were available for shipment on Nov. 1, 1918, 12,000 additional motor vehicles.

The convoy service of the United States, although formed primarily for training purposes, states the report, has since its organization transported more than 14,500 trucks overland, a greater part of which carried freight in the shape of spare parts and motor equipment.

The Motor Transport Corps had on hand at the time of the report a balance of \$501,698,824 from appropriations.

Truck production for the fiscal year of 1918 totaled 82,490 trucks and other motor vehicles amounted to 65,482.

That section of the report dealing with aviation, after enumerating figures which have already been published relative to production, states that at the cessation of hostilities there were 17,000 cadets graduated from ground flying schools, 6528 men training as aviators, 8602 reserve military aviators graduated from elementary training schools and 4028 aviators who had completed the advanced training course. In addition 14,000 mechanics had been graduated from training schools.

On Sept. 30, 1918, there were 32 squadrons composed entirely of American personnel at the front, of which 15 were pursuit, 13 observation and 4 bombing.

Reports of air casualties show that 2 aviators lose their lives in accidents for each aviator killed in battle. The report on battle fatalities up to Oct. 4 were 128 and the overseas accident fatalities 244, while the fatalities at training fields in the United States totaled 262. The Air Service, which in April, 1917, comprised 65 officers and 1120 men, at the signing of the armistice totaled 190,000, of which there were 20,000 commissioned officers, 6000 training cadets, 164,000 enlisted men and 11,000 other flyers. The Air Service constituted over 5 per cent of the total strength of the Army.

## Vincent, Vindicated, Returns to Packard

### Exonerated and Thanked for Services in Presidential Announcement

WASHINGTON, Dec. 9.—Commended by the President of the United States for his services to America in time of national need, and vindicated on all his acts in the speedy production of a military aviation engine for the United States forces, Lieut.-Col. Jesse G. Vincent has received an honorable discharge from the Army and has returned to take charge of Packard engineering, the work he left in June, 1917, to enter Government service.

"The President believes that the two gentlemen concerned, Lieut.-Col. Geo. W. Mixer and Lieut.-Col. J. G. Vincent," says an executive announcement made public at the White House on Dec. 3, "were entirely innocent of any improper or selfish intentions, that their guilt was only technical, and that their services to the Government, which have been of the highest value and of the most disinterested sort, deserve a cordial recognition."

#### Overland Prices Drop

DETROIT, Dec. 6.—The Willys-Overland Co. has decreased the prices of all its models, excepting the No. 88 eight-cylinder passenger car. The new price list follows:

Model	New Price	Old Price
90, Touring .....	\$985	\$1,095
Willys-6, Touring .....	1,625	1,775
88-4 .....	1,725	1,925
90, Sedan .....	1,495	1,665
88-4, Sedan .....	2,750	2,950
88-4, Coupe .....	2,650	2,850
90, Delivery .....	1,000	1,045

#### Allen Prices Down \$100

FOSTORIA, OHIO, Dec. 7.—The Allen Motor Co. has reduced the prices of its cars \$100 each, effective Dec. 2. New and old prices follow:

Model	New Price	Old Price
41 .....	\$1,195	\$1,295
Sedan .....	1,695	1,795

## Goodyear Profits Are Record

### Gross Sales for Year Amount to \$131,000,000—Net Profits Are \$15,388,190

AKRON, Dec. 7.—Although President F. A. Seiberling in his report of the year's business ending Oct. 31, 1918, pointed out to the stockholders of the Goodyear Tire & Rubber Co. that the net profits were materially reduced by the fact that Government business (approximately 15 per cent of the total volume) was handled at a considerably lower percentage of profit than was the company's regular business, he was able to show gross sales of \$131,000,000 and net profits of \$15,388,190.74.

Preceding year's gross sales were \$20,000,000 below the 1918 figures and profits were \$14,044,216.10.

Examination of the balance sheet discloses the fact that a year ago the company had in excess of \$15,000,000 notes payable outstanding. This item has been liquidated by the sale of \$15,000,000 of 8 per cent preferred stock to over 16,000 stockholders composed almost entirely of customers and employees.

At the annual meeting all the directors were re-elected, as follows: F. A. Seiberling, C. W. Seiberling, G. M. Stadelman, F. H. Adams, P. W. Litchfield, H. B. Manton and J. P. Loomia. The directors in turn elected the following officers: F. A. Seiberling, president and general manager; C. W. Seiberling, vice-president and manager of purchases; G. M. Stadelman, vice-president and manager of sales; P. W. Litchfield, vice-president and factory manager; A. F. Osterloh, secretary; W. E. Palmer, treasurer and assistant secretary; H. J. Blackburn, assistant treasurer.

Assets		1918	1917
Plant and property ..	\$29,785,045.61		\$24,942,790
Patents, trademarks and designs .....	1.00		1
Securities owned .....	5,363,502.69		1,706,426
Pfd. stock in treasury .....	149,636.24		18,790
Notes receivable .....	1,625,650.43		1,033,640
Inventory .....	30,507,966.81		28,496,624
Accounts and notes receivable .....	15,465,263.25		16,384,533
Cash .....	6,344,490.11		3,783,354
Suspended assets ..	208,323.98		175,587
Advances to cus., etc	3,488,956.62		5,218,217
Prepaid rentals, interest, ins., etc...	690,181.46		802,920
	\$93,619,018.20		\$82,562,592
Liabilities		1918	1917
Common stock .....	\$20,466,800.00		\$20,278,620
Preferred stock .....	38,783,800.00		24,293,700
Notes payable .....			15,410,800
Purchase accounts payable .....	5,687,407.36		4,864,761
Sundry other accounts payable ..	1,432,045.71		850,963
Balance unpaid for Liberty Bonds ..	571,500.00		
Dividends accrued and payable .....	392,530.05		
Reserves			
For doubtful accounts .....	439,769.28		707,032
For insurance on branch stocks ..	31,335.82		45,000
For depreciation ..	5,096,472.90		3,242,030
Surplus .....	20,717,366.08		12,763,631
	\$93,619,018.20		\$82,562,592

## Fordson Men Attend Sales Conference

Over 100 Distributors Meet at Tractor Plant to Discuss Prospects and Policy

DETROIT, Dec. 9.—A 100 per cent representation of Fordson distributors attended the sales conference at the Fordson tractor plant in this city on Thursday, Friday and Saturday of last week. Of distributors and executive men in their employ more than 100 were here. The conference was devoted almost exclusively to an open discussion of the prospects for the coming year and the policy which would be pursued by the distributors' association in handling it. No definite action was taken on many of the things affecting policies, but committees were appointed from among the members of the association which will take these matters under investigation and report conclusions to Henry Ford & Son for final decision.

Probably, as far as the distributors are concerned, the official recognition of the association by Henry Ford & Son was the most important outcome of the conference. C. E. Sorensen, in addressing the conference, said that the firm of Henry Ford & Son was heartily in accord with the principles underlying the organization, and that henceforth it should receive the approval and hearty co-operation of the company. Matters affecting the distribution of the tractor will be referred to the association and handled through committees, subject to the approval of the officials of the company, who are recognized as honorary members of the association and who constitute practically an executive committee with final authority.

It was decided at the conference that there will be no immediate change in the price for the Fordson tractor, which will continue at \$750, f.o.b. Dearborn, as heretofore. About the only change from past custom in this respect was the agreement by Henry Ford & Son to ship tractors in carload lots hereafter, payable upon delivery and not with sight draft attached to bill-of-lading, as has been the custom.

The kind and quality of service which the dealers shall render on Fordson tractors was discussed exhaustively. The real purpose in calling the conference to Dearborn instead of the meeting which had been scheduled for Chicago was to impress upon the distributors as a body the obligation that they and their sub-dealers owed to the country at the present time to do all they could to further agricultural operations.

The consensus of opinion of the distributors was that free service should be limited practically to delivery and to starting the tractor with preliminary instructions of the farmer in operation, subsequent service to be charged for at rates depending upon local conditions. The recommendation was made that in

all cases where it was necessary to supply spares, the local service man make an investigation to determine whether the breakage was due to the fault of the operator or to mechanical defects. This would determine the charge which should be made.

Regarding the equipment which will be used with the tractor, while it was not made conditional upon the distributors, still it is understood that if they sell equipment at all, it will be only such as has received the approval of Mr. Ford. An implement committee was appointed to consider the merits and claims of all operative equipment, both in the line of tillage tools and belt power machinery, and then to recommend the adoption of such implements as meet the requirements. Final decision will rest with the officials of the factory after considering the recommendation of the committee.

Regarding the character of the dealers who had been most successful in the distribution of tractors, the opinion was almost unanimously expressed that the Ford motor car dealers had proven their efficiency in this respect. They are prompt and efficient in service, loyal to the company and enthusiastic.

### Ford Entertains Visitors

The visitors were entertained by Henry Ford & Son with a dinner at the Detroit Athletic Club, followed by a motion picture entertainment showing the activities of the Ford organizations, a dinner at the Hotel Statler and an evening at the Garrick Theater.

As indicative of the production at the Fordson plant, the total number of complete tractors turned out for the week ending Dec. 7 was 852. These were divided into daily production as follows: Monday, 153; Tuesday, 174; Wednesday, 164; Thursday, 184; Friday, 177. In addition, 791 transmission housings, 582 engines, 797 rear axles and 778 front axles were produced.

### After American Agencies

WASHINGTON, Dec. 7.—The Bureau of Foreign and Domestic Commerce, Department of Commerce, has requests from Colombia for the agency for automobiles and trucks. Further information can be secured by addressing the Department of Commerce, referring to Foreign Trade Opportunity No. 27743. The Department also has an inquiry from Peru, desiring an agency on a commission basis for the sale of farm tractors, automobiles, accessories and oils. Further information can be secured from the Bureau of Foreign and Domestic Commerce by referring to Foreign Trade Opportunity No. 27748.

### Mitchell Prices Are Dropped

RACINE, Dec. 9.—The Mitchell Motors Co. has revised the prices of its cars and returned them to pre-war basis as follows:

Model	New Price	Old Price
B-40	\$1,275	\$1,465
C-42	1,525	1,735

## U.S. Russian Bureau Organized

War Trade Board Forms Company to Aid in Stabilizing Economic Situation

WASHINGTON, Dec. 9.—The War Trade Board of the U. S. Russian Bureau, Inc., is a company which has been organized by the War Trade Board at the direction of the President for the purpose of helping the Russians to help themselves in stabilizing the economic situation in Russia. It has a capital stock of \$5,000,000, all of which has been issued and fully paid in cash out of Government funds. The stock is owned in its entirety by the United States Government.

The company will engage in the business of exporting to Russia and Siberia agricultural implements, shoes, clothing and other commodities which the Russian population need, bringing back Russian and Siberian raw materials in return. The company thus is intended to aid in supplying the needs of the people of Russia, in encouraging Russian production and trade, and assisting in the marketing of Russian products in America and their exchange for American goods.

One of the chief objects which the company will have in view will be the encouragement of private capital to engage in trade in Russia and Siberia as shipping becomes available for the purpose. Its policy will be to co-operate with, encourage and promote such trade with Russia as will assist in the rehabilitation of her economic life, and to cover by its direct operations only such portions of the field as cannot at present be served readily by private enterprise.

The company has already begun the transaction of business by the dispatch of three vessels from the Pacific Coast to Vladivostok carrying commodities which its representative in Siberia has designated as being most urgently needed there.

By addressing the Russian Bureau persons interested in Russian trade may receive more detailed information as to the commodities most needed by Russia and the commodities likely to be available for export from Russia. Additional vessels will from time to time be scheduled, and shippers are urged to file applications for licenses to export to Russia such commodities as they know to be needed.

The head office of the Russian Bureau is in the War Trade Board Building at Washington, D. C. The board of directors of the company consists of the members of the War Trade Board. Hon. Vance C. McCormick, chairman of the War Trade Board, is president of the company; John Foster Dulles is secretary and treasurer, and Henry B. Van Sinderen is acting manager. The directors are Vance C. McCormick, Thomas L. Chadbourne, Jr., Edwin F. Gay, Albert Strauss, Alonzo E. Taylor, J. Beaver White and Clarence M. Woolley.



# Incorrect Hitching Neutralizes the Work of the Tractor

Speakers at the Meeting of the Minneapolis Section S. A. E. Emphasize the Importance of Proper Hitches and Plow Implements for Power Farming

MINNEAPOLIS, Dec. 5—The tractor man doesn't realize the importance of the implement, according to F. N. G. Kranick, speaker at the meeting last night in the Hotel Radisson of the Minneapolis Section, S. A. E. Mr. Kranick is in charge of the implement division of the Hyatt Roller Bearing Co., Chicago, and is most of the time in the field. His subject was: "Drawbar Implements and Hitches." Prof. J. L. Mowry, of the University of Minnesota, presided.

"The tractor is an incidental means to the end. If there were not another tractor in the world we would get along, but without implements we would starve," said Mr. Kranick as a basis of his attitude to the subject. In brief the speaker said:

"Implements to go with tractors as a whole apparently have not had the consideration due them. It is really the implement that does the work the farmer has to do. Really it is the work that is being done by the implement that makes the success for the tractor as a whole. It is no uncommon thing to see tractors sold for work done by the plow. The implement is part of this big problem that we have to work out. I believe the sooner we all realize the implement has an important function in common with the tractor the better it will be for the industry as a whole.

## Hitching Cause of Trouble

"Much of the trouble is the way the implement is hitched. The implement really does what we have to do. The history of nations is the history of its farm machinery, which governs the growth of agriculture which we must have to live. Since 83 per cent of farm work is machine work, farm machinery must receive more consideration from tractor makers. The implement really is first. The tractor is a means to an end to get more out of the implement and to use larger units and do more in the same time. Due to the development of machinery one man can do the work of 3 men in 1880.

"To-day is the fourth period of agriculture, or farm power. Farm power is part of agriculture. Plowing is "the peak of the load" in agriculture. It takes more power to plow the wheat fields than the power of all the industries for the same period.

"The tractor is doing away with the slow work of the walking plow. The type of plows is not varied so much as before. One manufacturer told me he had had 50 types of bottoms to fit the territory in which they were sold. With the tractor this has simmered to four. Many manufacturers have the flexible beam type, and there is the rigid beam

mounted on one frame and they travel together. It is found that where land is irregular and a constant depth is required the flexible type gives best satisfaction. It is harder to adjust and as it comes knocked down requires a good man to set it up.

"The rigid beam to-day is quite simple. The bottoms vary with what the farmer has to do. A plow has a certain work to do—to make the mold board such a shape as to turn one particle of the soil on another and mellow it. Sometimes with use of the stubble bottom instead of the general purpose the quality of the plowing is affected favorably.

"The hitch frequently defeats all the work of the tractor manufacturer. At the Salina demonstration this was apparent at quite a distance, as from the top of a stack, whence it was quite evident. The problem is to know just where to hitch to get the best results.

## Implement Should Be Watched

"When we get a tractor with plows in the field we are apt to watch the tractor and overlook the implement altogether. Ordinarily of the draft on a plow 55 per cent is used to cut the furrow, 35 per cent in friction and 10 per cent to lift the load of the total draft. It is important that the plow run true and it is a good scheme to know when it is running right. The load on all three of the wheels of the plow should be equal, and whether this is true can be found by holding to see whether the rear wheel, which is usually the wrong one, slips on the ground. The tractor operator can easily adjust the rear wheel. To give the tractor a good show have the proper hitch and proper adjustment of the plow at tractor demonstrations.

"The number of plows a tractor can pull is a problem. In some places it is 3 lb. per sq. in. per furrow section, and in Illinois 20 lb. and in sections in the West twice that.

"It is difficult to find an operator who understands the hitch of the plow. It is important that the plow is set so the tractor can do its very best, so two-plow tractors in cases can pull three plows. The center line of draft on plows is often talked about as a mystery. Some people have assumed the center line of draft is 2 in. on the inside of the land side of the plow, or the point of resistance.

Rather than to assume this Professor White made tests which I witnessed with a drawbar hitched from one wheel on the outside to a wheel on the inside with holes every 2 in., with a dynamometer, to see where the pull was easiest. It ran lightest when hitched the poorest, to one side, but the quality of

the plowing was awful. It revealed the importance of getting two units coupled up in harmony. This shows the engineers should give the unit consideration in the field as in the shop on the brake. What they do in the field is the final analysis to the whole thing.

"Never in public tests is any record kept of draft, so far as the hitch is concerned. This is important because one tractor can have a real good performance and a real poor performance, according to the test. If the manufacturer publishes figures of a test this item of hitch should be part of it.

"If a plow is set properly nine-tenths of the troubles of plowing will be eliminated. The industry as a whole will gain more if it gives more consideration to what is the tractor hitch to suit the implement."

## Center Line of Draft

In reply to a question from A. W. Scarratt as to where he found the center line of draft with the experiments, Mr. Kranick said the figures were so different from what they expected to find that it threw the whole thing into the air. They tried to find the point of resistance with the plow.

It was a little over 2 in. inside of the land side; for 2 plows 19 in., 3 plows 26 in., 4 plows 33 in. Professor Mowry asked what the effect was on the plow.

The speaker said that if the land side is rubbing on furrow there should be  $\frac{1}{4}$  in. to  $\frac{1}{2}$  in. clearance. The plow should not drag on the furrow so as to take the load off the wheels. C. F. Shoop asked what about higher plowing speed and what it is. Mr. Kranick said the manufacturers have no idea about it. Some had plowed 5 m.p.h., which hurt the tractor more than the plow. A general purpose bottom is better for high speed than stubble bottom. There is no speed set at which a plow should work for a good season's work, but 3 to 3½ miles steadily is good. One who plows along steadily gets along better. The S. A. E. standard of 2 1/3 miles is too slow. Plowing should really be 3 to 4 m.p.h. The average of the new light tractors is about 3 miles, but not for 3 or 4 plows. It all comes back to efficient speed of the tractor—the economic value as to whether fast or slow speed is the efficiency of the tractor, whether it will stand up.

## More Money for Wisconsin

MILWAUKEE, Dec. 9—The Wisconsin Motor Mfg. Co., which in recent years has become one of the largest and best known manufacturers of passenger car, truck and aircraft engines in the world, has increased its capital stock from \$1,000,000 to \$2,000,000 in order to accommodate the growth of its business and to provide for future extensions of facilities and trade. Within the last year and a half the size of the plant at Forty-fourth Avenue and Burnham Street, in West Milwaukee, has been nearly doubled. Charles H. John is president and general manager, and A. F. Milbrath is secretary and chief engineer.

**Seger Heads U. S. Rubber**

NEW YORK, Dec. 9—Charles B. Seger has been elected president of the U. S. Rubber Co., succeeding Samuel P. Colt, who becomes chairman of the board of directors. Mr. Seger is president of the Union Pacific Railroad Co. and for the past two years has been a member of the board of directors and of the executive committee of the U. S. Rubber Co. Lester Leland, for many years vice-president of the U. S. Rubber Co., was elected vice-chairman of the board of directors.

**Combs Enters Canadian Prest-O-Lite**

TORONTO, Dec. 8—R. H. Combs has become the general manager of the new Canadian company organized as the Prest-O-Lite Co. of Canada, Ltd., which will perpetuate the service of the Prest-O-Lite Co., Inc., in the Dominion.

The new company starts business with a capital stock of \$800,000. It also operates plants for the manufacture of Prest-O-Lite compressed acetylene at Shawinigan Falls, Que., at St. Boniface, Man., and at Merritton, Ont. The welding and cutting equipment is made and marketed from the Toronto plant. In addition warehouses and an office are maintained in Montreal and a sales office in Winnipeg.

**Dr. Garfield Resigns**

WASHINGTON, Dec. 6—Dr. Harry W. Garfield, Fuel Administrator, has tendered his resignation to President Wilson. The President accepted it. This announcement was made yesterday at the White House together with the statement that the Fuel Administration will continue, however, to operate until winter has passed. No announcement of modification of fuel restrictions or of any contemplated changes in the present policies of the Administration were made in connection with the statement.

Frank A. Storer has resigned as general manager of the Wire Wheel Corp. of America to return to his former activities in the foreign market field. The first of the new year will find him exconced as junior partner of the Argentine firm known as Storer & Co., with headquarters at 361 Calle Chacabuco, Buenos Aires, to re-engage in the business of importing American goods.

Rex W. Wadman, who has been doing special work for the Ordnance Department, U. S. A., has re-established his New York office at 16 Beaver Street.

**St. Louis Picks Landing Field**

ST. LOUIS, Dec. 8—The city officials last week designated a site in Forest Park for the airdrome and landing field of the airplane mail service which is to be established between this city and Chicago in January if the War Department can release to the Postoffice Department sufficient airplanes by that time.

## Men of the Industry

### *Changes in Personnel and Position*

**Lonn Heads Falls Motor**

MILWAUKEE, Dec. 9—At the annual meeting of stockholders of the Falls Motors Corp., Sheboygan Falls, Wis., the following officers and directors were elected: President, E. J. Lonn, head of the Great Western Mfg. Co., LaPorte, Ind.; first vice-president, P. A. Waller, Kewanee, Ill.; second vice-president, L. G. Blessing, of Bastian & Blessing Co., Chicago, and Muskegon, Mich.; general manager, G. G. Brandenburg, formerly of the Buda Co., Harvey, Ill. Directors—H. W. Ladish, Milwaukee; C. Testwuide and William Wilms, Sheboygan Falls. The Falls company is completing a new shop addition which will go into operation Jan. 1 and make possible a considerable increase in output. The addition represents an investment of more than \$250,000 in plant and equipment. The company is bringing out a new tractor motor to supplement its line of passenger car and truck engines, which it has been making and marketing for more than 15 years.

L. E. Schumacher, who for the past 8 years has been chief inspector of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been promoted to works manager of the Krantz Mfg. Co., Brooklyn, N. Y., the latest subsidiary of the former company.

J. K. Mahaffey, who has been representing the Edison Storage Battery Co. in Washington in connection with Government business, has been appointed district sales manager of the Pittsburgh district.

Bertram Smith, for the past 3 years district sales manager of the Detroit district of the Edison Storage Battery Co., has been appointed assistant general sales manager, with headquarters at the main office, Orange, N. J.

Lieutenant Thurber W. Cushing has been transferred to the inactive list of the Field Artillery Officers' Reserve Corps, and has returned to his duties as vice-president and sales manager of the Maibohm Motors Co., Racine.

Homer Hilton, formerly with the Class Journal Company, has joined the Oshkosh Motor Truck Mfg. Co., Oshkosh, Wis., as sales manager.

Gard Gale has accepted the general sales managership of the Commerce Motor Truck Co., Detroit.

**Toback Returns to New York**

NEW YORK, Dec. 9—Samuel S. Toback, who some months ago left New York to become president of the Redden Motor Truck Co., Chicago, has returned to New York to become general sales manager of the Marmon Automobile Co. of New York. This company, which controls the Metropolitan distribution of Marmon cars, has just added similar distribution of the Hupmobile, which up to recently was handled by Charles E. Reiss. Toback will have charge of both wholesale and retail sales of both lines.

**Lipsner Out of Air Mail**

WASHINGTON, Dec. 7—Capt. B. B. Lipsner has resigned as superintendent of the Aerial Mail Service. Capt. Lipsner objected to the assignment of "novices" in charge of important air work, and stated, "I wish to resign and keep spotless my record as first superintendent of the Aerial Mail Service."

**Alden Takes Horowitz's Place**

WASHINGTON, Dec. 4—Col. H. W. Alden has become assistant to the Chief of Ordnance in charge of motors, including tanks, following the resignation of Louis J. Horowitz, who was the assistant to the Chief of Ordnance in charge of tanks during the war. Mr. Horowitz resigned his position to resume his duties as chief executive of the Thompson-Starrett Construction Co. He was in complete charge of the engineering, manufacturing and inspection of military tanks.

Pablo Homs has been appointed assistant foreign sales manager for the Cleveland Tractor Co., Cleveland, with offices at 44 Whitehall Street, New York. The countries to which he will give special attention in the distribution of Cleveland tractors are Russia, Scandinavia, Holland, Dutch East and West Indies, Spain, Portugal, Japan, China, Manchuria, Philippines and Corea.

**Truck Show for Philadelphia**

PHILADELPHIA, Dec. 7—At a meeting of the board of directors of the Motor Truck Association of Philadelphia it was decided that the association will hold a show in March, following the show of the Philadelphia Automobile Trade Association. The motor truck show will be held under the direction of a committee consisting of the officers and directors. J. D. Howley is president of the association.

**Tractors for Snow Removal**

HARRISBURG, PA., Dec. 7—For the first time in the history of Pennsylvania, tractors will be used for the removal of snow from the highways. The State Council of National Defense will turn over several of the state's big farm tractors used in the fields the past season for the use of the State Highway Department.

## British Day at S. A. E.

### Metropolitan Section Hears Paper on Transmission by English Engineer

NEW YORK, Dec. 11—To-day was British Day at the Metropolitan Section of the S. A. E., beginning with an afternoon reception to the Council of the Society at which the speakers and the nature of the subjects for the coming winter meeting, which has been postponed until February, were discussed, and ending with a combination British engineering talk and French movies in the evening, with a satisfying dinner, including cider, sandwiched in between. All three events took place at the clubhouse of the A. C. A.

The principal speaker was F. Leigh Martineau, a British engineer, associated with Hele-Shaw, who gave an interesting talk on hydraulic transmissions. Owing to sickness he had not been able to prepare as complete a paper as he wished, but he dealt clearly with the fundamentals governing the use of hydraulic transmissions in general and the construction and operation of the Hele-Shaw oil transmission in particular, illustrating the latter with lantern slides. His experience, which has extended over several years, has been largely with the application of oil transmissions to other than vehicle uses, such as ship-steering gear, hydraulic cranes and presses, but his vision of the future developments of this simple form of power transmission includes the vehicle field. As an example of its ruggedness the speaker referred to an oil operated press which had been in use in a French munition works from 1914 until 1917, working night and day throughout that period without any repairs or replacements. Some interesting results of tests for economy of hydraulic as compared with steam steering gears for ships were given, showing a great saving of fuel consumed and even an increase in the speed, owing to smoother ruddering, of the same ship when fitted with hydraulic steering.

Remarkable figures of efficiency in the operation of oil transmission when full power is transmitted over a small speed range were also given. There is the limitation, however, that if a great range of speed is required at the output end this efficiency is considerably lowered.

As an example of an application of hydraulic transmission where its superiority over other types is very marked mention was made of large hydraulic cranes in use at the munition plants in England and France. The advantages are especially noticeable in the lowering of heavy loads, near the maximum of the crane. In the hydraulic crane this can be accomplished with almost perfect control and without any vibration, whereas friction-controlled lowering is accompanied with great danger, owing to the impossibility of applying smooth braking effort.

In the absence of Major Crossley, who was to address the meeting, C. G. Griffin of the British Mechanical Transport made a felicitous speech in which he expressed the gratitude felt by the British engineers for the great services rendered by their American confrères in the mechanical work of the war.

Harold L. Pope, who has lately returned from a tour of the aircraft factories in France and England, recounted his experiences briefly.

The meeting closed with a visionary expression of the future work of the society by President Kettering.

## Two New York Shows in February

### Dealers' Association Will Hold Car and Truck Exhibits in Madison Square Garden

NEW YORK, Dec. 9—Instead of having no show New York is to have two shows. The old double-show days are coming back under the auspices of the Automobile Dealers' Association of New York City.

After much negotiation the dealers have secured the Madison Square Garden, where the motor show was born a score of years ago, and will put on shows for both cars and trucks. The passenger cars will be shown Feb. 1 to 8 and the trucks Feb. 10 to 15.

Those who used to attend shows under the Garden's vaulted roof will remember that extra floor space used to be secured by extending the balcony out over the main floor. This plan will be again followed, so that the floor space will be about as it was in the old days before the shows left the Garden to go to Grand Central Palace, which is now a military hospital.

Space arrangements are being made and within a short time the exhibition areas will be allotted to the New York dealers.

Some of the personal machinery of the former shows is retained and the campaign for big, successful shows is being pushed actively by Manager Charles A. Stewart and the show committee, which consists of: Chairman, Charles H. Larson, Cutting-Larson Co.; H. R. Bliss, Colt-Stratton Co.; Walter Woods, Van Cortland Vehicle Co.; William C. Poertner, Poertner Motor Car Co.; Harry J. DeBear, Maxwell Motor Sales Co.; R. J. Gilmore, Packard Motor Car Co.

### Director of Bureau of Public Roads Dies Suddenly

CHICAGO, Dec. 10—Logan Waller Page, director of the Bureau of Public Roads, died suddenly of heart disease last evening. He had arrived to take part in the Highway Industries Association convention. Mr. Logan was a pioneer in highway work and the inventor of machines used in road improvement.

## Electric Starter on All Ford Sedans

### "Liberty" to Be Furnished Exclusively to Ford—Slight Increase in Price

NEW YORK, Dec. 7.—The new Ford sedans are to be equipped with an electric starter, and there will be a slight change in the price of the cars to cover the installation. The starter will be standard equipment for 1919 on as many cars as it is possible to obtain starters for. There are to be no mechanical changes in the Ford chassis except for some slight alterations made necessary to accommodate the starter.

Information regarding this radical departure from previous practice of the Ford Motor Co. comes to AUTOMOTIVE INDUSTRIES from an authentic source. Rumors to the effect that Ford contemplated a change of this character have been current many times during the past 2 years, and at one time it is known that a starter actually was developed and negotiations carried to the point where its equipment on all Ford models was practically assured. Later, however, difficulties arose which precluded the possibility of its addition.

### Starters Supplied for Tanks

The starter which is to be used is one which has been developed and is now being produced by the Liberty Starter Co., which was organized originally to build starters for the Government, and obtained a contract for 16,500 of them. A number of these have been furnished for use on government tanks and other automotive equipment in the American Expeditionary Forces. Latterly the Government contract has been canceled, and it is understood that the Ford Motor Co. has contracted to absorb the entire output of the factory.

The Liberty Starter Co. occupies a factory of moderate dimensions, and its present output is approximately 500 starters a day. Another building of the same size is to be built immediately and the output more than doubled. The starter will be supplied exclusively to the Ford Motor Co.

### Court Decides in Stewart Favor

CLEVELAND, Dec. 10—In a decision handed down Nov. 21, Judge Westenhaver of the United States District Court, held that the Jay Patent, No. 1,132,273, dated March 16, 1915, and on which the Stewart vacuum system is based, is infringed by the Sparton tank made by the Sparks-Withington Co., Jackson, Mich. Infringement is held on two out of fourteen or fifteen claims of the Stewart-Warner Co. On the other thirteen points it was held that the Sparton tank did not infringe. An injunction and accounting of damages and profits was granted Stewart-Warner against Sparks-Withington.



## AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>		<b>Fabric, Tire (17½ oz.):</b>	
Muriatic, lb. ....	.02 -.03	Sea Is., combed, lb. ....	1.65-1.70
Phosphoric (85%) ..	.35 -.39	Egypt, combed, lb. ....	1.25-1.35
Sulphuric (60), lb. .	.006	Egypt, carded, lb. ....	1.20-1.30
<b>Aluminum:</b>		Peelers, combed/lb. ....	1.05-1.20
Ingot, lb. ....	.33	Peelers, carded, lb. ....	.95-1.05
Sheets (18 gage or		<b>Fibre (½ in. sheet</b>	
more), lb. ....	.42	base), lb. ....	.50
<b>Antimony, lb. ....</b>	<b>.13%-.13%</b>	<b>Graphite:</b>	
<b>Burlap:</b>		Ceylon, lb. ....	.09 -.22
8 oz., yd. ....	.17%-.17½	Madagascar, lb. ....	.10 -.15
10½ oz., yd. ....	.21%-.22	Mexico, lb. ....	.03%
<b>Copper:</b>		<b>Lead, lb. ....</b>	<b>.06%-.07%</b>
Elec., lb. ....	.26	<b>Leather:</b>	
Lake, lb. ....	.26	Hides, lb. ....	.18 -.35½
		Nickel, lb. ....	.40

## Oil:

<b>Gasoline:</b>	
Auto., gal. ....	.24½
68 to 78 gal. ....	.30½
<b>Lard:</b>	
Prime City, gal. ....	2.30-2.35
Ex. No. 1, gal. ....	1.62
Linseed, gal. ....	1.63-1.65
Menhaden (Brown)	
gal. ....	1.35-1.36
<b>Petroleum (crude),</b>	
Kansas, bbl. ....	2.25
Pennsylv'a, bbl. ....	4.00

## Rubber:

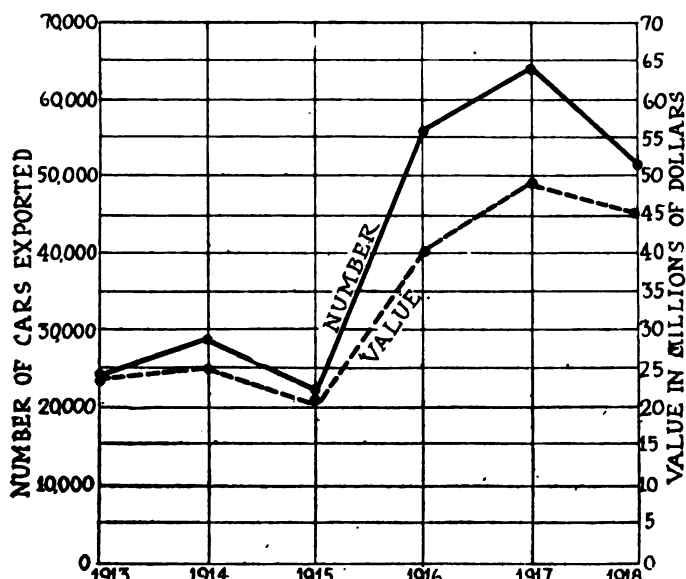
<b>Ceylon:</b>	
First latex pale	
crepe, lb. ....	.62½
Brown, crepe, thin,	
clear, lb. ....	.60
Smoked, ribbed	
sheets, lb. ....	.61½

## Para:

Up River, fine, lb. .	.62½
Up River, coarse,	
lb. ....	.36
Island, fine, lb. ....	.59
Shellac (orange), lb. .	.74 -.75
Speiter ....	.08½-.08%

## Steel:

Angle beams and	
channels, lb. ....	.03
Automobile sheet	
(see sp. table).	
Cold rolled, lb. ....	.06½
Hot rolled, lb. ....	.03½
Tin ....	.71 -.73
Tungsten, lb. ....	2.20-2.50
Waste (cotton), lb. .	.12%-.17



From 1915 to 1917 our exports of passenger cars showed a steady and satisfactory advance. This year's drop was caused by shortage of ocean transport and lack of fuel in many countries

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only per 100 lbs.	Primes when seconds up to 15 per cent are taken per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping .....	6.45	6.35
Hood, flat, fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
<b>Automobile Sheet Extras for Extreme Widths:</b>		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		

## Black Sheet Extras to Apply to Narrow Widths:

Oiling, 10c. per 100 lb.	
Patent leveling, 25c. per 100 lb.	
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.	
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.	

## Automobile Securities on the Chicago Exchange at Close Dec. 4

Net				Net				Rubber Stocks				Net			
Bid	Asked	Ch/g		Bid	Asked	Ch/g		Bid	Asked	Ch/g		Bid	Asked	Ch/g	
Auto Body Co. ....	7	10	..	Motor Products Corp. ....	40	..	+2	Ajax Rubber Co. ....	61	63	..				
Briscoe Motor Car, com. ....	11	..	..	Nash Motors Co., com. ....	150	175	..	Firestone T. & R., com. ....	125	132	..				
Briscoe Motor Car, pfd. ....	40	55	..	Nash Motors Co., pfd. ....	85	95	..	Firestone T. & R., pfd. ....	99	101	..				
Chandler Motor Car. ....	104	106	+4%	National Motor Co. ....	9	12½	..	Fisk Rubber Co., com. ....	60	65	..				
Chevrolet Motor Car. ....	144	146	..	Packard Motor Car, com. ....	115	125	..	Fisk Rubber, 1st pfd. ....	97	103	..				
Cole Motor Car Co. ....	90	105	..	Packard Motor Car, pfd. ....	95	..	+3	Fisk Rubber, 2nd pfd. ....	79	83	..				
Continental Motors, com. ....	8½	9	..	Paige-Detroit Motor, com. ....	27	28	+½	Fisk Rubber, 1st pfd. conv. ....	90	97	..				
Continental Motors, pfd. ....	92	96	..	Paige-Detroit Motor, pfd. ....	8½	9½	..	Goodrich, B. F., com. ....	52	53	..				
Edmunds & Jones, com. ....	18	..	..	Peerless Motor Truck. ....	14	17	-1	Goodrich, B. F., pfd. ....	101	103	-1				
Edmunds & Jones, pfd. ....	75	90	..	Pierce-Arrow Mot. C., com. ....	43½	44½	+2½	Goodyear T. & R., com. ....	225	235	..				
Electric Storage Battery. ....	50	60	..	Pierce-Arrow Mot. C., pfd. ....	102½	103½	..	Goodyear T. & R., 1st pfd. ....	102	103	..				
Federal Motor Truck. ....	31	35	-2	Premier Motor Corp., com. ....	4	..	..	Goodyear T. & R., 2nd pfd. ....	101	102	..				
Fisher Body Co., com. ....	36	40	..	Premier Motor Corp., pfd. ....	..	75	..	Kelly-Springfield, com. ....	56	58	..				
Fisher Body Co., pfd. ....	92½	93	..	Prudden Wheel Co. ....	15	17½	..	Kelly-Springfield, pfd. ....	88	92	..				
Ford Motor of Canada. ....	215	225	..	Reo Motor Car Co. ....	22½	24	+1½	Lee Tire & Rubber Co. ....	20	21	..				
General Motors, com. ....	126½	127½	+1	Republic Motor Truck, com. ....	33	37	-2	Marathon Tire & Rubber. ....	..	55	..				
General Motors, pfd. ....	80½	81½	-1½	Republic Motor Truck, pfd. ....	88	92	..	Miller Rubber Co., com. ....	142	148	..				
Hupp Motor Car, com. ....	4½	5	..	Saxon Motor Car, com. ....	7½	9½	+½	Miller Rubber Co., pfd. ....	96	98	..				
Hupp Motor Car, pfd. ....	81	85	..	Scripps-Booth Corp. ....	21	25	..	Rubber Products Co. ....	..	101	..				
Kelsey Wheel Co., com. ....	28	33	..	Stewart Warner Speed. Corp. ....	75	77	-1	Portage Rubber Co., com. ....	145	149	..				
Kelsey Wheel Co., pfd. ....	85	90	..	Stromberg Carburetor Co. ....	24	28	..	Swinehart T. & R. Co. ....	50	60	..				
Manhattan Electric S., com. ....	48	..	..	Studebaker Corp., com. ....	52½	53½	+3%	U. S. Rubber Co., com. ....	62	64	..				
Maxwell Motor, com. ....	28½	29½	+1½	Studebaker Corp., pfd. ....	92½	100	..	*U. S. Rubber Co., pfd. ....	104½	105½	..				
Maxwell Motor, 1st pfd. ....	51½	52½	+½	Stutz Motor Car Co. ....	46½	48½	+2½								
Maxwell Motor, 2nd pfd. ....	20½	21½	+1½	United Motors Corp. ....	32½	34½	+½								
McCord Mfg., com. ....	30	35	..	White Motor Co. ....	46½	47½	+2								
McCord Mfg., pfd. ....	90	95	..	Willys-Overland, com. ....	25½	26½	+1½								
Mitchell Motor Co. ....	30	35	..	Willys-Overland, pfd. ....	87	89	..								

\*Ex Dividend.

# Accomplishments of the Aircraft Production Board

**John D. Ryan's Report Shows That Though There May Have Been Some Inefficiency Quantity Production Was Being Rapidly Approached**

WASHINGTON, Dec. 9—When in May, 1918, the Senate was denouncing the Air Service because of "defects in the Liberty engine," "insufficient production," etc., there had been delivered 1104 Liberty engines, 1794 foreign combat engines and 6377 training engines, according to the annual report of John D. Ryan (May 24 to June 30, 1918) made public here to-day.

Up to May 24 148 battleplanes and 5091 training planes had been produced. The report shows clearly that the Air Service, although in some degree possibly inefficient, was undoubtedly entering into quantity production and headed for the production scale provided by the program. Instruments, accessories, machine guns, bombs, photographic equipment and balloons were all in a production that was growing steadily.

The Bureau of Aircraft Production was divided, states the report, into seven divisions—executive, engineering, production, spruce production, procurement, finance, advisory and consulting. A special mission of French and Italian engineers had been brought to this country and was engaged in the development of experimental plans. Spruce production totaled over 56,000,000 ft. up to May 24, while fir shipped up to that date amounted to 19,216,000 ft.

Total appropriations made by Congress for aviation amounted to \$682,646,067.16. Orders for airplanes and spare parts, balloons, plans, general equipment, instruments and engines totaled \$570,437,818.52 to June 30,

1918. Construction of buildings, flying fields, and training and operation and maintenance to June 30 totaled \$181,312,821.72, making a total of obligations incurred of \$751,750,640.24.

Cash disbursements to June 30, 1918, for airplanes and parts, engines and parts, balloons, general equipments, plants and experiments totaled \$208,419,894.53, and for building and flying field construction, training, operation and maintenance there was expended \$164,898,494.11, making a total of cash disbursements up to June 30, 1918, of \$370,318,388.64.

At that time, when Congressmen and others were denouncing the "wasteful" disposal of the \$640,000,000 appropriated for aviation, in the latter part of May—there had actually been expended but \$182,292,373.39 for airplanes, spare parts, engines and spare parts, balloons and accessories, general equipment, plants and experiments, and at that same time there had been delivered more than 9200 Liberty, foreign combat and training engines, over 6000 training and battle planes, 14,000 propellers, millions of feet of mahogany, walnut, spruce and other necessary woods, 34,000 machine guns and many thousands of other accessories of vital importance to the aircraft program.

Following is the complete report of the Bureau of Aircraft Production from May 24 to June 30, 1918, after the appointment of John D. Ryan to head the Bureau until the end of the fiscal year:

## Complete Text of the Report of the Bureau of Aircraft Production

JOHN D. RYAN, DIRECTOR.

(May 24 to June 30, 1918)

### 1—Creation of the Bureau of Aircraft Production

Under date of May 20, 1918, by Executive order of the President and by General Order No. 51 of the War Department, the Bureau of Aircraft Production was established.

The bureau was described as "an executive agency" which "shall exercise full, complete and exclusive jurisdiction and control over the production of airplanes, airplane engines, and aircraft equipment for the use of the Army."

The order provides that such person as shall at the time be chairman of the Aircraft Board shall also be the executive officer of the Bureau of Aircraft Production. He is designated as "Director of Aircraft Production," and the order provides that he shall, under the direction of the Secretary of War, have charge of the activities, personnel and properties of said bureau.

### 2—Aircraft Board

From the date of the creation of the Aircraft Board by act of Congress approved Oct. 1, 1917, to May 24, 1918, the Aircraft Board acted in an advisory capacity to the Secretary of the Navy and to the Chief Signal Officer of the Army, with respect to the purchase, production, and manufacture of aircraft, and made recommendations as to contracts and their distribution in connection with the foregoing.

The Navy has continued to function in its relations to the Aircraft Board in substantially the same manner as heretofore.

The board acts as a clearing house for information regarding aviation as between the Army and the Navy. The Executive order of May 20, 1918, which gave to the Bureau of Aircraft Production the jurisdiction and control of the production of airplanes for the Army, recognizes the existence of the Aircraft Board in designating the chairman of that board as head of the Bureau of Aircraft Production, and neither enlarges nor diminishes the duties and functions of the board.

The Aircraft Board consists of the following:

Civilian Members—John D. Ryan, chairman; R. F. Howe, vice-chairman, and W. C. Potter.

Army Members—Maj. Gen. W. L. Kenly, Col. E. A. Deeds and Col. R. L. Montgomery (last two temporarily relieved).

Navy Members—Rear Admiral D. W. Taylor, Capt. N. E. Irwin and Lieut. Commander A. K. Atkins.

### 3—Organization of the Bureau of Aircraft Production

In order to carry out the program and provide the equipment, the bureau is divided into seven main divisions:

- (a) Executive.
- (b) Engineering.

- (c) Production.
- (d) Spruce Production.
- (e) Procurement.
- (f) Finance.
- (g) Advisory and Consulting.

The Executive Division directs the activities of the bureau. The Engineering Division is responsible for the design of new models of airplanes and engines and all accessory equipment, necessary to meet the military requirements, and when developed to furnish models and drawings to the production department for the producing of quantities called for by the program.

The Production Division is charged with responsibility for the supervision of the production and inspection of all aircraft, including materials and parts therefor, for the investigation and selection of sources of supply, and for the conduct of all relations with contractors, with the exception of the production engineering, the execution of contracts, and matters of financial administration.

The activities of the Production Division are carried on by decentralization through district offices, which are established in various sections of the country where concentrated aircraft production is being carried on. By this means direct contact with the manufacturers is obtained and decisions can be rendered with the least possible delay.

It is of interest to note that aircraft requirements emanate from the Director of Aircraft Production for complete planes, engines and accessories, and are set forth in an authorized program furnished by the Office of the Secretary of War, which states that certain types of airplanes and airplane engines in certain monthly quotas of each type are required, these types having previously been determined largely by the Air Forces overseas.

In connection with production, it is of interest to note what has been accomplished:

#### Airplane Engine Production

	Total shipments to May 24.	Shipments May 24 to June 30, inclusive.	Total to June 30, inclusive.
<b>Liberty engines:</b>			
Army type .....	622	994	1,616
Navy type .....	482	293	775
Total .....	1,104	1,287	2,391
<b>Foreign combat engines:</b>			
Gnome .....	179	30	209
Hispano-Suiza 150-hp. ....	1,607	581	2,188
Hispano-Suiza 180-hp. ....		6	6
Hispano-Suiza 300-hp. ....	2		2
LeRhône 80-hp. ....	6	62	68
Total .....	1,794	679	2,473
<b>Training type:</b>			
Curtiss OX5 .....	4,258	1,216	5,474
Hall-Scott A7a .....	2,053	130	2,183
Lawrence .....	66	48	114
Total .....	6,377	1,394	7,771
<b>Grand total engines.....</b>	<b>9,275</b>	<b>3,360</b>	<b>12,635</b>

The foregoing figures show shipments from the factory.

In addition to this production, a certain percentage of spares have been included in the shipment of each type of engines.

Combat engines, consisting of the Hispano-Suiza 180-horsepower and the Liberty 12 are in large quantity production, while the Hispano-Suiza 300-horsepower and the Liberty 8 are approaching actual production, and the output of each plant is being pushed to the utmost limit, as it is realized that this country is called upon to supply a large percentage of the requirements of the allies in addition to equipping planes which are produced in this country. Sufficiently extensive tests of these engines have been made to warrant a feeling of assurance that they will be satisfactory in service.

#### Battleplane Production

Total battleplanes produced to May 24, 1918.....	148
Total battleplanes produced May 24 to June 30, 1918.....	393

#### Training Planes

Total training planes produced to May 24, 1918.....	5,091
Total training planes produced May 24 to June 30, 1918.....	523

In addition to this shipment of planes there is a percentage of approximately 80 per cent parts shipped as spares for battleplanes and approximately 100 per cent as spares for training planes.

In order to show in further brief detail what has been accomplished in developing the manufacturing resources of this country in quantity production, a list is given herewith showing in part orders now placed and quantities shipped first up to May 25, second up to June 29, 1918.

Articles or material	Quantity Ordered up to—		Quantity Freightd up to—	
	May 25	June 29	May 25	June 29
<b>Service planes:</b>				
Observation and day bombing—				
DeH-4 .....	8,000	8,000	155	529
Bristol fighter .....	2,000	2,000	11	24
<b>Night bombing—</b>				
Handley-Page .....	1,500	1,500		
Caproni .....	500	1,000		
Monoplane pursuit				
SE-5 (Auth) .....	1,000	1,000		
<b>Service engines:</b>				
U. S.-12 Army type.....	20,000	20,000	628	1,615
U. S.-12 Navy type.....	2,500	2,500	482	775
Bugatti .....	2,000	2,000		
Hispano 180-hp. (Auth)...	3,000	3,000		
Hispano 300-hp. ....	3,000	3,000	2	2
<b>Elementary training planes:</b>				
JN-4-D .....	3,700	3,975	2,837	2,972
SJ-1 .....	1,600	1,600	1,600	1,600
<b>Advanced training planes:</b>				
JN4-H training .....	402	402	402	402
JN4-HG and JN6-HG-2 ..	427	517	83	321
JN4-HB and JN6-HB .....	250	254	16	100
JN6-H observation .....	100	100		
JN6-H pursuit .....	125	125		
S-4-B .....	100	100	100	100
S-4-C .....	400	400	30	73
Penguin .....	300	300	36	50
VE-7 (Auth) .....	1,600	1,600		
<b>Engines:</b>				
Elementary training engines.				
OX-5 .....	7,950	7,950	4,340	5,474
A7a .....	2,250	2,250	2,064	2,178
Hispano 150-hp. ....	3,500	3,500	1,685	2,188
Gnome 100-hp. ....	242	242	177	209
LeRhône 80-hp. ....	2,500	2,500	7	68
Lawrence 28-hp. ....	450	450	65	114
<b>Raw materials:</b>				
Mahogany (1,000 ft.) ....	26,409	26,728	2,219	3,257
Walnut (1,000 ft.) ....	3,354	5,093	853	1,123
Spruce (1,000 ft.) ....	107,204	107,204	17,356	26,260
Oak (1,000 ft.) ....	281	281	261	281
Birch (1,000 ft.) ....	632	632	561	633
Cherry (1,000 ft.) ....		676		338
Fir (1,000 ft.) ....	50,234	50,234	5,926	8,346
Linen (1,000 yds.) ....	3,187	3,187	2,548	2,863
Cotton (1,000 yds.) ....	15,934	17,476	1,876	2,948
Cotton tape (1,000 yds.) ..	4,256	6,566	2,096	2,359
Acetate dope (1,000 gallons)	204	410	108	234
<b>Propellers (spares):</b>				
Training .....	30,988	31,312	14,761	19,948
Combat .....	4,925	6,925	176	1,373
<b>Instruments and accessories:</b>				
Air pressure gauges .....	10,000	10,000	4,889	6,273
Air speed indicators .....	13,500	13,500	1,789	2,115
Altimeters .....	33,600	43,600	7,996	10,108
Clocks .....	15,500	20,500	8,484	10,900
Compasses .....	12,200	12,200	2,145	4,228
Fire extinguishers .....	11,100	11,100	6,105	7,827
Gunnery safety belts.....	5,000	5,000		309
Map cases .....	2,500	2,500		4
Navigation lights (sets of 3)		5,000		150
Navigation lenses .....	6,500	6,605		1,825
Oil pressure gauges.....	10,000	10,000	4,965	8,103
Oxygen apparatus .....	6,000	6,000	88	641
Oxygen helmets .....	10,000	10,020		16
Oxygen tanks .....	10,000	10,000	44	9,409
Panels (sets of 2) .....		7,500		
Radiator thermometers ..	12,500	12,500	6,489	7,831
Standard safety belts.....	4,025	9,525	3,777	4,688
Tachometers .....	25,000	25,000	10,191	12,433
Voltage regulators .....		2,500		
300-watt generators .....		2,500		
<b>Machine guns:</b>				
Lewis .....	39,200	39,200	6,081	10,370
Vickers (ground) .....	12,000	12,000	7,005	8,245
Vickers (aircraft) .....	(1)	(1)	8	56
Marlin .....	38,000	38,000	20,744	22,353
Browning .....	20,000	20,000		
<b>Ordnance accessories:</b>				
Synchronizing devices—				
C. C. interrupter gears..	1,250	4,750	604	1,229
C. C. generator .....	2,500	2,500		
Mechanical interrupter gears .....	635	635	135	160
<b>Gun mounts:</b>				
Single flexible ring.....	10,000	15,000	6,530	8,435
<b>Gun sights:</b>				
Ring .....	13,200	13,200	4,523	7,050
Wind vane .....	10,499	12,999	4,326	6,849
Unit .....	8,000	8,000	628	1,323
Auxiliary .....	11,000	11,000		
<b>Gun yokes:</b>				
Single Lewis .....	11,000	11,000		
Double Lewis .....	11,000	11,000		
Duplex trigger control ..	11,000	11,000		
Single gun stems .....	9,202	9,202	4,004	4,653
Unit sight brackets .....	11,000	11,000		
<b>Bombs:</b>				
Incendiary—				
Mark I .....	112,116	112,116	1	207
Mark II .....	122,886	122,886	2	8
<b>High capacity drop—</b>				
Mark I .....	132,000	132,000		70
Mark II .....	70,000	70,000	102	299
Mark III .....	220,000	220,000		432
Mark IV .....	73,733	73,733		
Mark V .....	20,988	20,988		
Barlow, heavy .....	28,000	28,000	12	12
Dummy drop, Mark I ..	85,000	85,000	8,662	10,008

<sup>1</sup> Program is for 1,000.

<sup>2</sup> 1,000 ordered, 2,000 additional

authorized but not ordered.

<sup>3</sup> Includes 46 from the Navy.

<sup>4</sup> Balloon and airplane fabric.

<sup>5</sup> These figures taken from inspection returns.

<sup>6</sup> Does not include quantities shipped to allies.



Articles or material	Quantity ordered up to—		Quantity freighted up to—	
	May 25	June 29	May 25	June 29
<b>Bomb accessories:</b>				
Bomb sights—				
Low altitude, Mark I ...	100	100	100	100
High altitude, Mark I-a ...	15,000	15,000	135	5.9
Bomb releases—				
Mark I ...	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )
Mark II ...	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )
Mark V ...	2,420	2,420	1,051	1,051
Mark VII B (traps only) ...	100	100	.....	100
Barrow, heavy ...	250	250	19	182
Flares—				
Wing tip ...	( <sup>2</sup> )	112,165	.....	.....
Airplane, Mark I ...	( <sup>2</sup> )	50,083	.....	.....
Flare brackets, holders—				
Wing tip ...	22,000	22,000	.....	.....
Airplane, Mark I ...	( <sup>2</sup> )	( <sup>2</sup> )	.....	.....
Very pistols ...	22,500	22,500	.....	.....
<b>Photographic equipment:</b>				
Observation cameras ...	965	965	491	665
Enlarging lanterns ...	463	463	463	463
Camera guns ...	709	1,409	347	358
Unit section equipment ...	97	97	97	97
Cradles ...	.....	909	.....	175
<b>Hangars:</b>				
Steel, 66 by 100 ...	785	785	36	258
Steel, 66 by 140 ...	234	234	202	234
Steel, 100 by 110 ...	815	815	.....	90
Canvas ...	2,500	2,500	1,736	2,160
<b>Balloons:</b>				
Kite, type "R" ...	1,077	1,102	124	180
<b>Balloon essentials:</b>				
Ferrosilicon (tons) ...	1,320	1,320	810	954
Caustic soda (tons) ...	942	942	661	713
Hydrogen cylinders ...	107,800	107,800	63,350	66,000
Cable (feet) ...	1,120,200	1,143,390	1,007,292	1,119,492
Winches ...	53	55	21	23
Balloon equipment (units) ...	87	87	87	87
Balloon equipment ...	8	8	8	8
<b>Special clothing:</b>				
<b>Pilots and observers—</b>				
Goggles, Nos. 1, 2, and 3 ...	20,669	20,669	16,349	19,349
Soft helmets and caps ...	13,976	13,976	13,976	13,976
Hood, French type ...	13,000	13,000	3,003	9,003
Chin guards, No. 4 ...	7,476	7,476	7,476	7,476
Sweaters, No. 5 ...	10,576	10,576	8,364	9,894
Winter flying suits ...	13,012	13,012	8,375	10,255
Summer flying suits ...	1,000	1,000	1,000	1,000
Moccasins, No. 8 ...	16,500	16,500	9,757	14,981
Gauntlets, No. 9 ...	4,603	4,603	1,600	4,588
Gauntlets, No. 10 ...	4,603	4,612	2,200	4,612
Aviator coats ...	12,327	12,255	12,255	12,255
Face masks ...	3,003	3,003	3,003	3,003
Antislaking aviator coats ...	.....	825	.....	771
Knitted scarfs ...	12,000	13,000	2,000	6,000
Hard helmets ...	6,600	6,600	4,500	6,600
<b>Chauffeurs and motorecyclists—</b>				
Goggles, No. 21 ...	16,286	16,286	16,286	16,286
Soft helmets and caps ...	19,334	19,334	19,334	19,334
Trousers, No. 29 ...	19,286	19,286	19,286	19,286
Gauntlets ...	50,000	50,000	50,000	50,000
Coats, No. 28 ...	19,286	19,286	16,286	19,286
<b>Flying students—</b>				
Goggles, Nos. 1 and 2 ...	8,195	8,195	5,593	8,195
Hard helmets, Nos. 17 and 18 ...	6,540	6,540	4,040	6,540
Sweaters, No. 5 ...	5,700	5,700	1,500	2,700
Summer flying suits ...	4,440	6,440	2,190	4,088
Aviator coats ...	4,743	4,743	4,743	4,743
<b>Construction squadrons:</b>				
Boots, knee ...	5,025	5,025	3,750	5,025
Boots, hip ...	5,525	5,525	4,250	5,525
Coats, oil skin ...	6,750	6,750	6,750	6,750
Trousers ...	6,750	6,750	6,750	6,750
Hats ...	6,750	6,750	6,750	6,750
<b>Balloon companies—</b>				
Soft helmets ...	1,152	1,152	1,152	1,152
Sweaters ...	1,152	1,152	1,152	1,152
Winter flying suits ...	1,376	1,376	224	224
Moccasins ...	1,376	1,376	224	1,376
Face masks ...	1,152	1,152	1,152	1,152
Leather coats ...	1,376	1,376	224	1,376
Knitted scarfs ...	1,152	1,152	1,152	1,152
Leather vests ...	1,152	1,152	.....	.....
Leather breeches ...	1,152	1,152	.....	.....
<b>Miscellaneous orders—</b>				
Mechanician suits ...	85,700	85,700	80,103	85,700

Some idea may be gained from this list of the task of developing and getting into production the various products required by the Air Service, most of them never before having been produced in this country and representing a new art, to develop which both engineers and skilled workmen have to be trained and made proficient.

The manufacturers selected are entitled to the greatest credit for the co-operation and activity they have shown in turning over their existing facilities, and in many cases adding to these facilities in order to meet the requirements.

Recognition is also given to the hearty assistance accorded this bureau by other Government departments.

#### Special Allied Missions

A special French Engineering Mission and a special Italian Engineering Mission have been brought to this country and are now engaged in the development of experimental planes of various types, which will be carefully tested and put into immediate production if satisfactory to the Air Service. The

manufacturing facilities of this country are being rapidly developed for the production of complete battle planes in quantity, and also for the production of finished parts, which will be sent overseas for assembly.

#### 4—Spruce Production Division

The output of spruce on the Western Coast is being rapidly increased, and in order to give an intelligent picture of the methods in bringing about these results, the following figures on output are of particular interest:

Spruce		Feet
Total spruce shipped up to May 24, 1918.....		56,711,044
Total spruce shipped May 24 to June 30.....		8,413,548
Grand total spruce shipped.....		65,124,592
Fir		
Total fir shipped to May 24, 1918.....		19,216,012
Total fir shipped May 24 to June 30.....		6,181,737
Grand total fir shipped.....		25,397,749

Of the total shipments of spruce 2,530,824 feet were shipped direct to England from the southern district.

Of the total fir shipped, 7,055 feet consisted of wing beams completely finished.

Spruce Production Personnel		
	On May 24	On June 30
Commissioned personnel .....	459	538
Enlisted personnel .....	12,382	17,697
Civilian personnel .....	71	70
Total .....	12,912	18,305

#### Spruce Production Cut-up Plant

In addition to the activities of the spruce production division in getting spruce through regular lumber camp channels, a cut-up plant has been located on a Government reservation at Vancouver, Wash. Work on this cut-up plant was begun December 24, 1917, and completed February 7, 1918.

The inception of the idea of a cut-up plant to supplement the sawmills was due chiefly to the necessity of manufacturing rived cants by those not having sawmills. The cut-up plant is now being used for the manufacture of airplane lumber from the entire log.

Machinery of the most modern type has been secured and scientific methods of manufacturing aircraft material adopted. Circular head saws are being used in four of the six units of the mill, and band saws in the other two.

The logs and rived cants are shipped to the plant and are handled by the band saws, and the other units take the flitches from the sawmills in the woods. It is estimated that the cut at the mill can be run up to 9,000,000 feet per month.

In this plant the logs are cut to dimensions, which does away with the waste incident to transporting lumber across the country.

#### Dry Kiln

A dry-kiln plant of the Tidman pattern has been erected adjacent to the cut-up plant. The tremendous amount of material lost through checking in transportation and improper kiln-drying methods has been done away with by the installation of this plant. It is estimated that the saving in freight will pay for the erection of this plant within 12 months.

The plant consists of 24 modern kilns, each having a charge capacity of about 30,000 feet. The time of drying depends upon the size and condition of the wood, averaging from 12 to 30 days. The output of the dry-kiln plant averages 40,000 feet daily.

#### 5—Finances

Total appropriations, obligations, and disbursements as of May 31, and June 30, 1918, for all aviation purposes and not confined to production:

Appropriations			
Increase for aviation, Signal Corps, 1918.....			\$640,000,000.00
Signal Service of the Army, 1917-18, aeronautics act June 15, 1917 .....			31,846,067.16
Signal Service of the Army, 1918, aeronautics act May 12, 1917 .....			10,800,000.00
Total .....			\$682,646,067.16
Obligations			
	To May 31, 1918	June 1 to June 30, 1918	Total to June 30, 1918
Airplanes and spare parts.....	\$195,193,636.18	\$22,401,604.97	\$217,595,241.15
Engines and spare parts.....	249,188,596.81	4,967,050.40	254,155,647.21
Balloons and accessories.....	11,071,431.52	274,249.23	11,345,680.75
General equipment .....	79,048,280.52	2,458,740.82	81,507,021.34
Acquisition of plants .....	2,595,599.83	.....	2,595,599.83
Experimental and research .....	2,978,817.20	264,810.99	3,243,628.19
Total .....	\$640,071,362.06	\$30,366,456.46	\$670,437,818.52

<sup>1</sup> Included in above.

<sup>2</sup> No orders placed.

Obligations—Continued	To May 31, 1918	June 1 to June 30, 1918	Total to June 30, 1918
Construction of buildings and flying fields, including purchase and lease of land, United States and abroad.....	\$88,956,838.35	\$2,961,061.64	\$71,917,899.99
Training, operation, and maintenance .....	92,358,991.33	17,035,930.40	109,394,921.73
<b>Total .....</b>	<b>\$161,315,829.68</b>	<b>\$19,996,992.04</b>	<b>\$181,312,821.72</b>
<b>Grand total .....</b>	<b>701,387,191.74</b>	<b>50,363,448.50</b>	<b>751,750,640.24</b>

Cash Disbursements	To May 31, 1918	June 1 to June 30, 1918	Total to June 30, 1918
Airplanes and spare parts.....	\$76,257,253.08	\$7,464,198.94	\$83,721,452.02
Engines and spare parts.....	69,520,425.62	8,169,015.43	77,689,441.05
Balloon and accessories.....	1,718,082.71	422,397.47	2,140,480.18
General equipment.....	35,498,567.20	6,718,528.52	42,217,095.72
Acquisition of plants.....	1,036,952.54	.....	1,036,952.54
Experimental and research.....	1,261,094.24	353,378.78	1,614,473.02
<b>Total .....</b>	<b>\$185,292,375.39</b>	<b>\$23,127,519.14</b>	<b>\$208,419,894.53</b>

Construction of buildings and flying fields, including purchase and lease of land, United States and abroad.....	To May 31, 1918	June 1 to June 30, 1918	Total to June 30, 1918
.....	\$57,642,578.62	\$4,666,352.26	\$62,308,930.88
Training, operation, and maintenance .....	82,335,163.18	20,254,400.05	102,589,563.23
<b>Total .....</b>	<b>\$139,977,741.80</b>	<b>\$24,920,752.31</b>	<b>\$164,898,494.11</b>
<b>Grand total .....</b>	<b>\$325,270,117.19</b>	<b>\$48,048,271.45</b>	<b>\$373,318,388.64</b>

It is of particular interest to note that there has been disbursed in cash up to June 30 a total of \$208,419,894, covered by Air Service material, and a total of \$164,898,494 for buildings, flying fields, training, and maintenance. Of this amount there have been cash disbursements of approximately \$1,000,000 for experimental work on engines and planes at the McCook Experimental Field, Dayton, Ohio, and a cash disbursement of approximately \$350,000 up to June 30 for special gas at the Fort Worth, Tex., Experimental Plant. In addition to this, there has been a total expenditure of approximately \$200,000 in completing the development of the present battle planes so as to take advantage of American manufacturing methods and quantity production.

### 6—Personnel

One of the most difficult problems which continually faces the director of this bureau is the securing of the proper personnel to carry on the activities of this very specialized industry, about which so little was known in this country at the time war was declared. With the other activities of the Government, the problem grows more serious each day.

In order to convey an idea of what this problem is, a detailed set of statistics is given showing the enlisted, commissioned and civilian personnel—first, in Washington, and, second, in the district offices or plants where aircraft is being produced.

#### Personnel in Washington (excluding Spruce Production Division)

Rank or status	May 24, 1918		June 30, 1918	
	Men	Women	Men	Women
<b>Commissioned</b>				
Colonels .....	1	.....	2	.....
Lieutenant colonels .....	4	.....	5	.....
Majors .....	16	.....	18	.....
Captains .....	66	.....	73	.....
First lieutenants .....	111	.....	101	.....
Second lieutenants .....	116	.....	120	.....
<b>Total commissioned .....</b>	<b>314</b>	<b>.....</b>	<b>319</b>	<b>.....</b>
<b>Civilian</b>				
Executives .....	21	.....	24	.....
Volunteers .....	9	.....	8	.....
Production experts .....	238	.....	187	62
A. M. engineers .....	74	.....	76	.....
Inspectors, A. and A. E. ....	97	.....	86	.....
Expert cost accountants .....	14	.....	18	.....
Stenographers .....	82	248	51	300
Typists .....	45	135	48	141
Clerks .....	133	270	144	290
Catalogue and index clerks .....	.....	55	.....	62
Laborers .....	30	.....	31	.....
Messengers .....	117	59	150	23
Watchmen .....	61	.....	56	.....
Charwomen .....	.....	68	.....	69
Telephone operators .....	.....	19	.....	20
Elevator operators .....	6	.....	6	.....
Miscellaneous .....	107	7	140	7
<b>Total civilians .....</b>	<b>1,034</b>	<b>861</b>	<b>1,025</b>	<b>974</b>
<b>Combined totals .....</b>	<b>1,348</b>	<b>861</b>	<b>1,344</b>	<b>1,042</b>
<b>Grand total .....</b>	<b>2,392</b>	<b>861</b>	<b>2,389</b>	<b>1,042</b>

Note.—No master signal electricians, sergeants, corporals, or privates were assigned.

#### Personnel outside of Washington (excluding Spruce Production Division)

	May 24, June 29	
Rank or status	1918	1918
Commissioned		
Colonels .....	1	1
Lieutenant colonels .....	4	1
Majors .....	11	6
Captains .....	65	29
First lieutenants .....	149	127
Second lieutenants .....	125	130
Total commissioned .....	355	294
Civilian		
Executives .....	1	...
Volunteers .....	...	...
Production experts .....	124	128
A. M. engineers .....	97	154
Inspectors, A. and A. E. ....	2,260	2,367
Expert cost accountants .....	57	84
Stenographers .....	114	130
Typists .....	4	6
Clerks .....	133	133
Catalogue and index clerks .....	...	...
Laborers .....	1	2
Messengers .....	35	34
Watchmen .....	1	...
Charwomen .....	...	...
Telephone operators .....	7	8
Elevator operators .....	...	...
Miscellaneous .....	78	130
Total civilians .....	2,912	3,176

Note.—Prior to Aug. 1, 1918, all enlisted men were of the Division of Military Aeronautics detailed for special duty in the bureau. They comprised master signal electricians; sergeants, first class; sergeants; chauffeurs, first class; chauffeurs; corporals; cooks; privates, first class; privates.

#### Report of Personnel Department, Bureau of Aircraft Production. Washington (excluding Spruce Production Division), as of June 30, 1918.

Rank or status	Executive	Engineering	Production	Procurement	Finance	Advisory	Spruce	Total
<b>Commissioned</b>								
Colonels .....	2	.....	.....	.....	.....	.....	.....	2
Lieutenant colonels .....	1	1	1	.....	.....	.....	.....	3
Majors .....	9	11	11	2	2	.....	.....	18
Captains .....	17	5	36	11	10	1	1	73
First lieutenants .....	17	5	44	14	21	.....	.....	101
Second lieutenants .....	17	9	46	21	27	.....	.....	120
<b>Total commissioned .....</b>	<b>48</b>	<b>21</b>	<b>138</b>	<b>48</b>	<b>61</b>	<b>2</b>	<b>1</b>	<b>319</b>
<b>Civilian</b>								
Executives .....	3	4	5	9	2	1	.....	24
Volunteers .....	2	.....	1	4	.....	1	.....	8
Production experts .....	35	45	66	53	48	2	.....	249
A. M. engineers .....	.....	50	23	3	.....	.....	.....	76
Inspectors, A. and A. E. ....	2	10	74	.....	.....	.....	.....	86
Expert cost accountants .....	.....	.....	1	2	15	.....	.....	18
Stenographers .....	78	10	98	116	47	2	.....	351
Typists .....	52	4	44	49	40	.....	.....	189
Clerks .....	75	18	101	98	142	.....	.....	434
Catalogue and index clerks .....	21	1	19	13	8	.....	.....	62
Laborers .....	29	2	.....	.....	.....	.....	.....	31
Messengers .....	75	10	31	43	13	1	.....	173
Watchmen .....	56	.....	.....	.....	.....	.....	.....	56
Charwomen .....	68	1	.....	.....	.....	.....	.....	69
Telephone operators .....	20	.....	.....	.....	.....	.....	.....	20
Elevator operators .....	6	.....	.....	.....	.....	.....	.....	6
Miscellaneous .....	60	24	26	10	27	.....	.....	147
<b>Total civilians .....</b>	<b>582</b>	<b>179</b>	<b>489</b>	<b>400</b>	<b>342</b>	<b>7</b>	<b>1</b>	<b>1,999</b>
<b>Grand total .....</b>	<b>630</b>	<b>200</b>	<b>627</b>	<b>448</b>	<b>403</b>	<b>9</b>	<b>1</b>	<b>2,318</b>

Note.—No enlisted men assigned.

These figures show an increase in personnel from May 24 to June 30 of approximately 24 per cent.

### 7—Special Missions

In order to carry out a thorough study of European production of airplanes, engines and accessories, a special mission was sent overseas in June, 1918. This mission consisted of experienced experts from the United States on engines, planes, electrical equipment, contracts, instruments and accessory apparatus.

The necessity for continued liaison service between France and this country increases daily, but with the rapid training of the men responsible for the direction of the various departments this situation should be materially improved.

An invitation on the part of the allies has been given to the manufacturing plants of the United States to send their officers and plant managers to Europe to study European methods and adopt from their practice what will be of advantage to supplement American methods.—W. C. POTTER, Acting Director of Aircraft Production.

NEW YORK, Dec. 10—Trading with the Latin American Republics has been conducted under many difficulties during the past three years, more especially during the periods when every available vessel was transferred to transatlantic service. Despite the shipping shortage and the many formalities surrounding export business in wartime plus the shortage of both material and labor, our exports of cars and trucks to Latin America have shown a steady increase.

Comparing 1918 figures with those of

## 3 Years' Exports to Latin America

Despite Shortage of Ocean Transport Our Trade With Republics Has Increased Satisfactorily

1917, it is found that while the 1918 increase in number of passenger cars exported is but slightly in excess of 7.7 per cent, their value has increased no less than 37 per cent. This increase is partly due to higher prices, but it is also indicative of the Latin American demand for cars of more expensive types. As compared with 1916, the 1917 figures show an increase of 52 per cent in number and 76 per cent in value.

Truck exports, although not as great as they should be, also show gains.

Exports of Passenger Cars and Trucks from the United States to Latin American Countries for the Three Fiscal Years Ending June 30, 1916, 1917 and 1918

	PASSENGER CARS						TRUCKS					
	1916 No.	1916 Value	1917 No.	1917 Value	1918 No.	1918 Value	1916 No.	1916 Value	1917 No.	1917 Value	1918 No.	1918 Value
Argentina.....	4,390	\$2,065,439	3,924	\$2,336,001	3,525	\$2,666,898	45	\$33,063	141	\$146,255	51	\$50,124
Bolivia.....	26	16,208	141	100,151	152	105,408	.....	.....	20	48,590	14	24,958
Brazil.....	272	157,969	873	523,383	1,575	1,000,011	11	19,635	14	8,300	24	31,133
Chile.....	826	530,211	2,587	1,821,842	3,399	3,576,511	17	46,566	69	160,696	220	282,638
Colombia.....	91	58,525	173	118,937	164	121,422	4	1,236	2	4,998	3	7,100
Costa Rica.....	60	28,325	37	23,125	199	85,070	.....	.....	.....	.....	5	10,245
Cuba.....	3,698	2,091,295	3,529	2,545,071	2,846	3,029,813	117	171,647	397	722,519	554	1,130,982
Dom. Republic.....	131	60,127	191	96,173	248	157,607	4	5,173	22	23,640	21	13,323
Ecuador.....	62	44,396	137	106,478	142	130,086	2	3,378	1	2,050	3	6,876
Guatemala.....	24	23,552	35	36,174	34	46,657	2	4,916	4	4,323	3	5,512
Haiti.....	10	3,788	29	13,780	102	54,613	.....	.....	.....	.....	11	10,578
Honduras.....	34	22,652	42	24,564	16	12,292	6	14,540	4	4,094	6	3,373
Mexico.....	383	309,200	2,807	1,642,011	2,578	1,653,545	51	100,500	218	198,151	365	525,664
Nicaragua.....	.....	6,275	.....	3,084	49	32,031	.....	.....	.....	.....	1	2,509
Panama.....	288	170,964	356	216,711	129	93,329	32	55,171	75	97,970	47	47,859
Paraguay.....	6	2,256	40	20,192	13	5,025	.....	1,394	.....	4,172	.....	.....
Peru.....	59	40,388	400	295,558	784	913,669	5	5,830	25	48,776	73	155,834
Salvador.....	68	54,598	75	62,314	54	68,297	.....	.....	.....	.....	4	14,811
Uruguay.....	285	150,540	1,165	612,838	2,232	1,177,463	2	5,818	4	10,437	16	15,809
Venezuela.....	518	314,156	542	327,507	160	97,485	6	13,029	14	28,502	16	12,410
	11,180	\$6,150,836	17,083	\$10,925,894	18,401	\$15,027,232	304	\$486,896	1,010	\$1,513,473	1,437	\$2,351,738

# Calendar

## ENGINEERING

### S. A. E. Meetings 1919

- Jan. 8—Minneapolis Section, S. A. E.—Hotel Radisson. "Governors for Tractors and Truck Engines."
- Jan. 12, 13, 14—New York. Winter Meeting, Society of Automotive Engineers, Engineering Societies' Building.
- Feb. 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Radiator Cooling Fans."
- March 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Tractor Service and Sales."
- April 2—Minneapolis Section, S. A. E.—Hotel Radisson. "Implements Designed for Tractor Belt Power and Their Characteristics."

## MOTOR SHOWS

- Dec. 12-14—Dallas, Tex. Dallas Automobile Trades Assn.
- January—Detroit, Mich. Detroit Automobile Dealers' Assn. H. H. Stuart, Manager.
- January or February—Milwaukee, Wis. Milwaukee Auto Trade Assn. Bart J. Ruddle, Manager.
- Jan. 24-30—Milwaukee, Wis. Eleventh Annual, Milwaukee Automobile Dealers, Inc., Auditorium. Bart J. Ruddle, Manager.
- February—Grand Rapids, Mich. Grand Rapids Automobile Business Assn. E. T. Conlon, Manager.

- Feb. 15-22—Louisville, Ky. Louisville Auto Dealers' Assn.
- Feb. 15-22—Newark, N. J. N. J. Auto Exhibition Co. Calude Holgate, Manager.
- Feb. 15-22—Minneapolis, Minn. Northwestern Automotive Exposition, Overland Building.
- Feb. 15-22—Minneapolis, Minn. Minneapolis Auto Trade Assn. Walter B. Wilmot, Manager.
- Feb. 17-22—Des Moines, Iowa. Tenth Annual, Des Moines Automobile Dealers' Assn. C. G. Van Vleet, Manager.
- Feb. 17-24—Passenger Cars; Feb. 24-27, Trucks—South Bethlehem, Pa. Lehigh Valley Auto Shows Co. J. L. Elliott, Manager.
- March—Philadelphia, Pa. Philadelphia Automobile Trade Assn. Passenger cars.
- March—Motor Truck Assn. Trucks.
- Mar. 3-8—Columbus, O. Columbus Automobile Show Co. Memorial Building. W. W. Freeman, Manager.
- March 3-8—Buffalo, N. Y. Buffalo Automobile Dealers' Assn.
- March 10-10—San Francisco, Cal. Motor Car Dealers' Assn. G. A. Wahlgreen, Manager.
- March—Boston. Boston Automobile Dealers' Assn. Chester I. Campbell, Manager.
- Second or third week March—St. Louis, Mo. St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Manager.

- March 22-29, Passenger Cars; April 1-5, Trucks—Brooklyn. Brooklyn Motor Vehicle Dealers' Assn. I. C. Kirkham, Manager.
- Third week March—Trenton, N. J. Trenton Auto Trade Assn. John L. Brock, Manager.
- Probably February—New York. Automobile Dealers' Assn. Charles A. Stewart, Manager.
- Probably March—Chicago. Chicago Automobile Trade Assn.
- March—Philadelphia. Philadelphia Automobile Auto Trade Assn. A. L. Maltby, Manager.
- March—Pittsburgh. Automobile Dealers' Assn. of Pittsburgh. John J. Bell, Manager.
- March—Syracuse, N. Y. Syracuse Automobile Dealers' Assn. Harry T. Gardner, Manager.
- March—Utica, N. Y. Utica Motor Dealers' Assn. W. W. Garabrant, Manager.
- Large March or early April—Cleveland, Ohio. Cleveland Auto Show Co. Fred H. Caley, Manager.
- April 5-12—Montreal, Can. Automobile and Used Car Exposition. T. C. Kirby, Manager.
- Not decided—Bridgeport, Conn. Auspices of City Battalion. B. B. Steiber, Manager.
- Not decided—Harrisburg, Pa. Harrisburg Motor Dealers' Assn. J. Clyde Myton, Manager.

- Not decided—Hartford, Conn. Hartford Automobile Dealers' Assn.
- Not decided—Indianapolis, Ind. Indianapolis Auto Trade Assn. John B. Orman, Manager.
- Not decided—Kansas City, Mo. Kansas City Motor Dealers' Assn. E. E. Peake, Manager.

## TRACTOR SHOWS

- Feb. 10-15—Kansas City, Mo. Fourth Annual Tractor Show. Sweeney Building. Kansas City Tractor Club. Guy H. Hall, Sec.
- Feb. 18-22—Wichita, Kan. Annual Mid-west Tractor and Thresher Show. Wichita Tractor and Thresher Club. Forum.

## CONVENTIONS

- Dec. 16, 17, 18—Chicago. Convention, National Association of Automobile Accessory Jobbers. (Directors and Committees, Dec. 16; General Sessions, Dec. 17-18.)
- Dec. 30-Jan. 1—Chicago, Ill. Twelfth Annual Meeting American Society of Agricultural Engineers. J. W. Dickinson, Secretary. Ohio State University, Columbus.
- Jan. 12-14—New York. Meeting, Society Automotive Engineers.
- Feb. 25-28—New York. Sixteenth Annual Convention. American Road Builders' Assn.



## Congress Deals with Price Fixing

### Recommends Establishment of Government Agency to Abolish Evils

WASHINGTON, Dec. 8—The establishment of a Government agency by Congress is recommended by the Federal Trade Commission to abolish the existing evils of price cutting and price maintenance. An agency is to be organized which will maintain the records of commodities produced throughout the country together with the resale prices on them and which will review the resale prices and the terms of the contracts between the producer and the dealer.

If the prices and contracts are found agreeable it will mean that the dealer must abide by the resale price established. If the resale price and contract are not found satisfactory they will be adjusted between the Government agency, the producer and the dealer.

The object of this proposed agency is to protect producers of identified goods in their intangible property rights and good will, restrain price cutting, and also to curtail the unlimited power which manufacturers would have if they would legally be allowed to fix and maintain resale prices without regulation.

The Commission stated in its report that both price maintenance and price cutting under certain conditions are unfair. Up to this time the Commission has followed the letter of the law and prevented price maintenance, but it urges Congress to establish the agency, since price maintenance in some cases is justified, while wholesale price cutting is unfair in many instances and affords no protection to the producer. Following is the complete report made by the Federal Trade Commission to Congress:

The question is, whether or not a manufacturer of standard articles, identified either by trade-mark or trade practice, should be permitted to fix by contract, express or implied, the price at which the purchaser can resell them.

The question has been continuously before the Commission since its creation. It has been the subject of study, investigation and hearing and constantly recurs, in various forms, in complaints filed with the Commission by business concerns.

The Supreme Court has made it clear that, in the present state of the law, the maintenance of a resale price by the producer is a restraint of trade and is unlawful.

Such being the judgment of the Supreme Court, the Federal Trade Commission has enforced the law, even though it may have appeared to operate inequitably in some cases. In its enforcement of this rule, the Commission has been mindful that the cutting of a recognized resale price on well established and identified articles has been, at times, indulged in for unfair trade purposes. When so unfairly used, such price cutting is attempted to be cloaked as lawful competition and justified by the Supreme Court decisions.

Thus, both price maintenance, and price cutting under certain conditions are found to be unfair and business men are perplexed. It is with the desire that this perplexity may be terminated that the Commission addresses the Congress.

It is urged, and, the Commission believes, with reason, that it would be unwise to vest with the manufacturers of articles the right, without check or review, both to fix and to compel the maintenance of resale prices.

It is true that business practice inclines producers to fix the lowest possible retail price in order to secure the greatest possible sale of their product, but in the complex commercial organism functioning between the production of an article and its final sale, for actual consumption, both the wholesale and retail merchants are entitled to just compensation for useful service performed.

It is similarly urged that manufacturers should be protected in their good will created by years of fair dealing and of sustained quality of merchandise.

The consuming public does not enjoy benefits by unfair price cutting to compensate it for the injuries following demoralization caused by price cutting. This for the reason that, in the long run, unrestrained price cutting tends to impair, if not to destroy, the production and distribution of articles desirable to the public.

There must be a common ground wherein the rights of producer, purveyor and consumer may each be fully secured and equity done to all. The search for such a ground has been a task of the Commission and results in the following conclusions:

(1) That producers of identified goods should be protected in their intangible property right or good-will.

(2) That the unlimited power both to fix and to enforce and maintain a resale price may not be made lawful with safety.

(3) That unrestrained price cutting is not in the public interest.

Bills now pending before Congress may well be made to meet the difficulties of the situation if amended to provide for a review of the terms of resale contracts and a revision of resale prices, by a disinterested agency.

Therefore, it is recommended that it be provided by law that if the manufacturer of an article produced and sold under competitive conditions, desires to fix and maintain resale prices, he shall file with an agency designated by the Congress, a description of such article, the contract of sale and the price schedule which he proposes to maintain, and that the agency designated by the Congress be charged with the duty, either upon its own initiative or upon complaint of any dealer or consumer or other party in interest, to review the terms of such contract and to revise such prices and that any data and information needful for a determination be made available to such agency.

Such legislation would seem to be in accord with the spirit of the times in that it is designed, by removing this perplexity, to promote the efficiency of manufacturing and commercial institutions and so to serve the interest of the consuming public.

### Want \$8,000,000 for Mail Trucks

WASHINGTON, Dec. 6—Assistant Postmaster General James I. Blakslee yesterday asked the House Postoffice Committee for an appropriation of \$8,000,000 to carry on and extend the use of motor trucks in the mail service. The appropriation is asked for the year beginning July 1, 1919. This does not include purchase of trucks, as these will be turned over by the army without charge.

The rural parcel post made up of a fleet of thousands of trucks can lower the cost of farm produce by elimination of a large part of the cost of handling, Blakslee said. He illustrated this by showing that it costs 80 cents a ton mile to take goods from New York piers to the consumer, which is in many cases more than the original cost of the goods plus the ocean freight rate.

### Restrictions on Iron Ore Imports Modified

WASHINGTON, Dec. 7—Restrictions previously placed on the importation of iron ore by ocean shipments has been modified to allow the importation of calcined spathic iron ore originating in and coming from England when shipped as back-haul cargo.

## Dutch East Indies Offer Market

### Far Eastern Division of Bureau of Commerce Points Out Opportunities

WASHINGTON, Dec. 6—The Dutch East Indies is recommended as an excellent market for American merchandise, and particularly automobiles, accessories and farm tractors, by the Far Eastern Division, Bureau of Foreign and Domestic Commerce, which states that there is a steady growth of American trade in the Indian markets. The import trade of the Island of Java, which contains 80 per cent of the population of the Dutch East Indies, expressed in guilders (equal to \$0.402) for 1916 and 1917 included the following:

	1916	1917	Inc. in 1917
Automobiles and parts .....	5,600,000	8,200,000	2,600,000
Machinery, utensils and electrical apparatus .....	2,200,000	5,000,000	2,800,000
Tires, automobile and bicycle .....	750,000	1,300,000	550,000
Lubricating (mineral) oil .....	900,000	900,000	.....

The exports from Java to the United States in 1916 totaled 68,500,000 guilders as compared with 140,800,000 in 1917, an increase of 73,300,000. The trade was principally in rubber, tin, hides and spices, and was very profitable for the natives, which in turn resulted in the large imports of machinery, automobiles, and iron and steel products.

Territory of local agents in the Dutch East Indies should not be limited too narrowly, says the report. However, an agent making headquarters in Batavia is 2 days by rail from Surabaya and 3 days from Banyuwangu. Menado, the center of the Moluccas, is a 2-week steamer trip, and a trip around the Celebes requires 27 days.

For one agent to work the whole archipelago periodically would not only require his full time but prove exceedingly expensive. A branch office or district agency, therefore, in Batavia with authority over the whole colonial market would seem a practical solution. Such an office could establish sub-branches at all the principal centers, and in so doing take initial orders. It would subsequently collect and handle in a lump order from Batavia all outlying orders, at a great saving in cable charges, and the goods could be shipped direct to such branches and financed through its bank at Batavia, the branch distributing the shipment to its sub-agents.

Such a district agency would also save expense and time by acting as a clearing house for market reports from the manufacturer to the sub-agencies and could thereby answer every inquiry as to prices in short order from the latest information at its command. The advantages and economies of such a plan are particularly pertinent factors in successful marketing in this locality.

# Aerial and Motor Truck Mail Service Development

## Postmaster Burleson Indicates Enormous Expansion Within the Next Year in Report to President—Air Mail to Cuba and South America Forecasted

WASHINGTON, Dec. 6.—That aerial mail, city motor vehicle, and parcel-post motor truck will be developed amazingly within the next year is the most important message in the annual report made by Postmaster General Burleson to President Wilson this week.

The report, which contains a complete summary of the work performed in the new air mail service, the parcel-post truck service, and the city motor vehicle service, forecasts extension of the aerial mail service between New York and San Francisco, Boston and Key West, Key West and Havana, Cuba, Cuba and Panama, and Key West via the West Indies to South America.

The Washington to Philadelphia route, it is stated, has performed as a working laboratory, and the experiences secured will insure perfection of the service in the contemplated territories. A 9-hour schedule will be maintained between Chicago and New York, as compared with the 21-hour railroad schedule, and similar time savings will be effected on all of the routes planned. Following is the report in full of the aerial mail service:

During the year there was created a new rapid medium of mail transportation through use of airplanes. This subject had been given considerable study and a number of spasmodic flights with mail had been undertaken by exhibition aviators, but it was not until the establishment of a regular and dependable aerial mail service between Washington and New York that transportation of mail by airplane became a permanent and practical feature of the Postal Service.

The aerial mail route between Washington and New York was inaugurated on May 15, 1918. One round trip daily except Sunday is being made without fail. The trip from Washington to New York is performed on an average of 2 hr. and 30 min., and from New York to Washington in 2 hr. and 50 min., the difference in time being due to the resistance offered by the prevailing winds, which are usually from a westerly direction. A stop for the exchange of mail on each trip is made at Philadelphia. An average of 7½ tons of letter mail is being carried each month.

The cost of the operation of the service since it began, including development of new routes, is at the rate of \$108,223.41 per year, or 79 cents per mile operated. The cost per ton-mile of mail carried is \$5.35. By this service mail between New York and Washington is advanced from 2½ to 3 hours over the train service.

In addition to the airplane mail carried there is dispatched daily from Washington to New York letter mail from southern connections made up to carrier districts in New York City, which mail is thereby delivered to all parts of New York the same afternoon instead of the following morning.

The Aerial Mail Service was inaugurated with the co-operation of the War Department, which furnished the machines and aviators and conducted the flying and maintenance operations. This co-operation, which was of

inestimable value, was maintained until Aug. 12, when the entire operation was taken over by the Post Office Department and the work performed by this department with its own equipment and personnel.

The task which the Army had undertaken was new and full of unsolved problems. A few flights in the beginning were defaulted, partially abandoned, or interrupted by stormy weather, but gradually the service settled down to an absolutely dependable one. It gives pleasure to report that the high standard of daily perfect flights which the Army succeeded gradually in establishing is being maintained by the Post Office Department regardless of weather conditions.

The following table summarizes the first four and a half months' operation of this service:

Month	Miles flown	Pounds of mail	Cost of service	Cost net mile	Cost per ton-mile	P.C. of form-ance	Forced land-ings	Time in air Hr. Min.	Average speed Miles
May (15 days) ..	5,324	4,749	\$3,632.11	\$0.69	\$8.15	76.78	4	78 16	68.02
June .....	10,640	13,031	9,922.71	.93	7.12	93.00	8	151 22	70.29
July .....	11,720	16,967	10,001.46	.89	5.43	92.59	8	156 34	74.86
August .....	11,894	16,558	9,555.67	.80	5.24	99.07	3	159 24	74.61
September .....	11,753	15,206	7,421.83	.63	4.01	100.00	3	156 9	72.69
Total .....	51,331	66,555	40,583.78	.80			28	701 45	72.57
Aver. per month.	11,407	14,790	9,018.61	.79	5.25	92.28	57/9	155 57	72.56

The foregoing is the cost of operating the New York-Washington route. To ascertain the total cost of the Aerial Mail Service add \$2,216.91, the cost of preliminary work on the New York-Chicago route to be inaugurated this winter. The marked reduction in cost of the New York-Washington route for September was due to temporary withdrawal of operatives in connection with establishment of the New York-Chicago route.

The Washington-New York route has served as a working laboratory in which the many unknown factors that enter into the maintenance of a daily aerial service are being successfully solved, and the Post Office Department only awaits the day when the aircraft production of this country can more than supply the needs of our own Army and those of our allies to make effective the program for the aerial mail that I have directed to be put into operation as speedily as war conditions will permit.

This program directs, first, the establishment of an aerial mail service connecting the principal commercial centers of the country by a system of trunk lines and feeders, and, secondly, connecting this country with the West Indies and Central and South America. The trunk lines and feeders decided upon under this program are:

1. New York to San Francisco, with feeders from:

- (a) Chicago to St. Louis and Kansas City.
  - (b) Chicago to St. Paul and Minneapolis.
  - (c) Cleveland to Pittsburgh.
2. Boston to Key West, with feeders from:
- (a) Philadelphia to Pittsburgh.
  - (b) Washington to Cincinnati.
  - (c) Atlanta to New Orleans.

3. Key West, via Havana, to Panama.

4. Key West, via the West Indies, to South America.

In this program I have to report progress as follows:

1. Boston to Key West.—Of this route the Washington-New York division has been operated since May 15 and is functioning perfectly.

The Boston-New York division has been tentatively laid out and will be established whenever, in the opinion of the War Department, its operation will not conflict with the war needs of the country.

The Washington-Atlanta and Atlanta-Key West routes are now being worked out with a view to their immediate establishment at the close of the war.

2. New York to San Francisco.—Of this route the division from New York to Chicago has been carefully worked out. The War Department, under act of Congress of July 1, 1918, has released to the Post Office Department, for the use of this division, airplanes of 650 lb. mail-carrying capacity which are no longer suitable for war needs. The hangars have been ordered, landing fields obtained, and the route has been ordered established before the close of the present year.

In a series of airplane flights by the Post Office Department early in September the route was carefully charted for emergency and regular landing fields. In this work one

airplane made a record flight from Chicago to New York in less than 14 hr., including all stops on route. The flights were made through storm and heavy rains over parts of the route.

The reconnaissance developed that it will be feasible to maintain a daily 9-hr. schedule between New York and Chicago, as compared with the 21-hr. schedule of the Twentieth Century Limited. The New York-Chicago schedule for the present will call for departing from New York at 6 a. m. and arriving at Chicago about 3 p. m., thus connecting with all city deliveries. The principal mail stop will be Cleveland.

The time between Chicago and Cleveland will be cut to 3 hr. 45 min., and between New York and Cleveland to 5 hr. and 15 min. Mail from the Atlantic seaboard will be advanced from 12 to 24 hr. to the West and Southwest by this new service. The feeder routes from Chicago to St. Louis, Kansas City, St. Paul, Minneapolis and the remainder of the trunk line from Chicago to San Francisco will be worked out during the ensuing year with a view to their immediate inauguration at the close of the war.

3. Key West to Panama, and

4. Key West to the West Indies and South America.—Negotiations looking to the conclusion of special aerial mail conventions between the United States and the foreign countries involved for the establishment of these routes to the West Indies and Central and South America are now in progress. It is realized that these overseas routes will require the most powerful airplanes with wireless installation and special construction to make them safe over the seas, but the enormous commercial advantage that will result by materially reducing the time between this country and Central and South America will justify

tify the expenditure that such a service will entail.

In the conduct of the service now in operation and the preliminary work on the routes to be established immediately upon the termination of the war, the Post Office Department is receiving whole-hearted support from the War Department, Navy Department, National Aeronautical Advisory Board, Bureau of Standards, Weather Bureau and Geodetic Survey, besides much local assistance from committees, individuals and aero clubs in this country.

Postal receipts from eight parcel post motor truck routes operated from Jan. 1, 1918, to June 30, 1918, totalled \$204,198.89, an average of more than \$25,524.71 per route, with a total annual earning rate of \$51,049.59 per route, according to the report on the parcel post motor truck service. These earnings, it is pointed out, were exclusive of the important benefits such as the increased production and distribution of food, the elimination of intermediate cost of handling between producers and consumers, and the facilitation of the collection and forwarding of produce and merchandise. There are 150,000 miles of important highways now available, states the report, for truck line routes, and it is expected that thousands of military trucks will be used over these routes, which average 50 miles each and provide use for 80,000 trucks.

Following is the complete report on the parcel post service:

After the receipt of proposals that were considered exorbitant or unreasonable during the period, Dec. 1, 1917, to June 30, 1918, eight motor vehicle star routes were established between important market centers as government-owned vehicle routes and the cost of their operation was paid from the appropriation for the inland transportation of the mails by star routes.

These routes are designed primarily to promote the conservation of food products and to facilitate the collecting and forwarding of produce and merchandise, as well as any other matter admissible to the mails as parcel post, thereby affording a means of bringing the producer into immediate touch with the consumer, and eliminating intermediate cost of handling, thereby reducing cost to the ultimate consumer by making more accessible the productive zone in the vicinity of large cities.

By the use of such conveyances one man can perform as much service in a day as four average producers could under former methods, thus meeting to an extent loss occasioned by many farmer-producers who were diverted to occupations incident to the prosecution of the war.

During the six-month period, Jan. 1, 1918, to June 30, 1918, the postal receipts from these eight routes were \$204,198.89, an average of \$25,524.71 per route; a total annual rate of earning of \$408,396.78, or an average annual rate of earning per route of \$51,049.59. The total expenses were \$41,110.08, an average cost per route for the period of \$5,138.76, and an average cost per route of \$10,277.52. The average net profit per route for the period was \$20,886.04, an average annual rate of profit per route of \$40,772.08. The average earning per mile of travel was \$0.1568 and the average profit per mile of travel was \$0.6232.

The act making appropriation for Postal Service for the fiscal year ending June 30, 1919, having provided a specific appropriation with which to conduct experiments in the operation of motor vehicle truck routes, the expenses of operating the eight existing routes previously operated under the appropriation for the inland transportation of the mails by star routes is now paid from the specific appropriation.

While a portion of the revenues derived from mail matter carried on these routes, particularly transit mail, should properly be credited to other branches of the service, yet due to the fact that a quicker dispatch and more direct and expeditious delivery can be effected, patrons are expressing a preference for this service in forwarding mail matter of all classes; hence a considerable portion of the revenues should properly be credited to the motor vehicle mail service.

Owing to the experimental nature of the motor vehicle truck service, it was deemed best to await the stabilization of the service before discontinuing other existing mail routes or mediums of supplying mail which it could supplant; hence the economies effected in this direction are not as great as they otherwise would have been.

However, during the period, Dec. 1, 1917, to June 30, 1918, an annual saving has been effected of \$4,478.12 by the discontinuance of star railway mail service, mail messenger and electric car service, which it has superseded.

A total number of 105 trucks is required to serve the patrons of routes already established.

A standardized truck has been adopted for use on these routes, which is also adapted for use in all mail branches of the Postal Service, and four of these trucks have been constructed and are ready for delivery.

As provided in section 8 of the current appropriation act, the War Department has turned over to this department the chassis of two Army trucks, type AA, and they are now in service. A further extension of this service will provide use for a large number of vehicles when no longer necessary for military purposes, and other chassis will be supplied by the War Department, no doubt, from time to time.

An essential feature of this service is the commercial convenience of all the patrons, supplying them with data and information concerning points where they can secure the best products and commodities at the least cost. Postmasters at offices on the routes are reporting to the department each week the local retail prices received by farmers and producers for their commodities. These data are compiled and disseminated through the public press weekly.

In the light of this experience, it is proposed to establish through or trunk-line routes of an approximate length of 50 miles each—to connect one with the other—extending out from the larger consuming centers, through productive territory contiguous to such centers and removed from direct established lines of transportation, and to then connect with the trunk-line routes lateral or

feeder routes. There are, approximately, 150,000 miles of improved highways now available for trunk-line routes, and several thousand localities in which lateral or feeder routes in productive territory can be operated throughout the year.

There is an insistent demand for increased food production and a necessity for a more reliable means of intercommunication for the transportation of commodities, particularly food of local origin or production, and merchandise and implements incidental to food production.

The commercial and economic advantages of this service are so evident that its extension would seem to be desirable.

The efficiency of government-owned motor vehicle service in the cities over the contract method, states the report, has been demonstrated many times in the recent experiments made by the government. The service in operation in Boston, Brooklyn, Buffalo, Chicago and many other cities, controlling a total of 1004 trucks, ranging from  $\frac{1}{2}$ -ton to  $3\frac{1}{2}$ -ton, has been both efficient and profitable. The efficiency of the service has been so remarkable, says the report, that even express companies transport packages between two points by the local parcel post motor vehicle mail service for the ultimate delivery of the expressed parcels.

This service, which has been extended gradually, states the report, is operated in Boston, Brooklyn, Buffalo, Chicago, Detroit, Indianapolis, Nashville, New York, Philadelphia, Pittsburgh, St. Louis and Washington. It employs 1200 mechanics, chauffeurs, garagemen and clerks.

It has been instrumental in creating a coalition of all of the work of the Postal Service, making a directly connected collection, distribution and transportation system which was not possible under the old contract system.

The contract system in the larger cities also developed a constant friction between the contractor and the local postal officials which is now completely eliminated and which has been replaced by harmony and co-operation. It should be understood, says the report, that the charge against the appropriations for vehicle service for the fiscal year during which the service is installed in any office is usually in excess of the amount saved, due to the fact that the entire purchase cost of the fleet of trucks is charged against the current appropriation and the full economies cannot be secured until after four years of operation. Furthermore, many of the economies, adds the report, cannot affect other appropriations which under the law cannot be called upon for re-imbursement.

#### May Drop Return Loads Plan

BOSTON, Dec. 7—With the practical dissolution of the Massachusetts Committee of Public Safety, which was to have contributed \$2,000 toward the establishment of a fund to put into operation a Return Loads Bureau, it looks now as if that scheme was dead as far as the Bay State was concerned. The motor truck dealers made an investigation and recommended that a bureau be established and \$1,000 was pledged to aid the work. The Boston Chamber of Commerce also investigated the matter thoroughly and reported favorably and planned an appropriation of a similar amount, and to have headquarters in its buildings. The Massachusetts Committee on Public Safety felt that it was a necessity, too, and its officials were willing to contribute

\$2,000. The details were being worked out by a committee on transportation at the Chamber of Commerce. Now without the support of the state funds, which will not be available unless the Governor and his council authorize such an expenditure, the future looks dubious.

#### Milwaukee Show Jan. 24-30

MILWAUKEE, Dec. 9—The dates of Jan. 24 to 30 have been selected by the Milwaukee Automobile Dealers, Inc., for the eleventh annual Milwaukee show, to be held in the Auditorium. At a special meeting of the association, following the return of Manager Bart J. Ruddle from the conference of show managers in Cleveland, the action taken shortly after hostilities ceased to proceed with 1919 show was ratified and cor



## Reo Annual Report Very Satisfactory

Total Assets Show Increase of Over \$1,300,000 as Compared With Last Year

DETROIT, Dec. 5—The annual statement of the Reo Motor Car Co. for the fiscal year ending Aug. 31 shows a surplus of \$5,494,828, as compared with \$4,245,915 for 1917. The total assets show an increase of over \$1,300,000, as compared with 1917, while the current assets compare with \$8,836,922 for last year, an increase of over \$1,500,000. Considering the general conditions and the great reduction in the production of normal products, the balance of the company is considered most satisfactory.

### BALANCE SHEET REO MOTOR CAR COMPANY

Assets	
Current assets.....	\$10,460,231.69
Cash on hand and in banks.....	405,325.86
Receivables, misc.....	\$1,537,310.85
Less reserve.....	65,227.76
	\$1,472,083.09
Due on Government contract.....	1,811,245.52
Inventories.....	3,283,328.61
	6,771,550.22
	\$10,460,231.69
Capital assets.....	\$5,225,537.80
Land.....	237,205.18
Buildings.....	1,364,070.81
Machinery and equipment.....	3,592,261.81
	\$5,225,537.80
Deferred charges.....	\$21,825.40
Interest in branches.....	78,787.50
	\$15,790,382.39
Liabilities	
Current liabilities.....	\$3,358,304.21
Notes payable.....	1,250,000.00
Accounts payable.....	1,700,899.81
Accrued pay roll.....	122,326.55
Reserve for taxes, etc.....	284,577.85
	\$3,358,304.21
Capital.....	\$12,432,078.18
Capital stock authorized.....	10,000,000.00
Less unissued.....	3,062,750.00
	\$6,937,250.00
Stock outstanding.....	5,494,828.18
Surplus.....	\$12,432,078.18
	\$15,790,382.39

### More Oil from Texas

AUSTIN, Dec. 8—An enormous increase in oil refining facilities in Texas will be provided within the next few months. This is assured by the many new projects of this character which have already been decided upon. It is interesting to note that practically all of the new refineries now under construction or in early prospect in the Central West Texas fields belong to the smaller independent oil producers. The larger operators are financially able to lay pipe lines and the site of their refineries are for the most part some distance away from the producing fields.

The product of the Central West Texas fields is of a much higher grade than that of the fields of the Gulf coast region and this accounts for the remarkable strides that are being made in constructing refineries for handling the more valuable

oil. Instead of locating their refineries in the producing territory, the larger companies are arranging to pipe the product to Fort Worth, Dallas, Houston and Galveston, where it will be put through the refining process. More than a dozen new small refineries are to be built by independent operators at various points in the Central West Texas fields within the next few months.

### Texas Has 250,201 Vehicles

AUSTIN, Dec. 8—It is shown by the records of the State Highway Commission that a total of 250,201 motor vehicle licenses were issued in Texas up to Dec. 1, 1918. Of this number 3250 were for motorcycles. There are a total of 4188 motor vehicle dealers in the state.

### Starters for Lauson Tractors

NEW HOLSTEIN, WIS., Dec. 8—The John Lauson Mfg. Co. has placed a contract with the Christensen Engineering Co., Milwaukee, for Christensen starters with which all Lauson farm tractors will hereafter be regularly equipped. The Christensen starter differs from other starting devices heretofore put on the market in utilizing the "carburetion principle" instead of electric or air systems. The Lauson is the first farm tractor, so far as known, to be regularly equipped and sold with other than an electric starter.

### More Money for Auto Body

LANSING, Dec. 9—Stockholders of the Auto Body Co. have authorized \$600,000 of new preferred stock, of which \$500,000 will be issued at once. This will be 6 per cent cumulative.

### Cultivating Japanese Automotive Field

(Continued from page 1012)

tariff automobile parts pay a duty of 25 per cent ad valorem, whereas the general rate on such parts is 30 per cent ad valorem.

The listing of vehicles is clear and there is rarely any conflict on interpretations, although there was some time ago an importation of tractors which was passed as farm machinery at a reduced rate of duty. This classification was confirmed after the matter had been contested in court. The Japanese word covering all motor propelled vehicles is "jidodsha," meaning literally "self-propelled vehicle," and it was on this construction that the case was contested and lost by the customs authorities. Attention has also been called to a case wherein chassis were admitted as parts, in view of the fact that they were not fitted with bodies, but it is doubtful if this interpretation will be upheld.

Advertising matter may be packed in shipping cases with automobiles, and if in black and white will be admitted without duty, but if lithographed in colors is subject to duty. Pictures are also dutiable. Advertising matter shipped separately is governed by the same restrictions.

## Definite Program for Snow Removal

Highways Transport Committee Asks Co-operation from Various State Committees

WASHINGTON, Dec. 7—The Highways Transport Committee in forming a definite program for snow removal this winter from the various highways has addressed the different State Council of Defense Transport Committees asking them to give immediate attention to the following subjects:

Of the powers of the State Highway Department or Commission for removing snow. If such powers are not specifically covered by statutes whether maintenance funds can be used in an emergency?

What co-operation and work can and will be undertaken by the counties and States?

What co-operation and work can and will be undertaken by the municipalities and State?

What preliminary measures can be undertaken which will prevent the drifting of snow, such as location and erection of snow fences? Also, the change of rail, board, picket and hedge fences which check the currents of air during a snow storm, thus causing drifts to form, and removal of brush or weeds paralleling the road, which invariably cause drifts to form.

### Highway Department's Attention Called

Attention by State Highways Department or Commission, through its field organization and in co-operation with the State Highways Transport Committee, of physical conditions along the highways tending to cause drifts. Recommendations as to the best means of dealing with same by preventive methods.

The making of snow removal reports of every snow storm on such highways as are designated to be kept free from obstruction by snow so as to allow continuous essential highways transportation.

Letters have been sent to the Transport Committees in Massachusetts, Maine, Vermont, New Hampshire, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, Ohio, Indiana, Kentucky, Michigan, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, South Dakota, North Dakota, Colorado, Wyoming, Montana, Idaho, Washington, Oregon, California and Nevada.

### Continuous Truck Movement Needed

The Highways Transport Committee realizes that there will be great need for continuous motor truck movement this winter to assist in the distribution of foodstuffs from farm to mill and mill to seaboard or farms to seaboard, and consequently has asked the regional, State, district and county organizations to leave no stone unturned in facilitating this work.



# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

Vol. XXXIX  
Number 25

PUBLISHED WEEKLY AT 239 WEST 39th STREET  
NEW YORK, DECEMBER 19, 1918

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## Champion

### Dependable Priming Plugs

### Good Business For Bad Weather — Order Now

They sure-fire cold motors because the gasoline trickles down the core and drips from the electrode—right where the spark jumps.

They are imperative in cold weather for the hundreds of thousands of cars that do not have priming cups, and are infinitely better for those that do, because priming cups let the gas in too far from the spark plug.

The public demand is big—dealers should order at once.

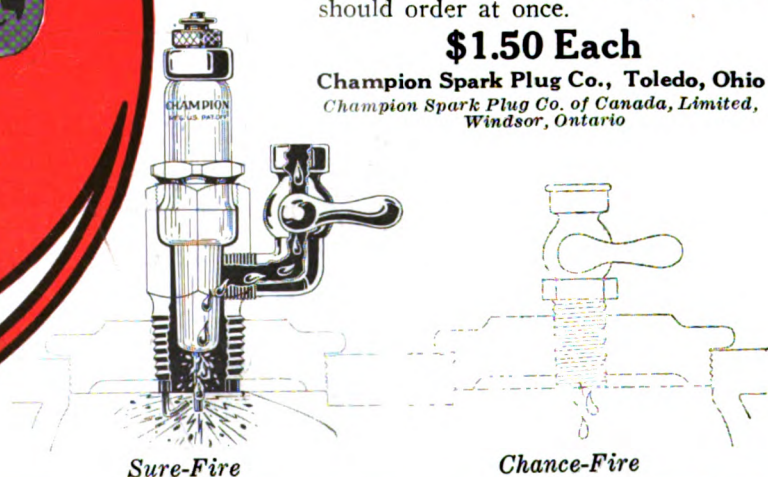
**\$1.50 Each**

Champion Spark Plug Co., Toledo, Ohio  
Champion Spark Plug Co. of Canada, Limited,  
Windsor, Ontario

Sure-Fire Here

Sure-Fire

Chance-Fire







# EDITORIAL



## Following Directions

**A**RE you one of the motorists who last winter used an anti-freeze compound in a manner which the maker of the preparation never specified and then condemned the stuff as being no good? If you did such a thing, you had better make sure that you followed directions to the letter. The manufacturers of anti-freeze compounds have met car and truck owners more than half way, and the complete directions printed on every label of their products are put there for but one purpose, and that is, to make sure the preparation will be used correctly.

\*\*\*

**O**BVIOUSLY if the motorist does not do his part and merely dumps the stuff in his radiator, without following directions, he does wrong and one morning he will go to his unheated garage only to find the tubes of his radiator burst or the waterjacket cracked. The next thing he does is blame the anti-freeze substance, whereas, had he been careful to follow instructions he could have gone all winter without worrying about the cooling system.

**M**OST of the anti-freeze preparations have been put up in convenient form, but the amount of water in the cooling system together with the variation in temperature dictate to a considerable extent how the preparations must be used. All this is set forth in the maker's directions and in every case the big thing to watch is that the radiator has no leaks and that the hose couplings are in good shape. In fact, new hose is desirable before adding the anti-freeze, as after a season's use the inner layers become separated.

\*\*\*

**T**HE radiator should be washed out carefully with a solution of hot soda, which reveals any leaks that exist. These then should be soldered. Many anti-freeze substances attack dirt and sediment and if your radiator started to leak last winter after you added the anti-freeze, it was because you failed to clean the radiator and repair the leaks. The anti-freeze told you that leaks existed. You probably thought the anti-freeze was eating away the metal. Follow the maker's directions this winter and you will play safe.

*Read Our Guarantee on*

**JOHNSON'S**

**FREEZE-PROOF**



**We guarantee that Johnson's Freeze-Proof has no more effect than water on the metals of the radiator or on rubber.**

**If Johnson's Freeze-Proof is used according to the simple directions in the proportion shown on our scale, it will absolutely protect your radiator against damage from freezing.**

**We do not guarantee Johnson's Freeze-Proof when used in cars with aluminum manifolds, although it has been used satisfactorily in hundreds of such cars. Water alone often has an injurious effect on aluminum.**

**\$1.50 Protects a Ford**

One package of Johnson's Freeze-Proof (Cost \$1.50) will protect a Ford to 5° below zero, and two packages to 50° below zero. For larger radiators or to protect to a lower temperature, use additional Freeze-Proof according to the scale on the package.

**FOR SALE BY ALL DEALERS**

Mfd. by S. C. JOHNSON & SON, Dept. A. I., RACINE, WIS.



# AUTOMOTIVE INDUSTRIES

## THE AUTOMOBILE

VOL. XXXIX

NEW YORK—THURSDAY, DECEMBER 19, 1918—CHICAGO

No. 25

## Development of the Aircraft Spruce Industry

**Spruce Most Suitable Lumber for Wing Spars and Struts—Army Furnished Volunteer Lumbermen—Loyal Legion of Loggers Formed to Combat I. W. W. Activities**

By Lawrence K. Hodges

**I**N August, 1917, shipments of spruce suitable for airplane construction amounted to 202,264 ft. There were no mills equipped to cut with the grain and in the two states of Oregon and Washington there were only 25 spruce mills all told.

Yet, in the following April, the output of spruce for plane construction had been pushed up to 30,000,000 ft. a month and since then even this figure has been exceeded.

This seemingly impossible result has been achieved in a manner which makes one of the brightest pages in the history of the world war.

In December, 1917, Brigadier-General Brice P. Disque realized that radical steps were necessary to keep pace with the demands of the United States and the Allies for spruce. He called a conference of five experienced mill owners and asked them if it were possible to design and build a mill which would cut spruce the right way and eliminate waste.

Four of the five said it could not be done. The fifth, H. S. Mitchell, thought it could be done. General Disque told him to go ahead. In two weeks work was started on the mill, and in 45 working days, despite the interference of the rainy season, the mill was complete and working. It is one of the largest mills on the Pacific Coast, employs 1800 men and works continuously in three eight-hour shifts.

The story of airplane spruce tells of the growth of a mere by-product of the North Pacific Coast lumber industry into a place of the first rank within one year.

Before the war Sitka spruce was cut as an incident to the logging and manufacture of Douglas fir, among which it grows in clumps, chiefly on the west slope of the coast range of mountains facing the Pacific Ocean. At that time there were in Oregon and Washington only twenty-five spruce mills, and any mill was so called of which twenty-five per cent of the cut was spruce. The lumber was used in building and in making boxes and food containers.

At the outbreak of the war the Allies scoured the world for lumber that was specially fitted for the wingbeams and struts

of airplanes, and they soon discovered the merits of Sitka spruce. They began to buy lavishly, but the output was limited.

Douglas fir is the predominant timber of the Pacific Northwest and the stand of spruce is so scattered that it was not commercially practicable to cut roads into remote forests in order to reach it. Only straight-grained stock could be used, and this must be free from cross grain, twisted grain, knots or pitch.

There were no mills equipped to cut with the grain, and consequently nine-tenths of the spruce bought by the Allies was waste, though they paid as much as \$250 a thousand feet for it. Yet so anxious were they to obtain it that soon after the United States declared war the British, French and Italian armies each sent an officer to the Pacific Coast to appeal to the people to get out more spruce, and the United States Government seconded their efforts.

The lumber industry of the two states was in no condition to respond to such an appeal, though good will existed without measure. The manufacturers were just emerging from a long period of depression, and many of them were not firm on their financial feet.

### Obstructive Measures Inaugurated by I. W. W.

The demand for lumber for army cantonments no sooner begun than the Industrial Workers of the World, which was active throughout the lumber region, declared a strike, ostensibly for the 8-hr. day and many other things, but actually to make war on what it called "capitalism" and to obstruct war on Germany. Acts of sabotage, by which saws, machinery and food were destroyed and some mills were burned, were frequent.

The War Department attacked the difficulty by sending Colonel, now Brigadier-General, Brice P. Disque to the Coast in October, 1917, to make a preliminary survey of the situation. He was selected because of the ability which he had displayed

while in the Philippines in overcoming obstacles and in inspiring men with zeal, and later as warden of the Michigan penitentiary. He returned about the middle of November with full authority to do whatever was necessary to get out the spruce.

He applied himself first to establishment of harmony between the employers and workmen. Starting with the belief that the lumberworkers were loyal at heart and that not 5 per cent of them were convinced adherents of the I. W. W., he seized upon a suggestion which had been afloat among the manufacturers and which had been commended in the *Portland Oregonian*, that a new organization be formed among the workers bound together by the spirit of patriotism to combat the I. W. W.

Probably if the movement had been initiated by the employers, distrust among the workers would have made it a failure, but when taken up by the army it proved an amazing success.

General Disque sent officers throughout the lumber regions to organize in every logging camp and sawmill a local branch of the Loyal Legion of Loggers and Lumbermen. He called for 10,000 volunteers from the army to cut spruce and they came from camps as distant as the Mexican border.

He sent these men into the woods, not only to cut spruce but to instill patriotism, or to awaken that sentiment where it was dormant. In a few months the new organization had gained control in every camp and town west of the Cascade Mountains, the I. W. W. had been put to rout and the manufacturers were so well pleased with the result that they placed the settlement of all questions of wages, hours, working and living conditions in General Disque's hands, agreeing to act upon any decision he made.

He established the 8-hr. day, raised wages, but fixed a maximum to discourage manufacturers from stealing each other's men, ordered that camps and boarding houses be supplied with good board, beds, baths and be cleaned up and kept clean, and fixed uniform rates for bed and board. His orders were cheerfully obeyed, and all went to work with good will and good feeling.

So impressed were the lumbermen of the white pine belt between the Cascade and Rocky Mountains with the success of this unique organization that they requested General Disque to extend it to their field. It was received there with as much favor as farther west, and the General was made sole



*Brigadier-General Brice P. Disque,  
commander Spruce Production  
Division*

arbiter in all labor questions and harmony extends through both regions.

With the co-operation of the employers the Loyal Legion now holds sway in Western Montana, Northern Idaho, and all of Washington and Oregon and has 120,000 members. The capstone was put on the structure last June when an agreement was reached to continue the organization after the war and to establish joint councils of employers and employees, local and general, for adjustment of disputes, with General Disque or his successor as sole arbitrator.

While he was getting this settlement of the labor question under way, General Disque set about increasing the output of spruce in other ways. The middle of November is the worst season of the year for logging operations on the North Pacific Coast, for it is the wet season, when rain is frequent, streams are in flood and the ground is soft and mushy; but war could not wait for good weather.

Contracts were made for purchase of spruce timber wherever it could be found in sufficient quantity and was accessible by building any kind of a road for a reasonable distance. Homesteaders were paid

to cut the spruce on their claims, to rive it with wedges into cants and to haul it through the woods to the nearest railroad or highway.

But this was a temporary expedient, to be followed only until operations could be extended on a larger commercial scale. The spruce on big timber tracts was purchased and contracts were made with logging and general contracting companies to cut it and to build roads.

Financial aid was given these companies in purchase of logging equipment, rails, cars and locomotives, motor trucks and tractors, and priority was obtained for manufacture and shipment of all this material.

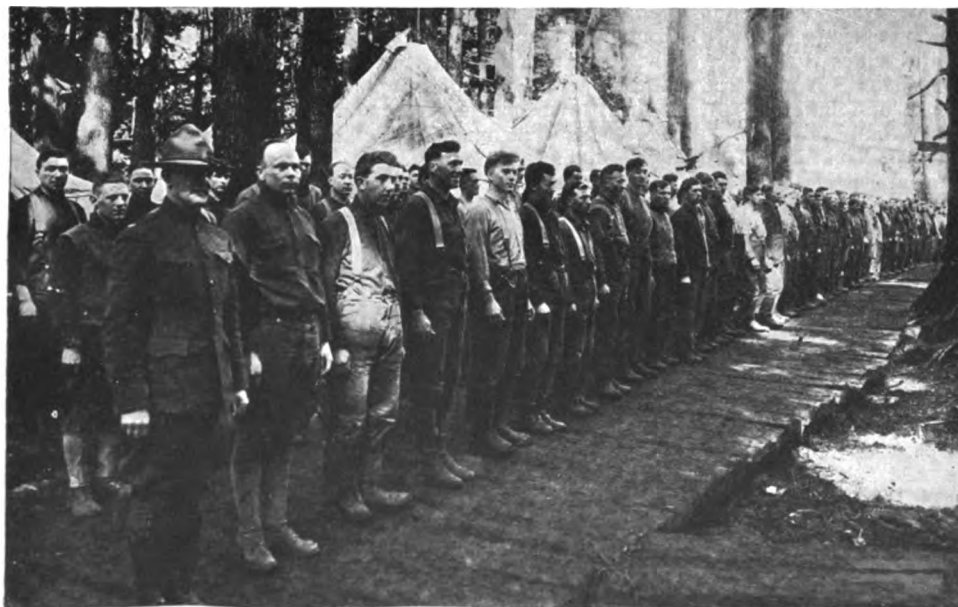
The troops under General Disque's command, who now number 30,000, were organized as the Spruce Production Division, and headquarters were opened in Portland, Ore., occupying an entire floor of a big business block, where hundreds of men in khaki handle one of the biggest businesses in the United States. The field of operations extends all the way from the Canadian boundary and the Straits of Fuca on the north to the southern line of Oregon, a stretch of over 600 miles.

The Sitka spruce is a shy, retiring tree, though it grows to a height of over 150 ft. to the first limb and to a girth of 11 ft., and is found deep in forests of fir.

To reach the heart of the timber the Government has built 166 miles of main railroad and 103 miles of spur track. From these lines graveled, plank or corduroy roads branch into small canyons and ravines, and over them motor trucks haul logs to the railroads, long trains of trucks often being seen.

Building these roads was no light task, for the country is rough and covered with dense timber and underbrush, and clearing alone often costs \$10,000 a mile. Some stretches have been built on the sides of slippery soapstone hills, others on huge tree trunks laid in parallel lines with the ties notched into them, others on piles over deep swamps and others on trestles 90 ft. high spanning gulches.

On the South Alsea Railroad a bridge 8800 ft. long containing 6000 piles has been built across Alsea



*Loyal Legion at attention*



Bay, Ore., by soldiers and a few civilians. A bridge of poles 196 ft. high was built across the Skagit River, Wash., and is declared to be the highest single pole bridge in the world. Eighteen thousand soldiers have been employed in this work, including some engineers who earned \$7,500 a year in civil life.

It became evident that a radical change in the methods of cutting airplane stock must be effected in order to meet the enormous demands of the United States and the Allies and at the same time to reduce the waste in shipment of stock which was rejected at the airplane factory.

Ninety per cent of the stock shipped to the Allies was thus rejected, and the waste was not confined to the lumber itself but extended to freight charges and to use of transportation facilities at a time when a famine of cars and engines had caused a fuel famine east of the Mississippi River.

Economy of the timber itself was an important consideration, for, while the statistics of the stand of spruce on the Pacific Coast look imposing, by no means all is fit for use in aircraft and, if it were cut at the rate indicated by the war's requirements, the supply would be exhausted in comparatively few years.

#### Where Sitka Spruce Grows

Sitka spruce grows all along the coast from the southern line of Oregon through that State, Washington, British Columbia into Southeastern Alaska. The best is found in the two States named, the total being about 11,000,000,000 ft., of which about 4,000,000,000 ft. can be reached at reasonable cost. British Columbia has more than 18,000,000,000 ft., but it is of inferior quality and comparatively little of it is accessible. Alaska has from 15,000,000,000 to 18,000,000,000 ft., but this is not so good as that of British Columbia; only about 1,000,000,000 ft. is suitable for airplanes and little of that amount is accessible.

The Government was therefore compelled to draw its supply from the 4,000,000,000 ft. of accessible timber in Oregon and Washington. This limitation of the available quantity led General Disque to seek means of obtaining from it the largest possible proportion of good stock.

He found that there were in the two States only twenty-five so-called spruce mills, any mill of which 25 per cent of the cut was spruce being so designated, but that they cut the log longitudinally without regard to the grain and had not the rigid system of inspection requisite to rejection of imperfect stock. As the grain of many logs does not run straight, which is essential in wingbeams, and as knots, twisted grain and pitch occur, this method of cutting was the main cause of waste.

The solution of the problem seemed to be the construction of a mill specially designed to cut with the grain and, instead of shipping broad fitches of which a large part would be waste when it reached the factory two or three thousand miles distant, to carry the process still further by cutting the lumber approximately to wingbeam size, reject all defective stock at the point of production and ship only perfect stock.

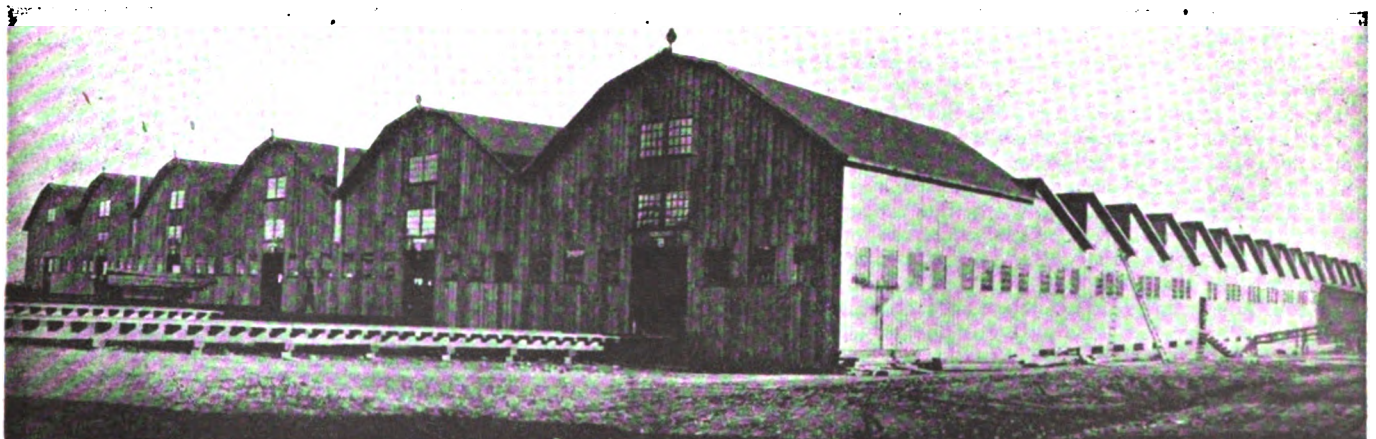
With this end in view he called five experienced lumbermen



*Stand of Oregon spruce used for airplanes*

into conference at Portland on Dec. 1, 1917, stated his problem to them and asked whether construction of such a mill was practicable.

Four of the men were doubtful, but the fifth, who was H. S. Mitchell, owner of a large mill at Wauna on the Lower Co-



*General view of airplane spruce cut-up mill, Vancouver, Wash.*





*Living spruce cants by hand*

lumbia River, thought it could be done and made some practical suggestions.

On the following day General Disque asked Mr. Mitchell to design, build and operate a mill after his own idea, as he had had many years' experience of that kind before he became an operator. Mr. Mitchell remarked that he had a pretty big job on his hands at Wauna, but the General answered in substance:

"I have no hesitation about asking any man to drop any job, no matter how big, when the Government needs his help to win the war."

"What could I do when it was put up to me like that?" said Mr. Mitchell in relating the conversation. He dropped his job, reported for duty 3 days later and has been at it ever since, prepared to stay with Uncle Sam as long as he is needed.

#### Operations Proceeded Rapidly

From that day things moved quickly. Three days later lumber was ordered from 40 mills and machinery from manufacturers all the way from Portland to Cincinnati, all being shipped under priority orders. A broad stretch of level ground on the north bank of the Columbia river at Vancouver Barracks, 10 miles from Portland, was selected as the site. It was necessary to extend a spur track of the Spokane, Portland & Seattle Railroad a mile and a half, and L. C. Gilman, president of that road, was asked to lay it immediately. He said:

"I have not a foot of rail loose and do not know where I can find it, but I will get it."

He tore up some tracks in the Portland terminal yard and a week after the request was made the first carloads of lumber were delivered at the mill site. By Dec. 15 material was assembled, and work began on the foundations just 2 weeks after the project was broached to the lumbermen's committee. The rainy season was in full force, and work was suspended for a few days while the entire coast was scoured for rain clothes for the 250 men employed. Then, though rain and snow continued, construction stopped for nothing except Sundays and holidays until the mill was opened on Feb. 7, having been built in 45 working days.

The mill is one of the largest on the Pacific Coast and is the first of its kind, though others from the same design have been built by the Spruce Production Division at Toledo, Oregon, on Puget Sound, and by the British Government on the coast of British Columbia.

Trainloads of cants arrive at one side, are lifted by cranes to handcars which are pushed into the mill, and come out on the other side as perfect airplane stock to be loaded for shipment to Eastern factories. The mill is operated continuously by electric power, 1800 men being employed in three 8-hr. shifts. There are six units, the most original feature of which is a series of movable knees by which a flitch is aligned so that the saw cuts with the grain. Thus it often happens that the cut runs diagonally from end to end of a flitch. The cant or flitch passes through four operations in the process of conversion into airplane stock, and undergoes three inspections to eliminate any pieces which show defects.

Dry kilns with a capacity of 200,000 ft. a day reduce the weight of much stock 20 per cent, saving a substantial sum in freight and preparing stock for immediate use, while air drying would occupy several months.

With the exception of a few highly skilled civilians, all the employees of the mill are soldiers who volunteered for this service. Few of them had ever seen the inside of a sawmill, and it was necessary to train crews until there were enough to operate all the six units. Men are sent from this to the other Government mills, and to instruct the crews of commercial mills which work on spruce. The patriotic soldier spirit is apparent in the zeal and skill with which they work.

*(To be continued)*



*Spruce tree falling*

# Hair-Line Defects in Crankshafts

## Metallographic Study and Physical Tests of Chrome Nickel Steel Crankshafts to Determine Nature and Effect of So-Called "Hair-Line" Defects on Their Physical Strength

By Lieut. P. J. Piccirilli

ONE factor which is the cause of much skepticism as to the strength of chrome nickel steel crankshafts is the existence of so-called "hair-line" defects. These defects appear most prominently upon the surface of finished crankshafts as very fine lines, resembling incipient checks, but they are always found to be running parallel with the axis of the shaft itself. With inspectors to whom their nature is unknown they are the cause of probably 90 per cent of the shaft rejections, the shafts being declared unsafe due to the existence of incipient checks. Since these "hair-line" defects have been the cause for so many rejections of shafts, the writer arranged a series of very accurate tests on two engine crankshafts which contained the above-mentioned defects.

In order to determine the effects of the "hair-lines," both physical and metallurgical tests were made. The tests described here were carried out at the Laboratories of Columbia University, New York, and in connection with the physical tests described it is interesting to note the method employed to measure the torque strain which permits of reading to one hundred thousandths of an inch (0.00001).

### Description of Physical Tests

In order to carry out the tests in such a manner as to avoid conflicting results, two motor shafts in which "hair-line" defects existed were chosen. One of these shafts, which for the sake of convenience we shall call shaft A, was subjected to torsional moments to determine the effect of torsion upon the defective bearings, and upon the shaft as a whole. The defective bearings previously cut from shaft A, after the latter had been subjected to torsional strain beyond the elastic limit, were compressed laterally, and the effects upon the "hair-line" defects were noted. In order not to obtain confusing results, a second shaft, which we shall call shaft B, was taken, and the physical properties of the material in direct tension were ascertained from specimens secured from it. Shaft B was used for this purpose rather than shaft A because the latter already had been

subjected to test. Therefore, in order to obviate the registration of any strains or stresses which had already been started in shaft A, the test specimens for determining the physical properties were taken from shaft B.

### Torsion Test

In order to investigate the effect of torsional stresses upon the defective bearings of shaft A, which contained three such defective bearings, located as shown in Fig. 1, it was subjected to torsion in a Riehle torsion machine. In addition to a careful examination of the defects under torsion, complete data were obtained for plotting a "load

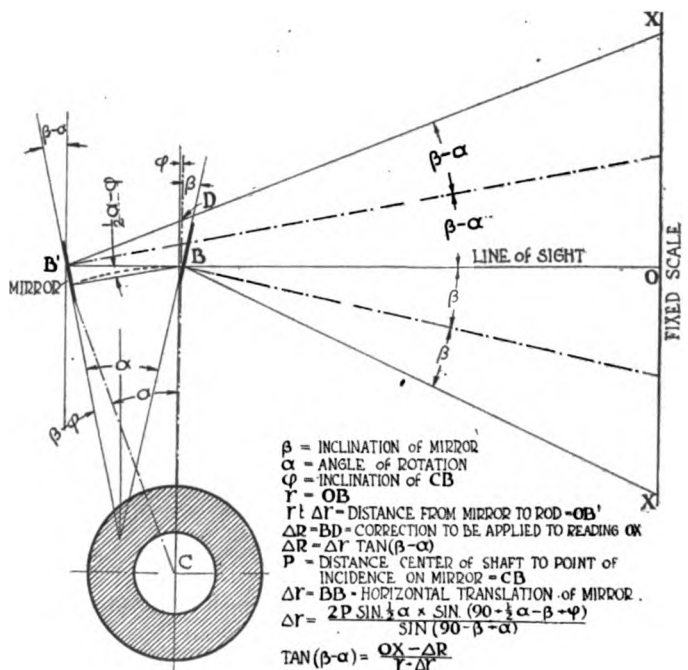


Fig. 2—Arrangement of mirrors for studying torsional strains

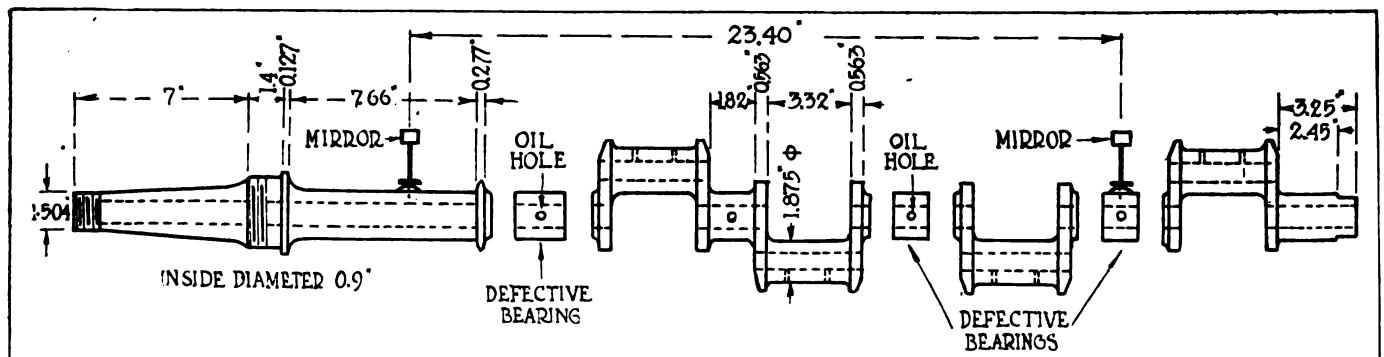


Fig. 1—Sketch of crankshaft, showing location of defective bearings

strain" curve. Owing to the irregular shape of the test specimen and the inadequacy of the ordinary laboratory methods for such important tests, the following method was used to determine very accurately the strains under various conditions of loading. Two small plane mirrors, mounted upon short steel stems and having both vertical and horizontal angular adjustments, were attached to the shaft by inserting the free ends of the stems or up-rights holding the mirrors into drill holes about  $\frac{1}{8}$  in. in diameter and  $\frac{3}{16}$  in. deep and securely held to the shaft by plaster of paris (see Fig. 1). One of these mirrors was placed in bearing 2 (Fig. 1), it being impossible to place it outside of the end crank, owing to insufficient space between the end crank in the grip in the head of the testing machine. The mirror was placed as indicated in Fig. 1. The total distance between mirrors was 23.40 in. At a distance of approximately 5 ft. 6 in. from each mirror, and in a plane nearly normal to the axis of the shaft, two Philadelphia leveling rods were erected, in a vertical position. Very nearly in line with each rod and mirror an engineer's transit was mounted several feet back of the rod, and at such an elevation that when focused upon the mirror the line of sight was exactly in a horizontal plane. By means of this apparatus and arrangement of instruments, the line of sight from either of the transits directed to its mirrors was reflected back to the corresponding vertical leveling rod, when the mirrors had been adjusted to the proper angle. It is evident, therefore, that for any angular position of the mirror, it was possible to take a

reading on either rod as seen in the mirrors with a horizontal wire of each transit. With mirrors clamped in such a way as to preclude the possibility of their shifting during the test, it was possible to record the slightest rotation of the shaft under varying torsional moments by the changes in readings upon the fixed scales of the leveling rods. The difference in the angular rotation of the two mirrors represents the angular displacement of two points on the shaft, a distance of 23.40 inches apart, since any slippage or rotation in the jaws of the testing machine was recorded by both mirrors. Therefore, the difference in the readings obtained of the angular movement of the mirrors was an accurate measure of the torsional strain. The tangent of the angle which either mirror makes with the vertical would therefore be equal to the rod reading, divided by the distance from the point of incidence to the rod.

Certain corrections, however, must be applied to this, because it could not be considered certain that the mirrors were exactly on the axis of revolution of the specimen, in which case they would have both a motion of translation and a motion of rotation.

Fig. 2 shows the relative positions of the shaft, mirror, rod and the transit, together with the necessary formula for reducing the rod readings to angular displacement, correcting the above described error.

Loads were applied and readings taken in increments of 5000 inch-pounds up to a load of 14,000 inch-pounds, beyond which the increments were reduced to 2000 inch-pounds. At a load of 70,000 inch pounds the increments

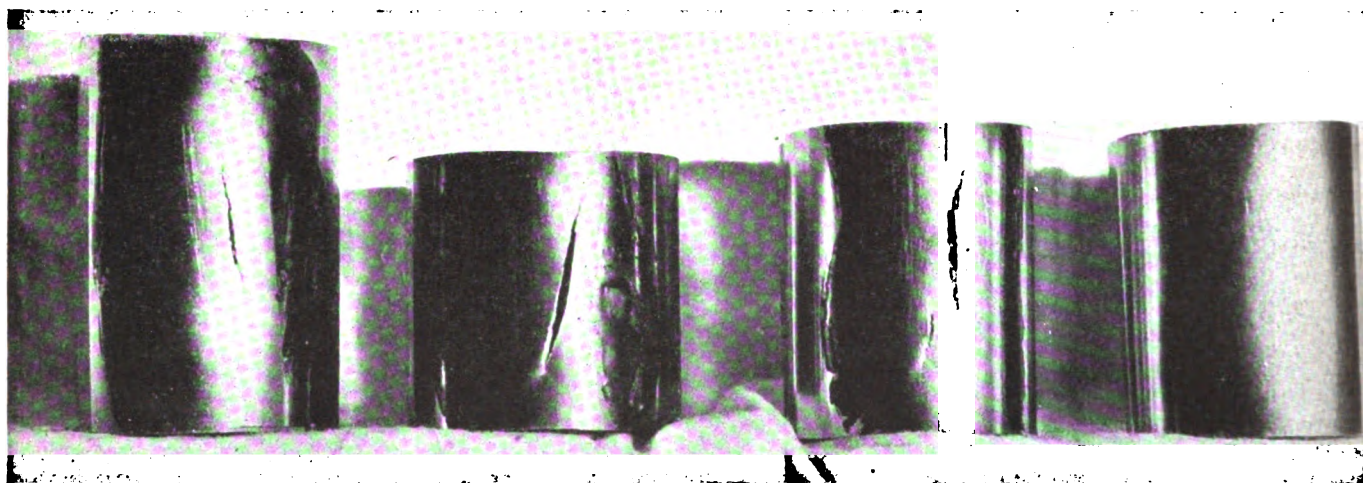


Fig. 3—Photographs of defective bearings under torsion

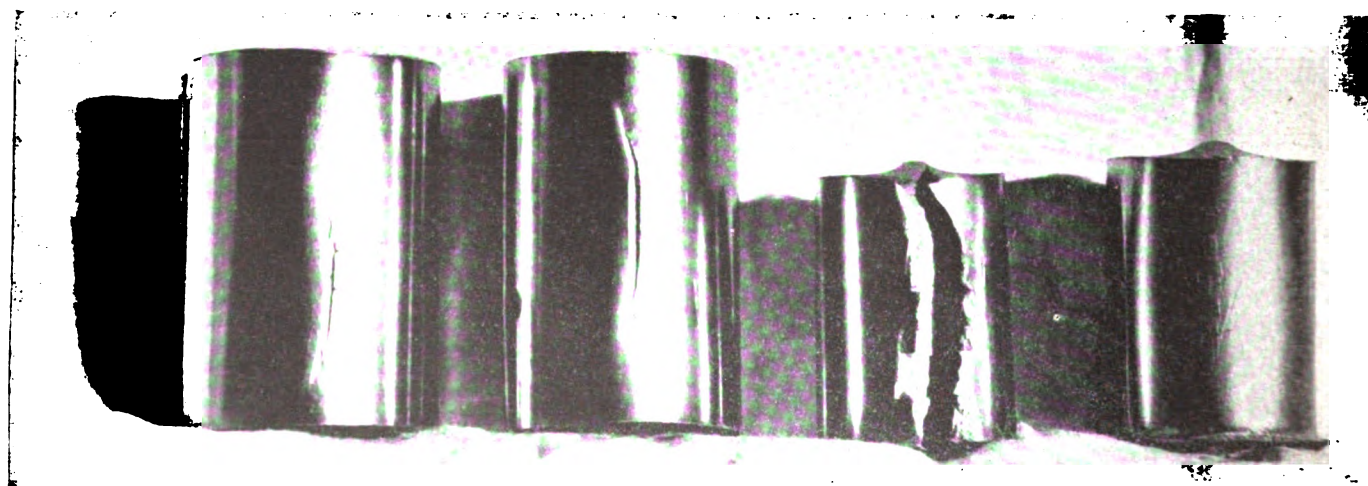
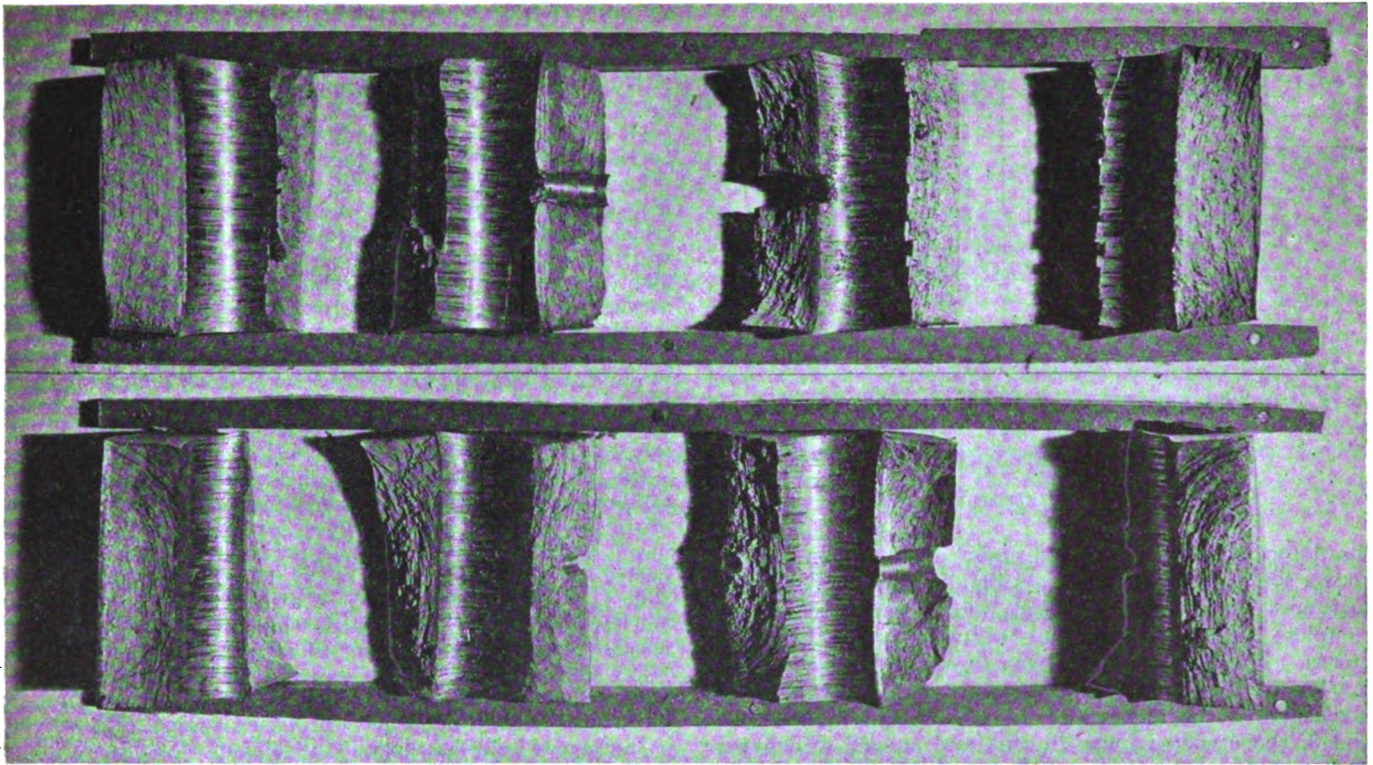


Fig. 4—Photographs of defective bearings after having been subjected to compression





*Figs. 5 and 6—Fractures of defective bearings. Upper and lower views are of the same specimens, but were taken with the light coming from opposite sides*

were further reduced to 1000 inch-pounds. Readings were taken to determine angular displacements of the mirrors as already explained, and the loads were read directly from the beam of the testing machine, which was accurately balanced. In order that the beam would be balanced exactly in the same position each time, two punch marks were made, one on the end of the beam and the other upon the fixed frame of the machine, between which a constant distance was maintained at each balanced load by the use of dividers. Sets were recorded at intervals of 5000 inch-pounds. Readings were continued up to a load of 80,800 inch-pounds, at which load the end of the shaft held in the head of the testing machine collapsed, making it impossible to hold the specimen and hence necessitating the discontinuance of the test. The failure at the end was due to the reduced section of metal at that point and was caused by combined torsional shear and lateral compression produced by the grips. At a load of approximately 60,000 inch-pounds the shaft assumed an appreciable set, amounting to 2 per cent of the strain at that load, but not until a load of 70,000 inch-pounds had been reached did the strain increase more rapidly than the loading. The true elastic limit of the shaft therefore must be assumed to lie between 60,000 and 70,000 inch-pounds. Assuming 65,000 inch-pounds as the elastic limit, this would correspond to a shearing stress of 53,500 pounds per square inch.

Inspection of the defective points with a magnifying glass showed that the so-called "hair-line" defects were visibly unaffected by the torsional stresses to which the shaft had been subjected and which, as already noted, was considerably beyond the elastic limit of the shaft as a whole.

After completing the torsional tests on shaft A, the bearings which contained the "hair-line" checks and which were unaffected by a torsional stress nearly 30 per cent in excess of the elastic limit were cut from the cranks. Defective bearings containing the "hair-line"

checks were also cut from shaft B. Both defective bearings cut from shafts A and B were subjected to a compression test, and in no case did incipient failure begin until the specimens had been compressed beyond the elastic limit, and considerable deformation had set in. The cracks which were ultimately produced when these specimens were subjected to compression either coincided exactly with the original "hair-line" defect or formed immediately adjacent and parallel to it, ultimately including the defects. In some cases the opposite side of the specimen, free from visible marks of any kind, failed to show cracks or else showed only minute cracks upon further continuance of the compression.

#### Compression Tests to Ascertain Cause of Cracks

However, it was especially noted that the defective side always cracked first. To ascertain conclusively whether the "hair-line" cracks really caused the ultimate failure under consideration by reason of some incipient weakness indicated by them on the surface, compression tests were made upon sections of bearings showing no surface markings. Before compressing these, fine scratches were put on the surface with an ordinary scribe at various positions and at different angles with the longitudinal axis of the piece.

This was done to determine whether upon deforming this piece artificial scratches on the surface would control the location of the crack formed under compression. Out of four cases only one of the cracks formed by the compressive stresses coincided with the surface scratch made by the scribe. All the others appeared to be entirely independent of the existence of such scratches on the surface. However, including all of these tests, it must be stated that no indications of cracks due to compressive stresses were noticed anywhere until the specimen had deformed considerably.

Figs. 3 and 4 show clearly the extent and nature of the above-described cracks produced on the specimens when subjected to compressive stresses. Fig. 4 shows

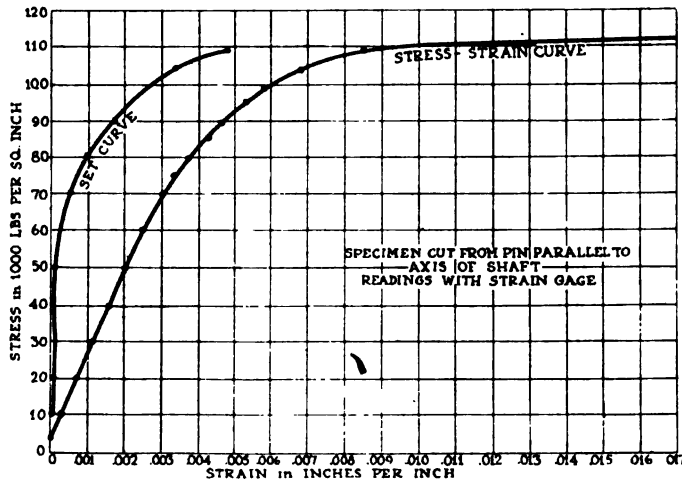


Fig. 7—Tensional stress-strain curve

the defective bearings tested under compression. Fig. 3 shows the perfect bearings artificially scratched. In two instances the compression test was purposely carried to complete failure, when the specimen broke into four pieces. The object of this was to enable a closer examination of the longitudinal fracture and a study of the structure of the material. As will be noted in Figs. 5 and 6, the structure was fibrous and curved or wavy in appearance, producing a rather twisted fracture. The reason for this particular type of fracture in chrome nickel steel shafts will be explained in the latter part of this article, dealing with the metallographic study of the material of the shaft. Figs. 5 and 6 are two photographs of the same specimen with the light on different sides.

#### Tension Tests

As previously stated, tension tests were made, irrespective of the defective points, to investigate the elastic properties of the material. The first test was made upon a specimen taken from the propeller end of the shaft, and was of the original diameter and shape. This piece was comparatively short and after allowing for the necessary length to be held by the grips only 3 in. remained clear between grips. Two sets of gage holes, 2 in. center to center, were drilled into the piece on opposite sides of the bar, so that strain gage readings could be taken. A 2-in. Berry strain gage was used to determine the strain produced on the piece at varying loads. Unfortunately failure took place outside the gage marks, and just inside the upper grips, thus preventing a representative determination of the proportional elastic limit or of the elongation. The maximum load carried was 213,000 lb. (or 100,100 lb. per sq. in. Fig. 7 shows the readings obtained. The fracture produced was mostly silky, except for a small area, which was crystalline, probably caused by a slightly eccentric loading due to the slippage of the grips on the specimen.

(To be continued)

#### Germans Using Wood Tires

A CORRESPONDENT of *L'Auto*, giving particulars of German transport vehicles captured during the recent Allied advance, says every vehicle has wooden tires, as no suitable substitute of an elastic nature has been discovered to counteract the rubber shortage. The tires on the front wheels are of the same section as the rubber tires usually fitted to French transport vehicles, but the rear tires are of a very flat section, 8 in. to 10 in. wide, and 4 in. to 5 in. thick. A detachable rim enables the wood tire to be changed, an operation which should be fairly frequent. The treads are grooved to reduce slipping and promote a grip of the roads.

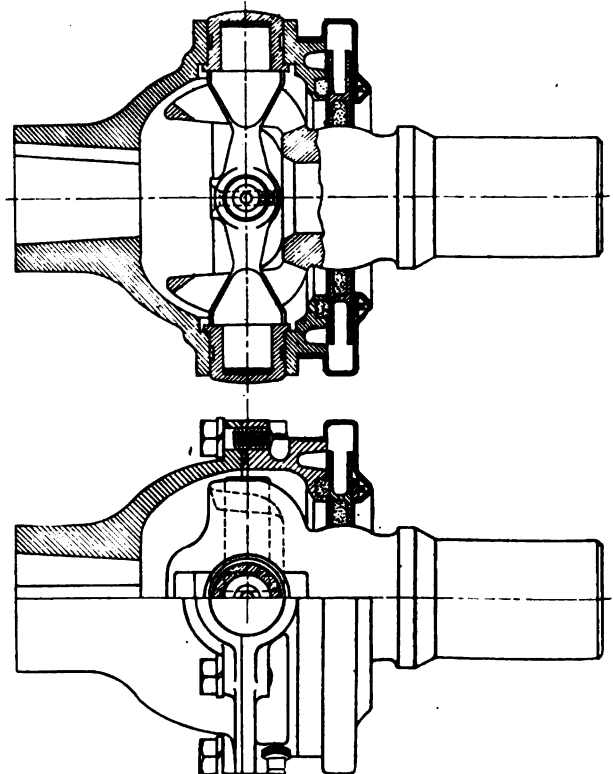
## Culbertson Universal Joint

**E.** ESTAY CULBERTSON, Detroit, Mich., has developed a universal joint of simple construction, and which can be lubricated by means of oil. Two sectional views of the joint are shown herewith, and the principle of the device will be readily understood from these illustrations.

Instead of the conventional driving and driven flanges, Mr. Culbertson employs a one-piece hemispherical member which transmits the torque through bushings to a driving pin, which in turn transmits it to the driven member. There is also a central pin, perpendicular to the driving pin, which serves merely to locate the driven member. This central pin is held to the driving pin by means of a machine screw. The hole in the driving pin at this point is about 0.004 in. greater in diameter than the pin, this clearance being allowed in order to provide for wear upon the flat bearing surfaces of the driving pin. A wear of from 0.006 to 0.008 in. at the flat bearings is thus provided for.

One of the features of the joint is such an inclosure that oil lubrication is rendered possible. Instead of using the conventional spherical type of wiper, Mr. Culbertson provides a novel form of housing. It comprises a vertical slide supported on a spherical surface on the driven member. This slide is being pressed against a cork packing, lodged in the end face of an annular casting bolted to the hemispherical member, the spring pressing directly against a fiber disk. Mr. Culbertson's object in using fiber at this point is to obviate all noise. The surface against which the packing for lubricant retention operates is protected against dirt.

In order to hold the parts of the joint in assembly, the same as in the conventional construction, the holes for the bushings are drilled with their centers not in the parting plane but 1/16 in. to one side thereof, in the annular casting. This makes the opening of the hole virtually 0.007 in. smaller than the diameter, and the bushing is pressed into this casting and is firmly retained in place. This permits of removing the hemispherical member from the joint without disturbing the assembly of the remainder. The driven member is drilled out from the end, in order to save weight. The construction calls for only two bushings, and there are parallel bearings on the driving pin. The slot in the driven member is made by simply pushing this part against a milling cutter.



Culbertson universal

# Status of the Unproductive Worker

## Are Not Salaried Workers Equally Entitled to Representation in Organization with Skilled and Unskilled Employees?

By Harry Tipper

THE attention of industrial organizations has been directed to skilled and unskilled workers engaged in the actual manufacture of the product by the activities of the organized bodies of labor and their constant appeal for public attention to such an extent that there is some danger of losing sight of the army of other workers whose demands are less vociferous but whose case is none the less important.

It is interesting to note that in some of the organization plans which have admitted the general body of labor in the establishment to a share in the responsibility for their own conditions a specific statement is made that *no salaried employee of the company shall be entitled to a vote in the election of the representatives of the working body.*

A number of individual plans have been made in the last 10 years, and particularly in the last 4 years, in various lines of industry, but very few of these plans seem to have recognized the bodies of employees who are not supervisors, who have no responsibility in controlling the operations, and who are equally important with any other bodies of labor as individuals, and equally necessary to the success of the organization.

It is true that for the most part these workers are not organized, and any demands which they have made have been of an individual character; they are not paid by the hour; and as a rule they do not receive extra pay for overtime. It is also true that the turnover of such labor is comparatively small, the permanency of occupation is very much greater, and the general tendency to stable conditions of work and of wage makes the problem an entirely different one.

### Reasons for Neglect of Some Workers

The reasons for this apparent neglect of a considerable body of workers in the systems of representation which are being considered and adopted by a number of concerns can be readily stated. The lack of organized protest has resulted in a lack of public attention. The stable character of the work and the orderly necessities of such work have produced dislike for the methods of skilled and unskilled labor protest which are evidenced by the failure of the occupational organizations of labor in this country to extend themselves into these fields.

Attempts have been made from time to time to organize one occupational branch or another of these workers without any success. It is natural for us all to consider those difficulties which are constantly brought to our attention, and in business the justification of the organized labor leader lies in the fact that the demands of organized labor, no matter what their justice, have resulted quite continually to the advantage of those branches of workers.

From the manufacturer's standpoint, however, any system of legislative organization in his whole industrial unit which places the workers who are engaged in actual production in one category and the supervisors or governors in another, bringing these two together with a

joint system of responsibility and discussion, but fails to recognize the necessities of the somewhat smaller body of workers who are neither supervisors nor engaged in the actual production—any such system cannot work out to the fullest advantage because it will eliminate from the discussions and from the responsibility of decision those workers who represent an orderly and valuable part of the industrial unit.

It is not so much a question of justice being done to this part of the organization, although it would be possible to show there is just as much necessity for an examination of this point, but it is the question of the value of this part of the working organization in the discussions of the legislative requirements.

Perhaps these workers represent the individualism which must be retained to an extent if the organization is to live, and their traditions of service, as well as their social surroundings and general habits of living, induce them to regard without entire approval the general movement toward purely collective action.

### Not Benefited by Continual Protest

They have not been benefited by the continual protests of organized labor; in fact, the increased wages and the improvement of working conditions in the factory have at times militated against their own economic advancement.

On the other hand, they have not been served with such notable justice by the employer that they are sympathetic with his viewpoints, or to be regarded as his representative. In general they have paid more for the training which precedes their service and received less for the years of their service than the skilled workers who have organized themselves into occupational units.

Their point of view in the organization policies which would be recommended by the legislative bodies of workers and supervisors together would be of very great advantage in placing the wage system upon a proper basis and in the consideration of conditions of work.

Furthermore, the exclusion of this body from the general considerations which come up before the legislative and judicial machinery established within the industrial unit must inevitably arouse discontent, a weakening efficiency, an increased turnover, and, finally, result in the loss of good material from these branches to the ranks of the skilled and unskilled laborers who form a part of the actual production force.

It is true that schemes of old-age pensions, continued salary during sickness, continued work during times of depression, have been usual in a good many organizations for this branch of the working force, and to that extent in the stability of the labor they have been treated with less rigor.

It is also true that the stability of their wages during times of depression must be compensated for by less advance in times of prosperity. It is nevertheless clear that if a careful analysis be made of the extent of the training required to produce efficient workers in these



occupational branches, and a careful examination be made of their importance, in comparison with the more active occupational branches of the workers, that *they have not received the attention that should be given to them by the manufacturer in the interests of his own efficiency and full content in his own organization.*

If we accept unconditionally the belief that control in industry should be vested in the stockholders, and exercised by the elected officers of those stockholders, and that labor is a commodity to be secured like other commodities at whatever price it is necessary to pay, then these considerations are without any bearing.

There is little danger of organized effort on the part of these workers to attract public attention in the immediate future, and although their sympathies are quite frequently with the other workers because of a natural similarity in aspiration, they are usually more conservative in their actions and not likely to be so readily caught up in radical movements.

If we accept, however, the position which has been taken by many industrial leaders of foresight and prominence, that labor is not a commodity but a human service, exacting in its fulfillment the very life of the worker, and demanding a consideration of the individual economic, social and political aspirations, these very facts should in themselves indicate the necessity, and indeed the advantage, of instituting organization plans which shall include this valuable part of the industrial group in some effective way.

### Consideration of Essentials of Co-operation

If we go further and accept what has been stated by some of the most discerning and successful of the industrial organizers in the last two or three years, to the effect that a reasonable degree of the spirit of co-operation, a thorough incentive and some measure of understanding will increase the economic value of the individual worker, then the necessity for the consideration of these neglected branches of the working body becomes apparent.

It is obvious that the tendency which was forecast in 1915 in the writer's book "The New Business" to invite the worker to exercise a greater responsibility in the determination of his working conditions is becoming manifest in the actions of a number of large and successful organizations which have adopted plans of this kind.

It should be equally obvious that any such organization plans should take in not only the skilled and unskilled workers who are engaged upon actual production but that equally important, although smaller, body of workers who are for the convenience of industry paid what is termed a salary and whose working conditions are more stable, but who are not concerned with the control of the operations or with the supervision of other labor.

It is true, of course, that the representation from such workers would have to be worked out in a somewhat different way from that which is usual in the organization plans providing for the representation of the skilled and unskilled workers who are engaged in the actual productive work.

In such an organization plan, for instance, as that which was discussed last week of the Midvale Steel & Ordnance Co., the number of such workers in any one of the plants might not be sufficient to provide them with a representative from their own ranks on the same basis as prescribed for the workers in the mill.

The question would have to be considered in each case as to whether it were desirable that they should be entitled to a vote along with the other employees specifically named in the organization plans or whether a change in

the representation should be made to permit of their securing a representative from their own ranks to sit upon the joint committees.

The plan of the Colorado Fuel & Iron Co., which is similar to the other plans in the steel business, states specifically as follows:

"Shall state that employees being wage earners in the employ of the company at the time of the meeting and for at least three months immediately preceding, but not salaried employees, shall be entitled to be present and vote." This means that the laborer of whom the company knew nothing and who had no interest in the company four months before the voting date can vote provided he arrived at the camp and was put to work three months before that time, whereas the man who had been paid to act as stenographer or record clerk at the same camp, and has been in the employ of the company for 10 years previous to the time of the vote, is specifically eliminated from voting because he has been paid on a weekly salary instead of on a time card.

It would be unwise, in the attempt to allay discontent, by providing a co-operative organization, to transfer that discontent from the ranks of the skilled and unskilled wage earners to those employees who have been, up to the present, the more stable branches engaged upon the necessary work of the industrial unit.

It is obvious that in no representative system adopted for organization purposes should any supervisor of labor or direct representative of such supervisor be included in the voting population for men who are to represent the employees of the organization, but this reason does not seem to be sufficient to eliminate all employees working on a salary without regard to their position and responsibility.

The fact of the matter is that there is no particular problem here at any one moment; there is no question of the stoppage of production or of general strikes; there is no distinct tendency to disorganization, and the thought has been put largely upon the problem and not thoroughly upon the principles behind it.

### Organization Should Begin with Details

It is well that, as stated previously, new organization plans of this kind should begin with small matters and gradually develop into the handling of the larger problems; but the machinery of the organization should be established in such a way that it can take care of practically every possible problem which may come up as it grows together and functions properly.

No organization can do much good unless the spirit of co-operation is there, and the spirit of co-operation must be shown first by the employer in his organization plans; but no organization plan can develop the spirit of co-operation thoroughly where it begins by eliminating a certain body of workers or a certain portion of the working force from participation in its actions and from a sense of unity with it.

The reason why organization plans such as we have mentioned are being adopted by concerns every few days is to be found in the necessity for common responsibility where there are common interests. The organization of industry was divided by the system of labor unions and by the increasing solidarity of labor, and these plans have been adopted to eliminate the division and bring the whole body together in common purposes.

It is a little surprising, therefore, that some of them should have specifically eliminated from this common responsibility a body of workers whose interests are no less important in the organization unit and whose incentive and content are just as necessary to the proper productive efficiency.

# Air Flow Through Poppet Valves

## An Experimental Investigation of the Resistance to Gaseous Flow Through Poppet Valves of Different Diameter and Lift—Single Versus Double Valves

**A**MONG the problems which have confronted explosion engine designers for some years is that of the dependence of air flow or gas flow through poppet valves upon the valve diameter and lift. This question comes up in a consideration of the advantages of double valves or four valves per cylinder, as now used in some automobile engines and many aircraft engines. It has not been definitely known in the past whether the flow for a uniform pressure drop would increase directly as the diameter and as the lift, and this made it impossible to make a comparison, on theoretical grounds only, between the capacity of two small valves of given dimensions with one large valve.

Considerable light has been thrown on this problem by an investigation made by the Clarke Thomson Research, under the direction of the National Advisory Committee for Aeronautics, the results of which are embodied in Report No. 24 of the committee, just published.

The apparatus used in the tests consisted principally of a centrifugal blower, a model cylinder and U tubes for measurements of pressure. The blower was one of special design with a balanced rotor 11.25 in. in diameter, composed of 10 forward curved blades. An electric motor furnished the power, rheostat control permitting speeds from 3000 to 6500 revolutions per minute, corresponding approximately to pressures of 9 to 32 in. of water. The number of impulses varied from 30,000 to 65,000 per minute, affording practically continuous flow. The blower was connected to the cylinder with rubber hose, care being taken to see that the alignment of the hose remained perpendicular to the face of the cylinder at point of entrance throughout the tests.

### Dummy Engine Cylinder Used

The cylinder is shown in longitudinal cross section in Fig. 1. The cylinder head was carved out of white pine and carefully finished. At the entrance end, the passages leading to the valves were cylindrical in form with axis perpendicular to the cylinder axis and 2.5 in. in diameter, the passages then curved as shown to the ports. The approach to the large valve, which had a diameter of 2.5 in., was circular in cross section at all points. The approach to the pair of valves on the opposite side of the cylinder became narrower in the plane of the cross section shown, and widened laterally to smoothly divide, about 1.5 in. from the ports, into two passages of 1.75 in. diameter. The angle between the valve axis and the cylinder axis was 15 degrees. No valve guides or bushings extended into the passages.

The diameter of the counterbore was 5.75 in. and of the cylinder proper 5 in. The valves were seated with a bevel of 30 degrees in the two planes forming the cylinder head. The diffuser shown was constructed of thin brass soldered together and inserted so as to divide the whole area of the cylinder at that point into rectangular passages about  $\frac{1}{2}$  in. square and 2 in. long.

The jet at the opposite end of the cylinder was likewise carved out of white pine as shown, and was connected to the cylinder head by a length of 5-in. wrought-iron pipe, smoothly galvanized inside, used to obtain sufficient length for rectification of the air current. Gaskets and shellac were used at the joints and the assembly drawn together with four long bolts extending from end to end, outside the cylinder.

### Three Sizes of Valves Tested

In addition to the single valve with a diameter of 2.5 in. and the pair of valves with diameters of 1.75 in. already mentioned, another pair with diameters of 1.25 in. was tested.

False seats were used with this smaller pair, consisting of turned hardwood rings, carefully fitted to the 1.75 in. seats and beveled to receive the smaller valves. These false seats obviously left a circular shelf or projection 0.25 in. wide immediately above the ports. As a matter of interest, two readings were taken with these shelves projecting above the port, but before running off the main test on these 1.25-in. valves, the lines of the passages were smoothed off by filling in above these projections with putty.

The valves were all designed on similar lines with the exception that the smallest pair had stems  $\frac{5}{16}$  in. in diameter, to fit the guides used for the larger pair, this dimension being

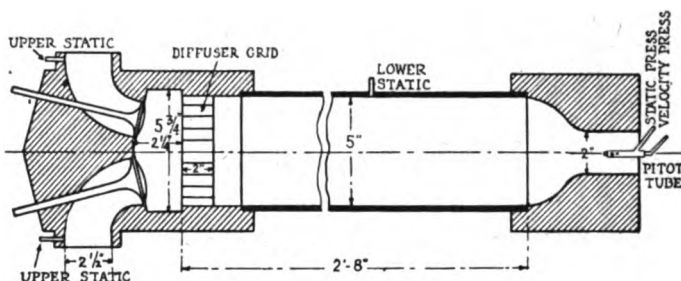


Fig. 1—The test cylinder

40 per cent larger than true proportion dictated, equivalent to a reduction of 0.022 sq. in. or 1.8 per cent of the port area of the smaller pair.

The Pitot tube shown in the jet in Fig. 1 was clamped in position at the axis of the jet throughout the tests, velocity readings being taken as later described. The dimensions were  $\frac{3}{16}$  in. outside dia. and about 2.5 in. in length. The impact end was gradually rounded and the static holes were four in number, about 0.02 in. dia., smoothly perforating the outer wall.

A static tube of  $\frac{1}{4}$  in. dia. penetrated the central portion of the cylinder, reading static pressure of the air column after passing the valves and the diffuser. This is for convenience termed the "lower static."

Static tubes of  $\frac{1}{4}$  in. dia. also tapped the flow where the air column entered the passage leading to the valves. These are for convenience termed "upper static," only one being used at a time, as indicated by its position with respect to the valves. All statics were slightly rounded on the inner periphery, and the end kept flush with the inner surface of the cylinder or passages, and so located as to be perpendicular to the direction of air flow.

The upper and lower statics were connected to the two legs of a U-tube to read directly the pressure drop through the valve, and also connected to other U-tubes to read the upper static and lower static head separately.

All U-tubes had an inside diameter of about 0.25 in. and were vertical with the exception of one, which was inclined at a slope of 10 to 1 to read with greater accuracy velocity pressures of 3 in. or less.

A centigrade thermometer was clamped with its bare bulb in the air jet at a point about 1.5 in. outside the apparatus. A similar thermometer was hung on the wall for readings of room temperature.

The moisture content recorded is the average for the period indicated, as taken from a recording hygrometer, the variations being but slight, as were those of the barometer.

It is not necessary here to give a full explanation of the methods of measuring the velocity and quantity of air as

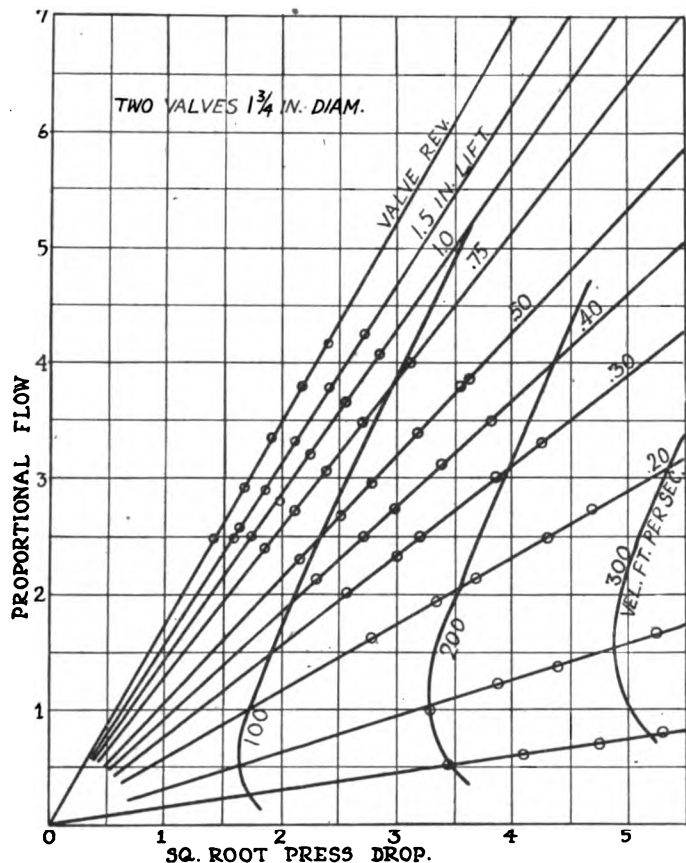


Fig. 2—Variation of flow with pressure drop and lift

given in the report. The results are embodied in tables and diagrams, but only the latter are reproduced here.

The purpose of this investigation was primarily to secure comparatively accurate comparisons as between the capacities of the different valve combinations, rather than to secure absolute quantitative determination of the flow in any case. It will readily be seen that the velocity and quantity of air flowing through the jet at the outlet of the system will be proportional to the square root of the velocity pressures read by means of the impact tube in the jet. The vertical scale of the following graphs is based on these readings and is termed for convenience "proportional flow."

#### Pressure Drop and Flow Graphs

The horizontal scale is laid off to the square root of the pressure drop through the valve combination tested, which is deemed much preferable for the present purpose to the use of the pressure drop itself.

Wherever "proportional flow" is used as a basis for plotting in the various plates shown, it should be remembered that this refers to flow through the same jet in all cases, without respect to the valve opening or pressure drop causing the flow, and that the various results so obtained may therefore be directly compared, owing to the use of this jet as the common medium of measurement in all tests.

As to Fig. 2, it is true that the scale is small and that plotting to square roots tends to reduce the magnitude of any irregularities in the points obtained, but the close coincidence of the points with the straight graphs passing through the origin seems to warrant the conclusion that the actual velocity through the valve at any given lift varies directly with the square root of the pressure drop, at least within the limits of these tests, as does the theoretical velocity. It further follows as a general rule within these limits that the coefficient of efflux does not vary with the pressure drop. Certain limitations upon this conclusion may be required, however, and will be discussed in connection with the graphs showing the variation of the coefficient of efflux with the lift.

Curves of equal velocities have been superimposed upon

the graphs of Fig. 2, to show the approximate velocities through the valves in feet per second. At about the average conditions of the tests, namely, 80 deg. F., 55 per cent humidity, 68 deg. wet bulb, and 29.72 in. barometer, air weighs 0.0717 pounds per cubic foot. Inserting this value in the equation  $V = 18.275 \sqrt{p/w}$  gives  $V = 68.2 \sqrt{p}$ . In other words, assuming air at this density, multiplying the vertical scale by 68.2 gives actual velocity through the jet in feet per second, and applying the same correction to the horizontal scale gives theoretical velocity through the valves. The actual velocity through the valves may then be obtained either by applying the ratio of areas to the vertical scale of jet velocities or by applying the proper coefficient of efflux to the horizontal scale of theoretical valve velocities.

Curves representing actual velocities of 100, 200 and 300 feet per second through the valves have been laid off by the former method and agree fairly with results obtained by the latter method, except as to irregularities in some of the points used for plotting the coefficient curves later presented.

These curves may be used to approximate the actual pressure drop necessary to produce a given velocity. For example, in Fig. 2 it is seen that the pair of 1.75-in. valves with 0.20 lift indicates a velocity of 200 feet per second at the ordinate corresponding to 3.55 in the horizontal scale or 12.6 in. of water or 0.455 pounds per sq. in. as the required pressure drop. It should be noted that these velocity curves are merely approximate and that errors up to 5 per cent or so may be found.

#### Variation of Flow with Valve Lift

It is evident that the intercepts on any ordinate on Fig. 2 will represent the variation of the flow with the valve lift at the pressure drop corresponding to the ordinate selected.

Fig. 3, lower chart, presents such curves for the three valve combinations, plotted from intercepts on the ordinates corresponding to a pressure drop of 16 in. of water, the ordinates numbered 4 in the square root scale. The curve of flow for the single 2.5-in. valve lies between those of the pairs of valves at all lifts. It is found to be very nearly equal to that of the smaller pair for low lifts and approximates that of the larger pair at the higher lifts.

These curves are plotted against valve lift in inches, but for convenience the points equal to one-quarter and one-half diameter have been marked on each curve. By interpolation between these points and others similarly located, the approximate curve of flow for two valves of 1.5 in. dia. is presented. This indicates a flow quite closely equal to that of the single 2.5-in. valve up to a lift of about 0.6 in.

Lift in inches.....	0.125	0.25	0.375	0.500	0.625	0.750
2 valves, 1.75 inches..	137%	129%	125%	119%	116%	113%
2 valves, 1.50 inches..	114%	106%	101%	94%	90%	87%
1 valve, 2.5 inches....	100%	100%	100%	100%	100%	100%
2 valves, 1.25 inches..	85%	77%	72%	65%	59%	54%

<sup>1</sup>Interpolated.

The points connected to the curves by broken lines indicate, to vertical scale only, the flow with the valves reversed. This might be considered equivalent to the flow with the valves at an infinite lift, which agrees with the horizontal trend of the curves, but more practically, these points represent the maximum limit of flow through the respective ports at this pressure drop. These curves, comparing performance upon a basis of equal lift in inches, are particularly applicable where it is conceded that mechanical features generally limit the possible lift regardless of valve diameter.

On the other hand, it is often asserted that the proper limit of valve lift is a function of the diameter, and for purposes of comparison on this basis Fig. 3, upper chart, has been prepared from the curves last discussed, changing the horizontal scale to read in per cent of the diameter of each valve. In the case of pairs of valves, the flow of both is plotted against the lift, expressed in per cent of the diameter of one valve only.

The result of this transposition is at once apparent. The intercepts on an ordinate very closely agree with the proportionate cross-sectional port areas of the several valve combinations, and in the case of the two curves corresponding to valve combinations with equal cross-sectional port area,



the curves coincide within the probable error of the work. Up to a lift of 0.5 dia. the coincidence is all the more exact if it be remembered that the two 1.75-in. valves have an area about 2 per cent less than the single 2.5-in. valve.

From this it would appear reasonable to infer that under fairly similar conditions different valves or combinations of valves have capacities in proportion to their respective cross-sectional port areas, when the lift in each case is same per cent of their respective diameters.

It also seems logical to infer that the theory of the hydraulic mean radius has but little application to the losses in poppet valves, it being more properly applicable to what may, for convenience, be termed surface friction, or actual rubbing of the moving fluid upon the surrounding wall, whence its derivation—the relation of cross-sectional area to perimeter in contact with the moving fluid.

It is evident from an inspection of the curves in Fig. 3 that a lift equal to one-quarter diameter develops less than 67 per cent of the full capacity of the port, and that a lift of one-half diameter develops 80 to 90 per cent of the full capacity.

#### Coefficient of Efflux

The coefficient of efflux is taken as the ratio of the observed mean velocity through the valve to the mean velocity which would theoretically result from an equal pressure drop. Assuming that the temperature, density and humidity of the air are the same at the valve as at the jet, this coefficient may be obtained directly from the relation of the areas and the proportional velocities observed. The proportional velocity at the jet multiplied by the ratio of the jet area to valve area gives the proportional velocity through the valve. If the ratio of this velocity to the square root of the pressure drop be taken, the result is the coefficient of efflux. To be more exact, this should be multiplied by 0.99, the coefficient of the jet.

The above short method may be justified by developing the usual equation  $V = \sqrt{2gh}$  in the units here most convenient:

$V$  = velocity in feet per second.

$g$  = acceleration constant of gravity in feet per second.

$h$  = head of air in feet causing the flow.

Substituting the head in inches of water:

$$V = \sqrt{2gp} \frac{62.31}{12w} = \sqrt{2gp} \frac{5.192}{w} = 18.275 \sqrt{\frac{p}{w}}$$

where  $w$  is the weight of water in pounds per cubic foot, 62.31 is the weight of water in pounds per cubic foot, and  $p$  is the pressure head in inches of water.

This equation is deemed sufficiently accurate for the low pressures here subjected to examination.

Now, if  $A$  = the jet area, and  
 $a$  = the valve area,

the mean velocity through the valve is  $18.275 \frac{A}{a} \sqrt{\frac{p}{w}}$  where  $p$

is the velocity pressure and  $w$  the density of the air at the jet.

The theoretical mean velocity through the valve is  $18.275 \sqrt{\frac{P}{W}}$  where  $P$  and  $W$  are, respectively, the pressure drop and the density of the air at the valve.

$$\text{The Coefficient of Efflux} = \frac{18.275 \frac{A}{a} \sqrt{\frac{p}{w}}}{18.275 \sqrt{\frac{P}{W}}} \text{ or } \frac{A \sqrt{p}}{a \sqrt{P}}$$

where the density of the air is the same in the jet and in the valve.

#### Basis for Valve Area Calculation

In computing the coefficient the valve area has been taken as  $\pi D h$  for all lifts. It is realized that for small lifts the aid of trigonometrical formulæ may be invoked to determine accurately the least area of opening, but the same formulæ are not applicable at higher lifts. Moreover, they are only justifiable upon the theory that the lines of flow are parallel, which does not obtain for any except the smallest lifts.

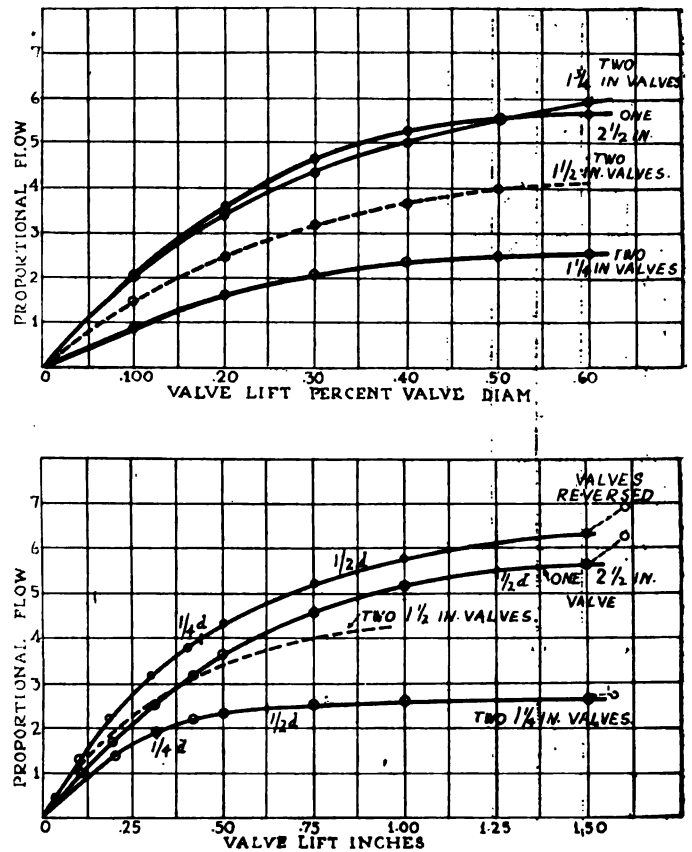


Fig. 3—Variation of flow with valve lift

In Fig. 4 the coefficients of efflux will be found, plotted against valve lift in the lower chart, and against lift in per cent of diameter in the upper. These coefficients are considerably higher at low lifts, a feature somewhat difficult to explain satisfactorily. Both friction and dynamic losses should be greater at low lifts, as the ratio of perimeter to area is then greater and the angular deflection sharper. It seems probable that there is an approximation to a jet action at low lifts, the discharge taking place at a region of relatively low pressure, somewhat after the manner of the true jet used for measurement at the outlet end of the cylinder. The comparatively high discharge efficiency of any such jet seems to make this the most probable explanation of the high coefficients.

If such jet action takes place, the pressure in the valve area should approximate that of the cylinder itself, and the theoretical velocity through the valve should be computed upon the lower pressure rather than the higher. This would reduce the error involved in computing the theoretical flow and coefficient upon the assumption of atmospheric density in the valve, as has been done.

#### Pressure Used in Tests

The maximum static pressure in the cylinder was 17.5 in. of water. As a pressure of 1 in. of water is equal to a pressure of 0.5768 ounce per sq. in., this would equal a pressure of 10.09 ounces, or 0.631 pound per sq. in., or an absolute pressure of 15.23 pounds per sq. in., 755 millimeters observed atmospheric pressure being equal to 14.60 pounds per sq. in. The density of the air varying with the absolute pressure and the ratio of absolute pressures being 1.046, the error involved under the above assumptions would be about 2.2 per cent as the density of the air enters the equation under the radical sign. This error would be materially less at the lower lifts, the pressures in the cylinder then being considerably less. No appreciable error would appear to be introduced by assuming equal temperature and equal humidity at valve and jet for any given valve opening and pressure drop.

Referring again to Fig. 4, it will be noted that, in lower chart, where the coefficients are compared at the same abso-

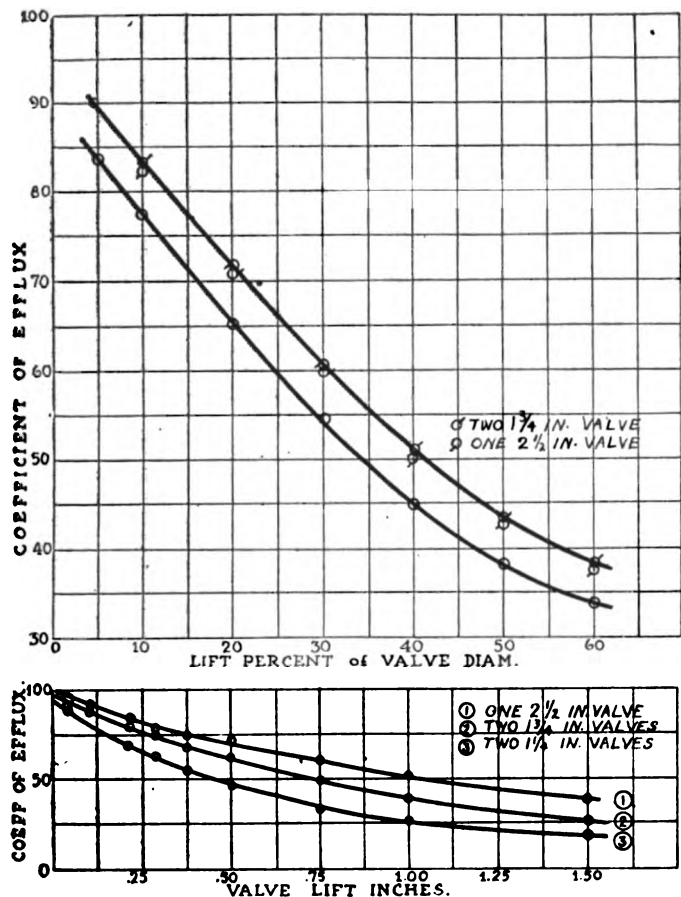


Fig. 4—Coefficient of efflux plotted against valve lift

lute lift, the differences between the three valve combinations are quite considerable, and that at the very low lifts the points plotted present some irregularities. The curves have been drawn to conform to the greatest number of points reasonably possible, and the curves in the upper chart have been plotted from those in the lower. The points for the two larger combinations so nearly coincide in the upper chart that but one line has been drawn.

The relative intercepts of the coefficient curves in the lower chart at various absolute lifts, expressed in per cent of the values for the single 2.5-in. valve, are presented in Table 1.

TABLE 1

Valve lift in inches.....	Relative coefficient of efflux.				
	0.125	0.25	0.375	0.50	0.625
2 valves, 1.75 inches diameter....	96%	94%	91%	89%	86%
1 valve, 2.5 inches diameter....	100%	100%	100%	100%	100%
2 valves, 1.25 inches diameter....	87%	73%	73%	69%	64%

In the upper chart it will be seen that when compared on a basis of equal valve lifts, expressed in per cent of diameter, the coefficients are much more nearly equal, the curves for the two larger combinations coinciding, and that for the small valves being but little lower. It seems entirely probable that even this small difference is largely caused by the converging lines of the passages leading to these small valves, as before explained. The comparative values are here shown.

TABLE 2

Valve lift in per cent of diameter	Relative coefficient of efflux.				
	0.10	0.15	0.20	0.25	0.30
2 valves, 1.75 inches diameter ..	100%	100%	100%	100%	100%
1 valve, 2.50 inches diameter....	100%	100%	100%	100%	100%
2 valves, 1.25 inches diameter....	93%	92%	91%	90%	90%

#### General Considerations

The only experimental investigation of the flow of air through poppet valves of which record was found in the technical publications was carried out as a thesis by R. M. Strong and F. W. Hollman, and later published by Prof. C. E. Lucke under the title "Pressure Drop Through Poppet Valves," Vol. 27, Transactions of the American Society of Mechanical Engineers (1905). Prof. Lucke seems to have

been the first to call attention to two noteworthy characteristics, which are found to be supported by the data here presented; first, that the coefficient of efflux, computed for air at atmospheric density, is nearly constant for all pressure drops; and, second, that this coefficient is much larger for low lifts. Tests were made both with continuous flow and intermittent flow, the latter being as nearly as possible similar to actual operating conditions for the two gas engines tested, and it was found that the coefficient of efflux for continuous flow was not the same as that for intermittent flow, even at the point of zero acceleration.

It is patent that extreme care should be exercised in any attempt to apply the results of continuous-flow experiments to flow under operating or intermittent conditions, since inertia and resonance effects in the inlet manifold will obviously make great differences in the absolute quantities, and these effects will vary with the type of manifold used. Moreover, the pressure drop, velocity, and coefficient will obviously vary with many other factors as between different engines, different speeds for the same engine, and as to instantaneous values at different points of the stroke for a given engine at a given speed.

#### Question of One or Two Inlet Valves

However, in the question of design as to whether two inlet valves or one should be used, it is believed the comparative results here presented may be made to serve a real purpose. It is difficult to perceive any reason why the comparative relations obtaining between these three valve combinations for continuous flow should not find some parallel in the comparative relations between the same three combinations for intermittent flow, if no other variables are permitted to affect the comparative results in the latter case. Only inherent differences between the three combinations, effective with intermittent flow and noneffective with continuous flow, or vice versa, would appear capable of affecting this parallel, and it is improbable that such differences, if any, are of great magnitude.

The dimensions of the cylinder model used for these experiments offer a ready basis for discussion, and are commonly encountered in aviation engine practice, the bore being 5 in. and the diameter of combustion chamber 5.75 in. A combustion chamber of this size permits the use of two valves of 2.5 in. dia., or four valves of 1.875 in. dia., inclined at 15 or 20 degrees to the cylinder axis in both cases. Four 1.75-in. valves can be placed in a 5.5-in. cylinder head inclined, or a 5.75-in. cylinder head vertical; and four 1.5-in. valves are even more readily accommodated in a 5-in. cylinder head, or a cylinder having the combustion chamber the same diameter as the cylinder proper. These valves may be placed vertically, and the cylinder is much more easily machined. The combustion chamber will have better proportions, and the slight increase in cylinder height will be more than offset as to over-all height by the saving in spring length.

#### Advantages of Two Smaller Valves

Two 1.5-in. valves will have a flow capacity equal to one 2.5-in. valve at the same pressure drop and the same lift, will present but 72 per cent as much area to any pressure in the cylinder at the time of opening, and will weigh but 56 per cent of the weight of the single valve, assuming that the weights vary as  $D^{2.5}$ , which is approximately correct for these sizes. Assuming any reasonable pressure in the cylinder at the time of valve opening, and spring tensions in proportion to valve weights, it is evident that the two small valves will require less than half the power to open them, and this will be a direct saving of mechanical loss, as valve action is not the type of reciprocating motion which can return during one portion of the stroke energy stored during another portion, excepting only the energy stored in the spring.

It has been said that valves in pairs are more difficult to cool than single valves, but this does not appear to stand analysis. The proportion of the 5-in. cylinder head occupied by the small valves is only about 95 per cent of the proportion of the 5.75-in. head occupied by the large valve. The circumference of the two valves is 20 per cent greater than that of the single valve, and although the seats would have some

what less width, the distance of heat flow in this direction would be but 60 per cent as great. As to the portion of the heat which flows to the guide, the conditions are also somewhat in favor of the small valves, the distance to the water-cooled portion of the guide being less and the proportion of water-cooled guide greater.

In one example of foreign engine design dual valves of about this size are lifted to one-half diameter, and give entirely satisfactory operation at speeds up to 2200 revolutions per minute. The possibilities in this direction are largely untried, but the negative work used in overcoming valve resistance to inlet flow might be reduced with small valves at high lifts and the volumetric efficiency increased, without introducing serious mechanical difficulties. This, of course, is contrary to the principle of using low lifts to secure a higher coefficient, but still the over-all result might be beneficial.

The comparison of a single 2.5-in. valve to a pair of 1.75-in. valves may be analyzed in much the same manner, and as to heat conditions the result would seem slightly in favor of the pair. If lifted 0.375 in., the capacity will be 25 per cent greater than that of one 2.5-in. valve, according to the experimental results, or the resistance will be but 64 per cent as great, the resistance varying approximately with the square of velocity or capacity. This should result in higher volumetric efficiency. The superficial area of the two combinations would be practically equal, but the weight of the pair would be but 82 per cent of that of the single valve, with correspondingly reduced total spring tension and slightly reduced mechanical loss.

#### Comparison With Mercedes and Benz Results

Interesting comparisons may be drawn from data published by the *Automobile Engineer*, London, Vol. VII, Nos. 105-6-8-9 (1917), covering Benz and Mercedes engines, each make being constructed in both 2-valve and 4-valve models. Except for the valve changes and an increase in compression ratio from 4.50 to about 4.90, the design of the 4-valve models is much the same as that of the respective 2-valve types. The data are represented in Table 3, the ratio of volume to horsepower and brake mean pressure being given for the rated power at 1400 revolutions per minute for each engine. The "valve-factor" is one-half the product of inlet-valve opening area by the number of degrees open divided by the displacement of one piston, affording a ready index of relative valve capacity.

TABLE 3

Engine	Benz 4-valve	Mercedes 4-valve	Benz 2-valve	Mercedes 2-valve
Bore, inches	5.71	6.30	5.12	5.51
Stroke, inches	7.48	7.09	7.09	6.30
Piston displacement per cylinder, cubic inches	191.38	220.82	146.05	150.20
Piston displacement, total cubic inches	1,148.30	1,324.90	876.30	901.20
Valve port diameter, inches	2.04	2.17	2.42	2.87
Valve lift, inches	.465	.398	.433	.440
Inlet valve opening, square in.	2.99	2.72	3.29	3.70
Rated horsepower	280	260	160	160
Rated revolutions per minute	1,400	1,400	1,400	1,400
Maximum horsepower	260	270	184	162.5
Maximum revolutions per min.	1,650	1,650	1,400	1,400
Inlet-valve opening, degrees	245	228.3	2.40	213
Area inlet pipe, square inches	3.65	6.85	2.96	3.54
Cubic inches piston displacement per horsepower	4.99	5.10	5.48	5.63
Compression ratio	4.91	4.94	4.50	4.50
Valve factor	3.80	2.82	2.70	2.62
Brake, mean effective pressure	113	107.5	103	102

The valve factor for the 4-valve Mercedes is but slightly larger than that of the 2-valve, and the mean effective pressure is increased only 5 per cent, which is practically accounted for by the increase in compression ratio from 4.50 to 4.94. In the Benz 4-valve, the factor is increased 35 per cent and the mean effective pressure increased 10 per cent, only about one-half of which can be due to the increase in compression ratio from 4.50 to 4.91.

In Fig. 5 a comparison is made of the power output of these four engines plotted against gas velocity through the inlet valve. These velocities are computed for this comparative purpose as the ratio of piston displacement per explosion to one-half of the product of valve-opening area by the time of the opening. The broken curves represent the 4-valve Benz and Mercedes, respectively, reduced approximately to compensate for difference in compression ratio.

In conclusion, a summary of the results experimentally derived is presented. It should be borne in mind that the number and character of the experiments is not such as to render them final and conclusive.

#### Conclusions

1. The coefficient of efflux is practically constant, for all pressure drops (at least below 1 pound per square inch) where the lower pressure is approximately atmospheric, and the theoretical flow is computed upon air at atmospheric density.

2. Under conditions of general similarity, the coefficient of efflux is very nearly the same for valves of different sizes, at equal lifts expressed in per cent of their respective diameters.

3. Lifting a valve one-quarter of its diameter may develop an area of opening geometrically equal to its port area, but affords a capacity less than 67 per cent of that of the unobstructed port, at the same pressure drop; a lift equal to one-half diameter develops 80 to 90 per cent of this maximum capacity.

4. At the same pressure drop, one valve of diameter  $D$  and lift  $h$  is equal in capacity to:

First, a pair of valves of diameter  $0.707 D$  (equal port area) and lift  $0.707 h$ .

Second, a pair of valves of diameter  $0.6 D$  and lift  $h$ , for values of  $h$  not exceeding about  $0.25 D$ .

REGARDING the relative merits of case-hardening and oil-hardening compositions, in certain kinds of service case-hardened gears are undoubtedly superior, while in others oil-hardened are best. As a general rule, the oil-hardened gear can be counted on for steady, uniform wear. Where a case-hardened gear is used the wearing down of the case to the core at any point means that the gear is gone. Similarly, if the case cracks it will flake, and the gear is gone. The actual cost of case-hardening will usually run slightly greater than that of oil-hardening. Oil-hardened gears always give a lower scleroscope hardness than case-hardened gears, but this is not a criterion of wearing quality, as the toughness of the material always enters in.

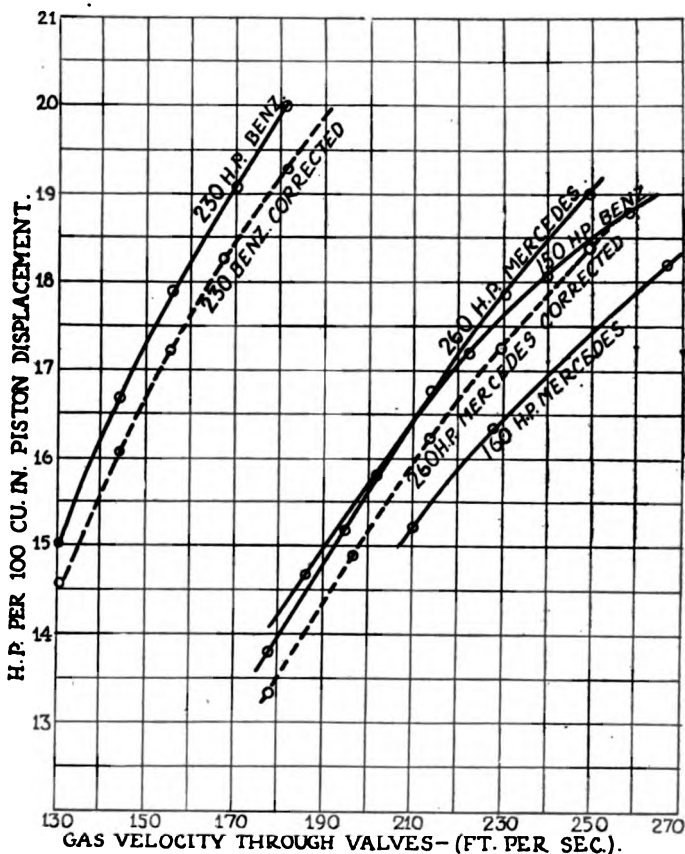
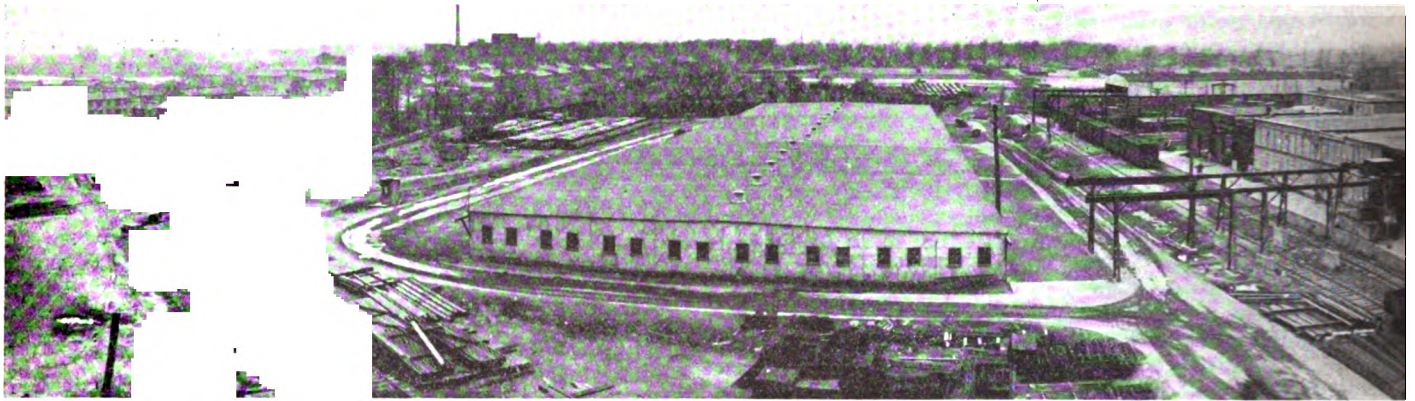


Fig. 5—Specific power output as dependent upon gas velocity through valves





*Shows the mechanical repairshop at the left, st*

## Camp Holabird—Largest Truck Overhaul Depot

**Present Capacity for Assembling 30 Trucks a Day and Crating  
22 an Hour for Shipment—1400 Trucks a Month  
Overhauled, Crated and Shipped**

**B**ALTIMORE, MD., Dec. 16—One hundred and fifty acres of uncultivated land converted into a beehive of industry; a motor truck overhaul plant of 200,000 sq. ft., capable of fully assembling 30 motor trucks per day; a packing plant 800 by 200 ft. with a capacity for completely crating 22 trucks per hour; a storage and shipping department with a capacity for handling 2200 tons of spare parts monthly—in brief, a complete organization of 7000 men and a factory which with a slight expenditure could be the equal of many truck producing plants—this is Camp Holabird, the largest motor truck overhaul depot in the world, and erected within the last 10 months at this city.

The illustrations on this page show the best indication of the remarkable development of this camp in less than a year. A description which appeared in these columns 8 months ago

told of the beginning of activities and showed illustrations of the grounds and the laying of foundations for some of the buildings. At that time the camp housed less than 500 men.

To-day it has an organization of 7000 men.

It has cleared as many as 1400 trucks a month, overhauled, crated and shipped them.

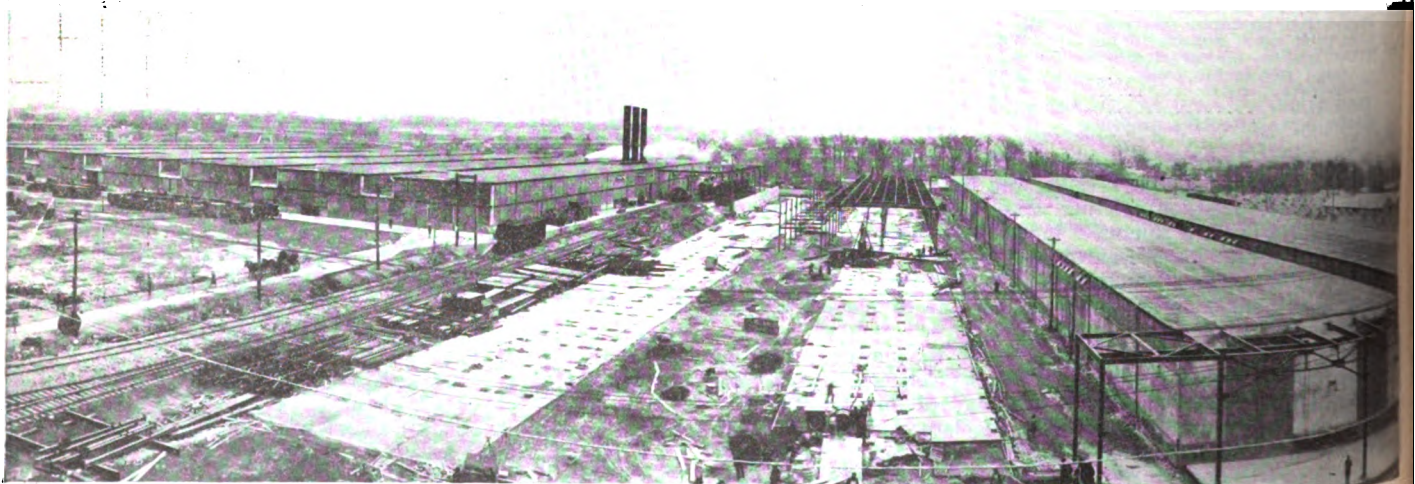
It has trained as many as 4000 motor mechanics within a month and shipped them abroad to the American Expeditionary Forces.

It has had as many as 7000 trucks in storage at one time.

It has completely torn down and overhauled and assembled 48 trucks in a day.

It has shipped 2200 tons of spare parts in a month.

It has disassembled and completely crated and shipped 115 trucks in a day.



*Shows the crating shop in the center, with the electrical crane which loads directly to the freight*





se in the center and trucks to the right

Occupying land to the northeast of Baltimore, the camp is to-day a mass of machine shops, tents, barracks and warehouses. The overhaul shop, 497 by 480 ft., one story high, comprises 28 departments, including chassis bays where the trucks are torn down, where the engines are completely inspected and repaired, and the final test room, where the trucks are reassembled and inspected, following which they are given a 50-mile road test and sent to the reserve park. In addition there are complete welding, drilling, painting, wood working, tire repair and other departments.

Painting is done by a spraying process which takes 15 minutes per truck. The shop has a stall capacity for 120 complete overhaul jobs at once.

A part of this space is assigned to passenger cars and a part to trucks. Motorcycles also have their respective space. On arrival at the shops, a vehicle is carefully inspected by an officer, who determines what the nature of the repairs to be done will be. The truck is then ticketed and sent in to be washed and then assigned to its stall.

A crew of men disassemble the truck; in the case of the complete overhaul the mechanism is taken to pieces until nothing remains but the bare frame. The various brackets and fastenings of the frame are inspected, loose rivets cut out and re-driven to make them absolutely solid and tight once more, and the process of reassembly is then ready to begin.

Meanwhile the units as fast as removed from the truck were ticketed with truck number and sent to the respective bays in the great shop where such units are handled.

The engine, for instance, goes to a special disassembling

shop, and is given a bath in hot soda to cut the oil and grease from it, and is then rapidly taken to pieces, and passes before skilled inspectors, who examine the condition of each piece and card it with the work to be done.

These pieces then pass to machines whose sole function is to perform the one operation required—crankshaft grinders for the shaft grinding, cylinders for re-boring cylinders, piston grinders for handling pistons. On completion of the work according to ticket, the parts once more pass over the inspecting benches, where the quality of the work done is carefully inspected and verified, and if need be, sent back for readjustment.

If acceptable, they pass to the reassembly bench just beyond. Thus in a few hours' time every part of the engine which is subject to wear receives mechanical treatment which brings it into as perfect condition as when originally manufactured.

The original makers employ the same tools that are used in this army shop for repairing and refinishing. When the engine has been reassembled, it is put on the stand and driven by belt power for some hours to smooth the bearings and make the working parts run quietly. It is then removed to a testing stand, where it is given gas and run under its own power against a dynamometer, and is not released from this stand until it generates the required amount of power for an engine of its class.

There is no guesswork about this part of the job. Every engine must deliver its quota and run absolutely sweet and true before release. While this work is being done on the engine, the transmission is also receiving similar treatment



and one of the warehouses to the left of it. A group of motor trucks can be seen at the right



## Camp Holabird—Largest Truck Overhaul Depot



*The crating room with 22 roller ways and a capacity for tearing down, crating and shipping a truck per way in 1 hour and 35 minutes*



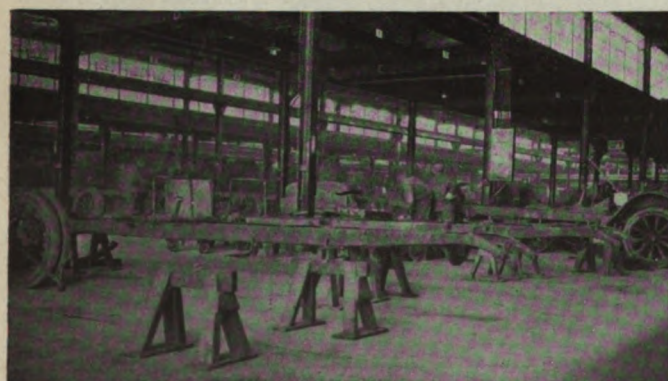
*Showing the individual electric traveling crane used at each way. The crane in the illustration is lowering the floor of the crate, which is so arranged that almost all of the parts taken off the truck fit conveniently and compactly*



*Beginning the work of disassembling the truck. Showing the individual roller doors at the side of the building and leading individually to the disassembling stalls. The floor of the crate with many units distributed over it. Each unit is painted with oil, either by spray or brush, to insure against rust, which is often caused by the ocean atmosphere*



*View of many parts properly placed on the floor of the crate, and the frame and engine being lowered by the crane. The wheels are laid over the frame and the sides and tops of the crate are placed in position and securely fastened and the crate is then ready for shipment overseas*



*The chassis bays in the overhaul building where trucks in service on this side and intended for service overseas are disassembled and overhauled when necessary*



*Showing a part of the cantonment, a field, the band stand and the auditorium in which enlisted men are given instructions and special motor mechanics trained, and also serves entertainment purposes*



in a separate bay; the axles and differentials are receiving treatment in an adjacent bay; and every minor part of the vehicle—magneto, carburetor, radiator, steering gear, even the siren—is repaired by men who do nothing else, and know the last word in tuning up their respective units.

In due course of time the units travel, by a telfer or overhead crane, to the bay where the original frame stands, repaired and ready to receive them. In the case of standardized vehicles, every unit drops into its place without interference or loss of time. Where a conglomerate mass of different types of vehicles is to be repaired, there is naturally a tremendous slow-down in the rate of repair.

The amount of time required to take a truck to pieces completely and reassemble it, substituting already repaired units in case some particular part of the truck would otherwise delay re-erection, is approximately 4 working days.

Thus, with 120 stalls fully occupied, there should come out of the factory at least 30 completely rebuilt jobs daily, working one shift. Where the kind of repairs is less serious than completely rebuilding, the number would be proportionately increased. In ordinary work the shop would normally probably handle 50 or 60 jobs per day, but under pressure and with double shifts the number could be increased to 100 jobs, of which about 50 would be complete overhauls.

Thus it is seen that this shop is really a tremendous manufacturing institution, a specialized factory devoted to doing that kind of repairing which the operation of a large fleet of motor vehicles requires. The experiences of Mexico and France have taught the Army that maintenance is the key to success. A truck literally eats parts, as a mule eats hay and oats.

The personnel of the shop required is 55 officers and 1402 men. As a matter of practice the personnel may be more numerous, as it has been necessary to have a considerable number of men in training.

The warehouse buildings, 800 by 200 ft., like the other factory structures, are composed of steel, glass and concrete. The buildings are divided into sections, one section containing those spare parts for domestic use and the other those for overseas duty.

#### Crate 22 Trucks an Hour

The most remarkable feature of the plant is the crating department, including complete carpenter shops which manufacture the crates from raw lumber materials, making them in six pieces. A huge electrical traveling crane picks up the floor of the crate and deposits it on one of the 22 roller ways in the crating room, which is 800 by 200 ft.

This room is so constructed that it contains 22 ways for 22 trucks which enter through individual rolling doors along one wall on their own power, standing before the way along the wall. Two other electric cranes operate in addition to the crane that carries in the crate.

As quickly as the truck is run through the door and before its way the crew of mechanics start their work of disassembling and laying the parts in their proper position on the floor of the crate, which is conveniently arranged on the roller ways directly in front of the truck.

The body is loosened, lifted and whirled away to a distant corner of the shop by a crane, where it is torn down and crated in a flat package. An electrical traveling crane is operated above each way and picks off the heavier pieces of the truck and deposits them on the crate floor. The truck is completely disassembled until nothing is left but the frame containing the engine, and all of the parts are so conveniently distributed over the floor of the crate that the frame and engine can be laid on top compactly, and over them are placed the wheels. When the truck is completely disassembled and crated a third crane picks it up and carries it to the far end of the building through a huge door and into the waiting freight cars. The complete operation of running in a truck, disassembling, crating and loading occupies 1 hour and 35 minutes.

#### Crating Time Cut Three-Fourths

The truck completely crated consumes 370 cu. ft. of space. It is said that the crating operation is done in one-fourth of the time formerly used by motor truck makers, and that

the crate, which is 18 ft. long, 40 in. high and 40 in. wide, is one-fourth as large as the motor truck crates used by the manufacturers, and which occupy 1200 cu. ft.

All of the automobile truck and passenger car makers, it was stated, are sending their representatives to learn this crating method. Prior to closing the crate, all parts are painted with a solution of vaseline and lubricating oil, part of this operation being performed by a spray and the remainder with pail and brush.

The carpenter shop has turned out an average of more than 100 crates daily. It can manufacture many more than this, but is limited by the consumption of the crating room. The crate shop is an absolutely unique institution and cost \$500,000. It was so designed that following the war, when crating is no longer necessary, the building and machinery can be used for body building and body repairing, and it will use the complete camp outfit, making one repair shop for repair and construction of chassis and the other for construction and repair of wooden bodies.

Camp Holabird, which is exclusively a motor transport base, will be the distributing point of motor trucks for the United States Army for all territories. It is planned as a permanent institution. It is responsible for the maintenance and repair of all Army motor vehicles in the United States, which include 40,000 trucks, 10,000 passenger cars, 15,000 motorcycles and bicycles and 6000 ambulances. All heavy repairs, reconstruction and salvage are taken care of by the repair shop unit. Only minor repairs are made by local repair shops or commercial garages. The motor trucks are sent to the overhaul shop only when major repairs are to be made, which local service stations are unable to handle. About 40 per cent of the vehicles coming to the shop require rebuilding.

The need for so complicated a repair and construction institution as Camp Holabird was caused by the use of more than 100 types of vehicles by the American Expeditionary Forces.

Besides the mechanical work, Camp Holabird is also a very large center for motor transport activities. It is the headquarters for the district motor transport officer who administers the entire northeastern district of the county. It is an organization park at which motor transport personnel is received, organized, trained and equipped. It is a supply depot for motor transportation. It is expected that the camp will continue during peace times in the training of men for motor transport, and it will serve in the future as a necessary storehouse for motor repair parts and supplies for the Army in times of peace. Its fireproof warehouses are capable of storing millions of dollars' worth of parts and tools.

The camp has not neglected the social aspect. It has 7000 soldiers housed in cantonments which constitute a veritable city, and which has been supplied with pure water, sewerage, electric lights, streets, sidewalks, hospitals, bakeries, kitchens, bathing facilities, and lastly a huge auditorium where the men are entertained and instructed. There are also ball grounds, recreation grounds and the Y. M. C. A. hut. The camp has a band of 40 pieces which leads the men to their meals and also affords considerable entertainment in hours of relaxation.

Fokker Triplane



This is the type of machine flown by the late Captain von Richthofen

# The Use of Measuring Wires

## Permits of Accurately Determining the Effective Diameter of Screw Threads— Much Used in Inspecting Plug Thread Gages—Precautions Necessary in the Use of the Wires

FOR some time extensive use has been made of measuring wires for making accurate measurements of the effective diameters of screw threads, and wires for this purpose, which necessarily must be very accurate in dimensions and straight, are now on the market. The effective diameter of a screw thread is the length of a line through and perpendicular to the screw axis measured between the points where the line cuts the slopes of the thread. The method of thus measuring the diameter and the principles involved were discussed in an A. S. M. E. paper by H. L. Van Keuren of the Bureau of Standards.

In measuring screws by the three-wire method, cylinders accurately ground and lapped to size and diameter are used. These wires or cylinders are inserted in the thread two on one side and one on the other. A measurement is then made directly over the tops of the wires by means of an outside micrometer or other suitable measuring device. From this measurement and from the size of the wire the effective diameter of the screw can be computed.

### Choice of Wires

In the choice of wires any size may be selected which will permit the wires to rest on the flanks of the thread and still project above the top of the thread. It is best, however, to choose wires of such a size that they touch the sides of the thread half-way down, or, in other words, at the mid-slope. In this case errors in the included angle of the thread have no effect on the measurement of an effective diameter. Moreover, the time spent in computations is greatly reduced. The best sizes of wire for various threads may be computed from the following approximate formula:

$$G = \frac{P}{2} \sec a$$

where  $G$  = diameter of wire, in.

$P$  = pitch in in.

$a$  =  $\frac{1}{2}$  included thread angle, deg.

For 60-deg. threads this formula reduces to

$$G = 0.5774 \times P$$

The following extracts are taken from specifications recently written by the Bureau of Standards for purchasing wires for measuring thread gages: "The wires used are to be of steel. The working surfaces are to be glass-hard and lapped to a high polish. The working surface should be about one inch in length and the wire should be provided with a suitable handle. The handle should be provided at one end with an eye or hole for the purpose of suspending the wire when measurements are taken. On one side of the handle, which is flattened, there should be marked the pitch for which the wire is to be used as the best-size wire and the diameter of the working end of the wire. The working ends of the wires should be round to within 0.00002 in. and they should be straight to 0.00002 in. over any  $\frac{1}{4}$ -in. interval. One set of wires should consist of three wires, which should be of the same diameter to within 0.00005 in. This common diameter should be within 0.0001 in. of the size corresponding to the best-size wire for the pitch with which the wire is to be used."

### Standardization of Wires

Before the wires can be used to measure effective diameters of threads it is necessary to know accurately their diameters. The wires should be standardized in a way which approximates, as nearly as possible, the conditions under which they are used. In order to accomplish this purpose the wires are standardized with a micrometer caliper by measur-

ing the wire when placed over a standard reference disk, the diameter of which is accurately known. The object of measuring the wire over a cylinder is to approximate the condition of pressure which is exerted upon the wire when it is placed in the screw thread. The micrometer to be used for this purpose should be one which has graduations to ten-thousandths of an inch and upon which hundred-thousandths of an inch can be estimated. This can be secured in one of the similar forms of small precision bench micrometers. Care should be taken to make sure that the micrometer measuring faces are sufficiently parallel. If the wires differ appreciably in diameter, the two having diameters most nearly equal should be used on one side of the thread and the other wire should be used on the opposite side. In the computations the mean diameters of the three wires may then be safely used.

### Computation of Effective Diameter

In the computation of the effective diameters of thread gages, if the exact conditions are recognized the formula is quite complicated and the resulting computations are very laborious. The formulæ for computing effective diameters as given in most engineering handbooks involve the use of best-size wire and do not take into account the complications introduced when considering the effects of the helix angle of the thread. These formulæ, as generally given, result in securing an answer which should check with the outside or full diameter of the screw being measured. The effective diameter is not mentioned in these formulæ and this often leads to confusion. Reference will therefore be made here to a simplified formula for 60-deg. threads which results in the direct computation of the effective diameter. This formula is as follows:

$$E = M + \frac{0.8660}{N} - 3G$$

where  $E$  = effective diameter

$M$  = measurement over the wires

$N$  = number of threads per inch

$G$  = diameter of wires.

In the use of this formula the term  $0.8660/N$  may be computed for various pitches and the computations simplified.

The general formula which may be used for any size of wire which will fit in the thread and which takes into account the helix angle of the thread for precision measurements is as follows:

$$E = M + \frac{\cot a}{2N} - G(1 + \sqrt{\csc^2 a + s^2 \cot^2 a})$$

where  $a$  =  $\frac{1}{2}$  the included angle of thread

$G$  = diameter of the wires

$s$  = tangent of the helix angle.

The above formula involves squares and a square root of functions and therefore is awkward for making computations, and the following formula, which is an expanded approximation but which is accurate to better than one hundred-thousandths of an inch, is more convenient:

$$E = M + \frac{\cot a}{2N} - G(1 + \csc a + \frac{s^2}{2} \cos a \cot a)$$

This formula is a general approximation which may be used for U. S. form 60-deg. threads, Whitworth 55-deg. threads, Lowenherz 53-deg. 8-min. threads, and for other threads of a similar nature. It should be noted that the error due to

(Continued on page 1075)

# "The Automobile After the War"

## Views and Suggestions of Georges Cote to Automobile Manufacturers of France as to Means and Methods of Meeting Reconstruction Problems and Foreign Competition

Reviewed by N. S. Diamant, Harrison Radiator Corporation, Lockport, N. Y.

**T**HE vital and all important problems of reconstruction have received the attention of engineers and industrial leaders in spite of the great and pressing needs of the war. Thus Georges Cote, director general of the Pilain Automobile Company of Lyons and Paris, in a book\* bearing the above title considers the problems of reconstruction and those having to do with successful competition by French automobile manufacturers with foreign makers.

In an introductory way attention is first called by Mr. Cote to the situation that will arise immediately after the declaration of peace; although the market will be flooded to a certain extent with military cars, the unfavorable reaction of this on the market condition will probably be limited, and, in any case, the situation will have to be met once only.

The real danger he considers to be the growth of American competition, which is already fairly large. Since 1913 the American danger began to be felt, and energetic measures of protection were requested by French manufacturers, in view of the obvious inclination of the public to become converted to American ideas, although the majority continued to patronize the sporty and aesthetic French cars. However, the war, with its great demands on equipment and production, made necessary the purchase and introduction of immense quantities of American products, and the public thus had occasion to appreciate American designs which for so long had been adversely criticised. The public judged them from a utilitarian point of view.

### War Has Popularized the Automobile

The transportation facilities that will be required in the invaded territories which have so savagely been ruined, and in the French colonies, can be met only by the assistance of the automobile and the truck. Particularly, when it is remembered that the rolling stock of the railroads has deteriorated so much in meeting war conditions. Finally, the war seems to have popularized the automobile so much that we can say the latter has become part of our life and customs.

Thus the manufacturers of France should not count so much on "universal reputation" to produce the best quality car as they have done in the past, but rather give to the purchaser a reasonable-priced, useful car.

According to Mr. Cote, the "dominant characteristics" of the utility car are the following: 1. It must be easy to drive and relatively free from deterioration of the most important parts even in the hands of the inexperienced driver. 2. Its operating cost must be low. 3. It must be capable of use even on very bad roads. 4. The price of the car must be as low as possible.

The author calls attention to the dominant characteristics which made the success of the Ford car possible, and thinks that these are its ease of control and minimum deterioration of the engine even in the hands of an inexperienced driver. In this connection he thinks that the present day common method of speed changing is one of the glaring defects of cars, inasmuch as it involves a rather skillful combination and manipulation of a hand lever with a pedal. Unless this is properly done the machine suffers considerably and some of the most essential parts rapidly deteriorate. With reference to the above, the question of two or three speeds is raised, and the opinion expressed that unless the car is light in weight and the engine fairly powerful, which is the case with the Ford, two speeds can hardly be considered sufficient.

### Two Devices for Changing Speed

In this connection Mr. Cote briefly describes two patented devices for changing speed, one of which is electromagnetic, and he calls special attention to the great desirability of using the engine itself not only for propelling purposes, but for braking as well. He calls attention to what he considers the most wonderful experience he has had with the above electromagnetic system, with which, while a car was going down hill, the control lever was placed on "reverse" and without the use of brakes at all the car was slowly stopped and reversed without the least shock or jar. Mr. Cote simply gives these general ideas and leaves it to the specialists to go into these matters deeply and carefully.

The author emphasizes the importance of a "flexible" car and cites American practice as a fine example, which French manufacturers could well afford to follow, and if necessary pay less attention to the question of efficiency, which is considered so important on account of the high cost of gasoline in France.

Attention is called to the two-cycle engine, and the question is raised whether it may not be possible to improve its efficiency. Considering the susceptibility of this engine to great simplification and cheap construction, it is desirable to undertake research along this line.

### Front Axle Drive

Another idea emphasized by the author is that of front drive, which is very desirable for light-weight cars. The front drive is very rational and simplifies greatly the mechanical arrangement of the chassis. This arrangement makes possible better distribution of weight, allowing the front axle to carry more dead weight and relieve the rear axle, which carries most of the useful weight. Front drive also makes possible the advantage of front braking, which is preferable since the front wheels have a greater coefficient of adhesion. Finally, one might add the advantage of having a closed, quiet car with the passengers in the rear and the engine with its accessories in front.

\*"The Automobile After the War." by Georges Cote, Director General of the Société des Automobiles Pilain (Lyons-Paris), 125 pp. published and copyrighted by H. Dunod & E. Pinat, 47 Quai des Grands-Augustins, Paris, 1918.



The author continues and calls attention to the desirability of increasing the distance between the ground and the chassis and of the judicious reduction of weight, and he believes that an ordinary four passenger automobile should not weigh more than 1800 to 1600 pounds (or 600 to 700 kilograms).

#### Production

The author in this connection calls attention to the handicap of the manufacturers who had to follow "the whims of fashion." He thinks it would be very much better if a given company after incorporating all the qualities which answer the real needs of the majority of its customers would be able to put its production on an all the year round basis, and thus increase and facilitate its output greatly.

#### Standardization

On the basis of past experience he advocates the classification and standardization of self-propelled vehicles and suggests the following:

- Class 1. "Popular Car" selling at lowest possible price, and corresponding to the "Ford."
- Class 2. Semi luxe, which would correspond to the present day 12-hp. (French) cars.
- Class 3. The car "de luxe," which should be built in three types, namely, for city, tourist and sport purposes.
- Class 4. A small rapid delivery truck good for useful loads of about 2600 pounds or 1200 kilos.
- Class 5. A heavy truck which can be built in capacities of two and four metric tons (4400-8800 pounds).

Standardization of this kind would benefit the industry enormously.

#### Possible Forms of Co-operation

Mr. Cote suggests and advises forms of co-operation between different manufacturers, by either organizing a syndicate or merging a number of firms. He suggests that the different firms in the industry decide to specialize in one of the classifications already given and form a strong association, the returns of each being made proportional to the capital invested. He favors an independent association, and not the absorption of smaller companies by larger ones.

The second form suggested is that of a "syndicate," among the advantages of which would be the distribution from a central organization of all the raw materials and tools which are to be used by the different members. This would result in considerable economy. Furthermore, besides a central purchasing office the syndicate might have some kind of a central office for inventions to which all inventors could submit any designs and plans of interest to the automobile industry. A special organization of this kind would greatly facilitate the testing of new schemes, and demonstrate their practical feasibility. The author thinks a "syndicate" would present all the advantages of "combination," conserving at the same time the independence of each member, whereas "fusion and merging," if generalized might pave the way to a "trust," and thus would become incompatible with democratic and individualistic ideas.

#### Labor

Under this heading the author calls attention to the generalization of labor saving devices and the increasing substitution of machines for men. In this connection he approves and speaks highly of American methods of specialization and selection.

The following interesting figures are given to show the great possibilities of expansion of the automobile trade

in France and its colonies. The increase of automobiles, including trucks, in France was as follows:

7,183 vehicles from 1908 to 1909
8,900 vehicles from 1909 to 1910
10,540 vehicles from 1910 to 1911
12,562 vehicles from 1911 to 1912

In 1914 the total number of automobiles, including 6000 trucks, was about 100,000 and during the war there have been added 35,000 trucks and 10,000 small trucks, making a total of 145,000 for a population of 39,000,600; that is, one automobile for every 273 people. Without suggesting the possibility of equalling the figure reached in the United States, which according to 1916 statistics is one automobile for every 29 people, it would seem that there are great possibilities of increasing the number of automobiles in France. Further, considering the whole of Europe in order that it may have the same ratio of automobiles to population as that of the United States, the total number of automobiles of all types should be 15,583,000, instead of 437,600, representing an increase by 15,145,400. Going a step further and considering Africa, Asia and Australia, it will be found that on the same basis the total number of vehicles ought to be 56,000,000 instead of 4,500,000.

It is idle to base any economic studies on the latter figures, since it will not be possible for the world and even for Europe to have the same proportion of cars to population as America. However, the above figures do show that there is a great field which justifies the making of a special definite effort to increase the production. The logical consequence of increased production will be a complete revision of present commercial methods.

#### Actual Sales Methods

According to these the buyer gave his orders at not particularly attractive prices either to an agent or directly to the manufacturer, who in general could not fill this order immediately, but placed him on an indefinite waiting list. It was only the large companies which had "direct representatives" and service stations that could properly look after their customers. In short, the old methods did not offer any facilities to the buyer. The prices were rather high; also many cars were sold to men who owned one, and thus the manufacturers or agents had to take an old car back at their own risk. Further, the purchaser, being also a seller, became more exacting and hard to please. Thus the chief problem is to force automobiles among new buyers. To accomplish this two things are necessary—a reduction in price of all kinds of cars except the strictly de luxe type, and the provision of every possible service facility to the purchaser.

#### Price Reduction

Reference to this matter has been made before and considerable emphasis laid upon it. According to Mr. Cote, the selling price should differ as little as possible from the actual cost of production. The difference between these two items represents general sales expenses, agent's commission and the net profit of the manufacturer. The numerous facilities that ought to be given to the customer should be charged to the general item of sales and be given considerable importance; this situation should be accepted with all its consequences, and it will be found very profitable both to the manufacturer and to the agent.

#### Facilities to Be Offered to the Purchaser

According to the above the commission will represent a fair profit and the cost of efforts to attract prospective buyers and retain them. This can be done by means of  
(Continued on page 1075)

# Cultivating Japanese Automotive Field

## PART V

### Domestic Manufacture of Tires—Opportunities for American Tire Makers— Accessory Market Is Limited—Suggestions to American Manufacturers—Conditions Not Favorable to Tractors

By Tom O. Jones\*

AT the present time there is no established preference respecting tire types in Japan. American cars imported are adapted to both clincher and straight-side construction. Since two of the largest American tire companies are now represented in the country, one by a branch house and the other by a distributor, practically any size tire can be secured in either hard or soft bead.

The bulk of the replacement business in Japan falls to the Dunlop Co. This is a separate corporation with both British and Japanese capital interested, but is allied with the British company of the same name. A large factory is maintained at Kobe, where the production is confined entirely to soft-bead tires.

This factory, which has been in operation for several years, manufactures not only tires but many other lines of rubber goods. Its business is not limited to Japan, but extends to various parts of the Far East, practically all the eastern business of the British parent company being turned over to the Japanese factory, so that its trade reaches as far south as Singapore. The factory is well equipped and according to the management, the workers are easily trained and soon become highly proficient in the work. Social work is carried on for the employees, with separate departments for men and women, in which there are lunch rooms, libraries, and games.

In value, the tire business done for jinrikishas exceeds that for motor cars. This can readily be understood when one considers the great number of jinrikishas that are used, not only in Japan and China but also in the Straits Settlements, and practically all of these jinrikishas are equipped with pneumatic tires.

Within the past year one of the largest American rubber companies has completed a plan of organization whereby it will operate a factory in Japan. A foreign organization entering the Japanese field will be materially assisted by having Japanese capital in-

terested, and this is the plan adopted by the first American company to enter rubber manufacture in the Empire, a close alliance having been established with a large manufacturing concern. In the beginning practically all the manufacture will be mechanical rubber goods. When the plan was consummated last fall it was hardly expected that manufacture of tires could be undertaken in less than four or five years.

There are several Japanese rubber companies that import raw material from the rubber plantations of Malasia. In fact, Japanese capital controls a number of large plantations. But these companies all operate on a small scale, and for the present at least will have very little influence on the volume of American trade.

#### Selling Agencies for Tires

It is advisable for an American tire company entering this field to do business through one house, unless the company feels disposed to open its own offices and send its own representative to the

field. This latter proposition doubtless would have small appeal, because of the expense involved in conducting the organization and introducing the lines for the very small volume of business which can be expected when the company is only to get its share of the tire sales for less than 3000 automobiles. Japanese dealers handling tires are accustomed to the British plan of operation, that is, paying for the tires as they are sold and having the stock kept up by the tire companies.

Below is a table of prices prevailing in Japan last fall for one of the standard American tires, the quotations being for clincher-type fabric casings and tubes (yen=\$0.498):

Size in Inches	Smooth or Nonskid. Yen	Tube. Yen	Size in Inches	Smooth or Nonskid. Yen	Tube. Yen
30 by 3.....	47.50	12.20	35 by 4.....	91.00	18.50
30 by 3½.....	63.20	14.20	36 by 4.....	94.00	18.75
31 by 3½.....	65.50	15.10	33 by 4½.....	112.00	20.45
32 by 3½.....	68.00	15.30	34 by 4½.....	115.00	21.30
34 by 3½.....	72.00	16.20	35 by 4½.....	118.00	22.20
31 by 4.....	80.50	16.75	36 by 4½.....	122.00	23.00
33 by 4.....	86.00	17.60	34 by 5.....	140.00	27.00
34 by 4.....	89.00	17.90	35 by 5.....	146.00	28.00

\*EDITOR'S NOTE—Mr. Jones was formerly with the J. B. Crockett Co., New York, and was given a special appointment by the Bureau of Foreign and Domestic Commerce to investigate automotive conditions in Japan, China, the Philippines and Hawaii. This story is taken from the advance proof sheets of Mr. Jones' report to his department.

The market for additional equipment or attachments for cars shipped from America is a small one. As a general rule, the Japanese buyer is disposed to take the car as it comes without extra equipment. Americans in the automobile business generally agree that the fewer equipment features the more disposed the Japanese are to favorably consider the car. This, of course, is not meant to exclude the usual standard equipment of a car, such as speedometer, windshield, top, etc. Shock absorbers, for instance, find little or no market. Surface conditions of the roads are generally good, and the ordinary spring equipment, with perhaps an extra leaf inserted, gives satisfactory riding comfort.

An accessory demanded in Japan, but not usually found on the American car at the present time, is a bulb horn. This is required by the police regulations. Such horns are now being made in quantities in Japan to meet the demand, as are door fittings, foot and robe rails, and other features which generally enter into the home-built closed bodies.

Accessories are generally handled by the firms which have car representations. Just how little demand there is, and how little effort is expended on the sale of accessories, was revealed one afternoon in a call on one of the largest dealers in Tokyo. About half a store front was given up to the accessory department. Articles were displayed in the windows and in cases around the room, but to get into the salesroom it was necessary to obtain the key from the manager. In other words, there was not enough business in this line to warrant keeping a salesman in that room. The stock carried was similar to that usually found in a small garage in an American city, and included only essential parts, such as spark plugs, carbureters, bulb horns, and acetylene gas generators.

#### Some Suggestions to American Manufacturers

One accessory which might be introduced in Japan is a light dimmer or nonglare lens. At the present time there are no regulations for lights, either in city or country. For the large variety of American extras there is practically no market in Japan, certainly not enough to warrant getting after the business in any way except by correspondence.

In many ways Japanese dealers, at least large firms, are progressive. As an instance of this the action of one of the companies during the season of 1917 is worthy of mention. This firm, which has exclusive selling rights for one of the best-known low-priced American cars, foresaw the possibility of an absolute embargo against the export of American cars after the United States entered the war, or if not absolute prohibition at least insurmountable obstacles that would make shipping even more difficult than it had been up to that time. Accordingly orders were placed for hundreds of cars to be shipped as promptly as possible. These began to arrive in July and followed in quantities for two or three months. Shipping conditions continued to grow worse, but this dealer had on hand plenty of cars for immediate delivery at a time when cars were greatly desired in Japan. After all, the way to get business in Japan is to be able to make immediate deliveries, and this dealer had shown wisdom in following the course he did.

Another company, having decided to take the representation of American cars as a separate division of its established business, ordered 39 cars of different makes by cable as its first samples and devoted practically all of the two lower floors of an extensive

building in the very best business portion of Tokyo to the automobile sales. At the suggestion of the writer, this company inaugurated the business with some advertising that has had very little trial in Japan, namely, the mailing of personal announcements. As the firm had been in business for several years and had a large number of names on its books, and the family connections of the principal stockholders were extensive, a good mailing list was available. According to the sales manager of the firm, results were highly satisfactory, numerous prospective customers being secured even before the sample cars had arrived.

#### Should Avoid Demanding Too Much Business

The American manufacturer should studiously avoid, in his first correspondence with a Japanese dealer, to scare the prospective distributor at the very start by demanding too much business the first year. As an instance in point, a manufacturer, in reply to a dealer's inquiry, said that he believed the Japanese market should be good for 100 cars the first year. The Japanese dealer immediately gained the impression that the manufacturer was trying to make him guarantee to take 100 cars during his first season. He was new to the automobile business and was not in position to guarantee any such amount of business. The writer, feeling that this would be a good connection for the American manufacturer, took it upon himself to assure the dealer that the company would not be arbitrary on this point, and on the strength of this assurance the dealer cabled an order for six sample cars. In less than two months another order was sent for 24 cars, and the Japanese firm seemed to be well on the way to take the suggested number of cars during the first year, but the one suggestion in the first letter almost halted the deal. No doubt the matter could have been straightened out by mail, but it would have meant the delay of three months in getting the business started.

It is well, therefore, in first letters to disregard any suggestions as to the number of cars that should be taken, leaving this with the dealer, or if the question is brought up, care should be taken to let him know that he is not required to take a large number of cars. To a certain extent this may seem contrary to American sales methods, but its wisdom can be found in the fact that the company which is now getting more business in Japan than any other American concern specified a very small number of cars in its first contract and continued with this dealer even though this specified number was not taken the first year.

#### Must Guard Against Conflicting Lines

Another point which should have the careful attention of every export manager is the matter of conflicting lines. There is one company in Japan which for several years has had the sole selling rights for a low-priced American car. Within the past year it has taken on another line which is in direct competition, there being hardly \$100 difference in the price of the two cars. One cannot help but feel that the first car is not getting the representation it should. The manufacturer should know just what cars are being handled by an agent and he should refuse to make a contract when a conflicting line is handled. There is no telling when or on what line "sidetracking" may take place.

A determined effort should be made to live up to all promises made to the dealer. Rash promises are more often made by traveling representatives than in correspondence from the factory, for the traveler is desirous of getting business and is likely to make promises that cannot be fulfilled. The chief complaint along



this line is in the matter of deliveries. Delays, of course, are often caused by circumstances over which neither the traveling man nor the manufacturer have control, but the dealer loses sight of this altogether, and simply feels that he has been promised something which the company has not delivered. The same applies to promises on services, catalogs, and other printed matter. Delays result in a feeling on the part of the dealer that is not to the best interests of the manufacturer.

### Better Packing Suggested

Dealers in Japan are generally satisfied with the cars that the American manufacturers are sending them and with the financial terms. There is little protest on the packing, but there is still room for improvement along this line. Cases have arrived badly broken and cars damaged, but there has been vast improvement in packing during the last few years. Heavy packing cases are well worth the extra cost. During the summer of 1917 a shipment of cars, the list price of which in America is more than \$1,500, was received in Yokohama. Upon opening these the enamel work on fenders and hood was found to be badly cracked. It looked very much as though these parts had been fitted while still "green." There are instances in which packing paper has stuck to and ruined the finish of the bodies. Certainly the cars should be given time to dry before they are boxed. Instances of this kind, however, are rare; they can easily be guarded against and are well worthy of attention by the manufacturer. When cars are boxed partially disassembled, great care should be exercised to have all parts included in the case.

A subject that has been written up so often that it seems a stereotype of every article on export trade is the matter of postage. It would seem by this time that foreign mail would have at least the necessary amount of stamps to carry it through, but a number of instances can be cited where this is not the case. One dealer, tired of paying excess postage time after time, adopted the policy of returning insufficiently stamped mail. Many important letters were sent back to the company, and there was much delay in the business. A card calling attention to this matter should have a place with "Do it now" and other placards over the mailing desk.

Improvement could be made in the form of the manufacturer's contracts. Contracts made for Japan and foreign trade in general should be made to cover every point, of course, but they could be made somewhat more brief. Most of them are formidable looking documents and contain a lot of conditions that never are and cannot be fulfilled.

During the past year considerable business has been built up in importing used cars into Japan. Honolulu dealers seem to have been the first to discover this plan of ridding their own territory of surplus second-hand cars. According to the Honolulu dealers who are engaged in this business, they have made efforts to ship out only cars that were in fair mechanical condition, endeavoring thereby to develop the trade and clear the field for new cars. Usually these cars are shipped on a blanket order which specifies a certain number of used cars totaling a certain value. That somebody is simply trying to unload junk is evident by some of the vehicles that can be seen on the docks at Yokohama. Honolulu dealers claim that these cars are sent from the Pacific coast. It is certain that unless there is a change this newly discovered outlet for used cars is going to be cut off even before it is fairly started, a circumstance which may be looked upon by the American manufacturer as either favorable or unfavorable.

### Use of Tractors Not Practicable

Although the available agricultural land in Japan is intensively cultivated and farming has a big part in the country's industry, there is absolutely no market for farm tractors worthy of consideration. Most of the landholders have small plots, probably more than 50 per cent of the farms being less than 2½ acres in extent.

Rice is of course the principal crop grown, and the manner of preparing the land is decidedly against the use of tractors. The fields are from 60 to 100 ft. square and terraced one plot above another, so that the water used in irrigating may drain from each terrace to the one lower. Moreover, the wages of farm laborers, if help outside the owner's family is required, is so low that the cost of gasoline at 45 cents or more per gallon would prohibit the use of tractors.

Road tractors and trailers also can be given little consideration. Roads are narrow and turns sharp, making almost impossible the handling of road trains.

## Refinements in Design to Facilitate Maintenance

By J. Willard Lord

**I**N the beginning of the industry the designing engineer dominated production engineering—this because every effort was made to build a car that would run. Then production engineering, because of competition, became more and more powerful and slowed up the efforts of the designing engineer to improve the product; which increased production and lowered selling prices.

There is, however, a third element of engineering. On any car built to-day there are one or more parts difficult to take apart because there never was any provision made to apply a puller or heavy wrench or other device which would make it possible to tear down in about the same time as to rebuild. We all know of jobs that can be assembled in twenty minutes but take four hours to get them apart when replacement is necessary, because no adequate means are provided or else the job is buried in the depths of the car, requiring considerable tearing down to get to it.

The neglect of this maintenance element helps run up repair time and charges and makes very difficult the maintenance and service problems, the satisfactory solution of

which are so essential to the sales organization and the number of sales made.

In other words, there are three elements of engineering that should bear on the product: 1, Design; 2, production; 3, maintenance.

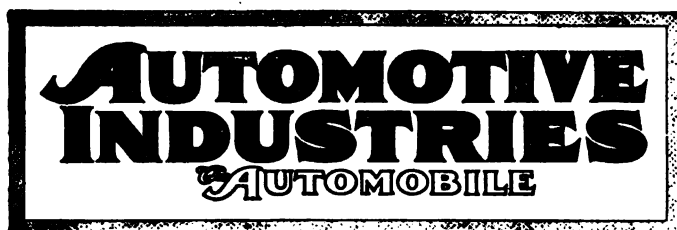
The third item has not received sufficient attention and thought at headquarters or the factories, maintenance and service often being left to selling agents who are essentially salesmen and not engineers and mechanics.

When designing the "Post War Car" I hope to see

1. *Refinements in engineering*—A lighter, more staunch car, more efficient, roomier and more comfortable.

2. *Refinements in production*—More readily produced and easier to build accurately and hold to close limits. Good design and accuracy mean long life.

3. *Refinements in maintenance*—Adequate provision made to disassemble parts quickly when necessary, provision made to apply various kinds of pullers, wrenches, etc.; due consideration given to tools necessary to make good, quick and accurate repairs.



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## Readjustment

WE are now passing through the period of readjustment. When we meet friends we are wont to ask them what they think of conditions, and what this or that concern, which was heavily engaged in war work, is going to do. In some cases definite conclusions can be drawn while in others this is impossible.

One important fact, however, stands out very plainly, and that is that the period of readjustment is going to be short. It is like a yacht race. Before the starting gun is fired the yachts can only jockey about behind the starting line, but as soon as the starting signal is given they can pass the line and begin the race. Industry is now in the jockeying period. The clever skipper is the one who will put his boat across the line to a flying start, and he is the one who will be just that much ahead when the commercial race begins again.

The war has stimulated business competition. The principal reason for this is that it has reduced prac-

tically all concerns in any given line of business to the same level. Old business connections have been done away with in a great many instances, and the office of the purchasing agent will again be the mecca for thousands of traveling salesmen who have busied themselves in the past few months answering letters begging for deliveries on materials ordered months before or turning down orders for future delivery. In other words, business is getting back to a normal state, and it is getting back fast.

The period of readjustment is going to be short, yet it is going to take a measurable length of time. It is easier to tear a house down than it is to build it up, and the same material cannot be used. It is easier to re-organize a business for war with the Government back of you with all the money you need than it is to get back to peace times. The jockeying time will be very short—and then for the commercial race!

## Anti-Friction Crankshaft Bearings

ALTHOUGH spasmodic attempts have been made in the past to fit anti-friction bearings to engine crankshafts, the practice has never gained much ground. These bearings are of the greatest advantage on high-speed shafts, and when even the axles of farm tractors are mounted on roller bearings it seems strange that their use on the crankshafts of high-speed engines should not have become popularized.

It is, of course, the general opinion that anti-friction bearings are used because they reduce friction and thus prevent waste of power. This certainly is one of the reasons why they are preferred to plain bearings in many classes of work. But it is to be doubted that they would ever have attained their great popularity in the automotive field if it hadn't been for the fact that they require practically no attention. Just a slight amount of oil applied at long intervals, sufficient to maintain a film over the bright metal surfaces and protect them from rust is all that is required. A plain bearing, on the other hand, must be constantly kept well lubricated or it will soon wear out and give trouble. Therefore, where it is difficult to insure a constant supply of oil to the bearing it is advantageous to use an anti-friction bearing which does not need it.

In an automobile engine having a completely closed crankcase, and where the lubrication of the cylinders is effected by means of the splash or spray of oil in the case, the lubrication of the crankshaft bearings is easily taken care of. The ordinary circulating splash system is simplicity itself, and even if the bearings required no lubrication, all of its elements would have to be provided to take care of cylinder lubrication. Therefore, the use of ball bearings on the crankshaft would not reduce the amount of attention that must be given to crankcase lubrication.

Another reason why anti-friction bearings are not used is the difficulties connected with mounting them on the crankpins and intermediate journals. The

bearings must either be stripped over the crank arms, which necessitates the use of bearings of very large size, together with split filling rings or bushings, or the crankshaft must be built up. Both of these constructions are rather expensive. At the present time ball or roller bearings are used only on engines with only one or two main bearings, in which the mounting difficulty does not arise.

In single and double-cylinder engines roller bearings are occasionally used on the crankpins. Where the crankpin is a separate piece it can readily be hardened and ground and the rolls can bear directly on it, so that the outside diameter of the bearing is not appreciably increased. But if a ball or roller bearing had to be stripped over the crank arms it would have to be of large size, which not only would increase the necessary size of the crankcase and add to its weight, but also add to the centrifugal mass, thus increasing the bearing loads.

It is thus seen that the fitting of anti-friction bearings to multi-throw crankshafts is hedged about with difficulties, and though the reduction in frictional losses which their use would insure would be desirable, the consensus of opinion among automotive engineers is that it does not warrant the expense involved.

## Double vs. Single Valves

A GOOD deal of valuable research work has been done at scientific laboratories in this country in regard to problems arising in connection with war work. While the war lasted it would have been poor policy to publish the results obtained, but now that it is over we may expect to see considerable material of value to the engineering fraternity released.

In another part of this issue we reprint a part of a report on an investigation of the subject of air flow through poppet valves. This problem arises in the design of explosion engines, and especially of aircraft engines, when the relative advantages of a single large diameter and two smaller valves are considered. So far we have considered the flow to be proportional, under a given head, to the actual area of valve opening. It has generally been admitted that a very narrow annular opening, such as obtained with a large diameter and small lift, would not be quite equal to an opening of equal area obtained by the use of a smaller diameter valve of greater lift, but just how much effect the form of the opening had on the flow has been conjectural.

While the investigation referred to was made under the condition of steady flow, instead of under interrupted flow as obtains in a combustion engine, we are fairly safe in assuming that the results obtained are indicative of what may be expected in an engine. They have definitely shown that a relatively high lift is a great aid in obtaining high volumetric efficiency. Heretofore it was generally assumed that a lift equal to one-quarter the valve port bore, giving a valve opening equal to the valve port area, did not restrict the flow of air in any way. The investigation showed that with a lift equal to one-

quarter the valve diameter the flow is less than 67 per cent of what it would be if the valve were entirely removed, and with a lift equal to one-half the diameter it is equal to between 80 and 90 per cent of the flow through the unobstructed port. Evidently it requires an infinite lift to give a flow equal to that through the unobstructed port and with any moderate lift there is a reduction of the flow.

A relation that has been definitely established is that with the lift proportional to the diameter the flow through a valve is proportional to the square of the diameter, or, in other words, to the area of the valve port. On the other hand, with a constant lift not exceeding one-quarter the port diameter, the flow varies only about as the  $4/3$  power of the port diameter. It is under this condition, that is if the lift can be maintained constant, that double valves are of the greatest advantage over a single valve.

## War Truck Repair Shops

THE war has resulted in the building of a number of immense automobile repair plants, and now that hostilities have ceased some of these will be of very little use. This seems to apply particularly to a partly completed repair works at Slough in England. Most of the plants at which the British transport vehicles were kept in repair were located not so very far behind the lines in France, but last spring when the Germans made their great drive and advanced to within a few miles of Amiens, these repair depots were seriously threatened, and to provide for all possibilities it was decided to erect a large plant in England. An idea of the immensity of the proposed plant may be gained when it is stated that the plans called for an area of no less than 15 acres under roof.

When the tide of the German advance was turned and it became apparent that the plant would not really be required, its erection became a matter of some concern to British automobile and truck manufacturers, and their anxieties are voiced in an article in a leading engineering paper. Should the Government complete the works about the only use it would have for them, now that the war is over, would be in the repair of the thousands of war-worn military trucks and automobiles. The automobile manufacturers, on the other hand, feel that during the early reconstruction period they cannot immediately get back to 100 per cent peace time production, and if they could secure the business of rebuilding or overhauling the war trucks it would serve to help tide them over this period of readjustment. Therefore they are urging that the Slough project should be dropped.

GREAT inroads have been made on the timber supplies of the leading European countries during the past four years and as a result wood construction will undoubtedly be more and more replaced by metal construction. In Great Britain about one-half of the forests were cut down during the war.





# Latest News of the

## England Sees Certain Development of Commercial Aviation

Plans Already Being Made for Mail, Express and Passenger Transportation Over Routes from London to Scotland, France, Ireland, Russia, Africa, India and Australia—Problems of Laws Being Considered

By David Beecroft\*

LONDON, Nov. 25—(Special to AUTOMOTIVE INDUSTRIES)—Post-war aircraft activities are taking more definite form since the signing of the armistice and it is now generally conceded that commercial aviation is certain to make very rapid progress.

A report was made some time ago by a committee known as the Civil Aerial Transport Committee, and the presentation of this report to Parliament this week has opened the door for a few of its broader considerations, although the complete report has not yet been published.

The committee has six definite conclusions regarding commercial aviation, which include a business flying speed of 100 m.p.h., stages of 500 miles or thereabouts as the ideal distance for limits of flight, arranging facilities for night flying, and providing of both land and air brakes to meet landing conditions.

The six conclusions of the committee are:

- (1) That for commercial success speed is probably the most material factor.
- (2) That for commercial success the speed needed depends very largely on the conditions of competing methods. Between large centers connected by direct high speed railways, speeds of 100 miles per hour are desirable; but for linking places between which the railway service is slow or interrupted by sea crossings, lower speeds will be found commercially practicable.
- (3) That at present stages of about 500 miles would be the normal limit, but that it will be desirable from the commercial point of view that stages should be as long as possible.
- (4) That it is desirable as speedily as possible to develop the existing facilities for night flying, especially for the carriage of mails.
- (5) That heavy loading is necessary for commercial success, but since this will involve a high landing speed, development of land and air brakes is necessary.
- (6) That in view of certain disadvantages of high landing speed, efforts should be made to keep loading as low as possible consistent with securing a commercial rate of speed, and to provide for aerodromes and landing places possessing the best possible surfaces, and that it may well be hoped that future inventions and improvements in design will enable a lower landing speed to be attained without sacrifice of flying speed.

The door is just opening on the possi-

bilities of commercial aviation, and no one to-day can foresee the widening future that awaits it. Up to the present invention has largely had to do with war development, but from this date forward the needs of peace and commerce will be the spurs to invention.

It is generally recognized that the large capacity planes are to be the leaders in commerce and that the possible field of commercial aviation embraces—

a—An express letter mail which will compete in speed with telegraph service and constitute a new aspect of postal service.

b—Passenger service that will afford very high sustained speeds over long distances, particularly where water routes are included.

c—Carrying of such ordinary merchandise as commercial samples which otherwise would require a long time for transporting.

Undoubtedly the light machines with capacity for one or two passengers will furnish the immediate call for passenger service, and following such service will be the installation of large machines for scheduled service.

The recent performance of the monster Handley-Page carrying forty passengers over the City of London is a suggestion of what may be in store in the near future. Such a machine with its four engines, giving a total of 1400 horsepower and with its wing spread of 137 ft. and a sustained speed of over 100 m.p.h., is indicative of what invention will bring out.

The garaging of such an aerial monster is facilitated by the use of hinged wings which swing back parallel with the fuselage and give a very compact machine.

Innumerable problems are bound to arise with regard to the manifold tasks lying ahead, but already Great Britain has had committees working on them, and while nothing tangible has come out of the committee further than some resolutions, these convey some conception of what must be looked for.

The problem of aerodromes across the length and width of those sections of the country called for by aerial transporta-

tion is one of these. A committee working on this problem has concluded that the following points should be kept in mind with regard to location of aerodromes. Landing grounds should—

- (1) Bear some reference to the direction of the main aerial routes;
  - (2) Be sufficiently far from the centers of cities to be fairly clear of houses in the direction of flight;
  - (3) Be unlikely to be shut in by buildings in the immediate future;
  - (4) Be as far as possible clear of railways, telegraphs, trees, and other obstructions;
  - (5) Be situated on ground as far as possible free from mist or fogs;
  - (6) Be provided with adequate water supply, telephone connections, and good facilities for rail, tram, omnibus and motor traffic with the different districts of the cities to be visited;
  - (7) Be capable of expansion.
- The Second Committee also came to the conclusion that the use of aircraft would be advantageous:
- (1) In the case of mails, by competing with the telegraph service, or by establishing a new type of express letter service;
  - (2) In the case of passengers, by affording rapid transit over long distances, particularly where the journey includes a sea crossing; and
  - (3) By enabling ordinary merchandise, commercial samples, etc., to be carried more rapidly than by any other means.

(Continued on page 1073)

### Postpone S. A. E. Winter Meeting

NEW YORK, Dec. 16—The winter meeting of the Society of Automotive Engineers has been postponed. The new dates are Feb. 4 to 6 instead of Jan. 12 to 14. The Victory Dinner will be held at the Hotel Astor, Feb. 6. The change in dates has been made so that the meetings will be held during the New York automobile show, which is to be held in the Madison Square Garden and the Sixty-ninth Regiment Armory during the first two weeks of February.

### Sales of War Materials

WASHINGTON, Dec. 13—Secretary Baker emphasized yesterday that War Department plans for disposition of surplus stocks of raw materials contemplate the absorption of these stocks by the ordinary peace-time industries of the country in such a way as will prevent economic disturbance. In letting go of its considerable holdings of copper, steel, lead or similar products, Mr. Baker said, the War Department will consult both the producers and the consumers of these commodities.

### Soldiers in Aviation Service Discharged

WASHINGTON, Dec. 16—Thirteen thousand soldiers in the Division of Military Aeronautics, 30,000 engaged in spruce production, and 7000 in the Tank Corps are among the enlisted men designated for immediate discharge from the army, according to a statement made here to-day by General March.

\*David Beecroft, Directing Editor of AUTOMOTIVE INDUSTRIES, is at present in Europe as one of a party of Business Paper representatives, called to the other side by invitation of the Allied Governments.

# Automotive Industries



## Goodyear Patent Is Not Infringed

**Firestone Does Not Infringe—  
Some Claims Invalid, Others  
Not Infringed**

NEW YORK, Dec. 18—Many of the claims of the Goodyear tire machine patent, over which the Goodyear Tire & Rubber Co. started suit against the Firestone Tire & Rubber Co. in 1914, have been declared invalid, and certain other claims alleged to be infringed are held not infringed. This decision, rendered last week by the United States Circuit Court of Appeals, reverses the opinion of Judge Killets when in May, 1916, he held the patents valid and infringed by Firestone. At that time, and pending final decision, Firestone was placed under a bond of \$225,000.

The decision is an important one, inasmuch as it covers what were alleged to be basic patents covering tire making machinery. Immediately following the earlier decision a very considerable number of companies acknowledged the apparent finality of the opinion and arranged with Goodyear to operate under the patents. These included such well-known makes as United States, Revere, Federal, Fisk, Empire, Howe, Kokomo, Mason, General (Akron), Portage and others.

To quote a Goodyear official, the effect of the decision is that Goodyear is "temporarily licked"; it is intimated that the litigation may be carried further. It is possible for the case to be brought before the Supreme Court of the United States on a writ of certiorari.

The patents in suit were one issued to Seiberling and Stevens on June 14, 1904, No. 762,561, and one issued to Seiberling Nov. 30, 1909, No. 941,962, the latter issued upon application made by the State. In the original decision Judge Killets held valid and infringed claims 1, 2 and 14 of the earlier patents and sixteen claims of the later patent. Under the new decision claim 1 of the Seiberling-Stevens patent was held not infringed and claims 2 and 4 are held invalid for want of invention; claim 14 "does not differ from the second in any respect now material." Of the State patent claim 4 "and all other claims sued upon (except the 15, 17 and perhaps the 11)" are held invalid.

In the original suit the Goodyear company contended that the Seiberling-Stevens machine was the pioneer and that it paved the way for the modern semi-automatic tire making machine; that it was the first machine ever produced to make automobile tires, and that while the majority of the tire makers have been building their tires on machines licensed under the Goodyear patents, a few, among them the Firestone Co.,

refused to conceive the validity of the Goodyear patent. The purpose of the machine was to supplant the uncertain and inefficient results of hand work by stretching the fabric layers and uniformly placing them by machine processes.

Pending the appeal, all the exhibits were removed to the Federal Court at Cincinnati and the tire machines were set up side by side for the edification of the judges. During the argument of the case early in 1917 the full bench of judges viewed the manufacture of tire casings as carried on in the Goodyear and Firestone factories.

After the argument but before the court had rendered its opinion, Firestone discovered new evidence in the form of a Belgian patent of 1906 issued to a Frenchman named Mathern. The utilization of this patent was impracticable before this time because of the European war. The case was reported to consider the Belgian patent and its effect upon the State patent in suit. A replica of the Mathern machine, the original having been purchased by Firestone from Mathern in 1909, was set up beside the more modern machines and operated with them before the court.

### Makers Pay \$23,981,368 Taxes

WASHINGTON, Dec. 18—Automobile manufacturers paid the United States Government \$23,981,368.35 for the year ended June 30, 1918, under the 3 per cent revenue tax. Of this amount more than 60 per cent came from the State of Michigan, which paid \$14,711,373.33.

### General Motors Building Three Tractors

NEW YORK, Dec. 19—In addition to the 2-3 and 3-4 plow tractors brought out recently by the General Motors Corp., which were described briefly in AUTOMOTIVE INDUSTRIES of November 28, a third model, known as type D, is being introduced. Model D is a small tractor or motor-cultivator designed to operate existing horse-drawn farm implements of regular type. It will sell for \$450. It is understood that later on a complete range of especially designed and low-priced farm implements for model D will be marketed. Model M, the 2-3 plow type, is priced at \$650 and the larger model is \$900. Arrangements are being made to distribute these tractors on a basis of limited allocation to each State. About 10,000 tractors of the three models will be produced during the next four months by the new factory at Janesville, Wis.

### Col. Mars Heads Aircraft Production

WASHINGTON, Dec. 19—Lieut. Col. J. A. Mars has been appointed director of the Bureau of Aircraft Production, taking the place of W. G. Potter, who has resigned as was previously announced. Col. Mars is a regular army officer.

## Makers Slowly Quit War Work

**Efforts Turned Toward Re-  
building Sales Organization  
—Truck Makers Active**

DETROIT, Dec. 17—Manufacturers in this district are congratulating themselves or otherwise, depending on their ability to get out of war work and back into their customary peace lines. Shell contracts and other ordnance work is not being cancelled as rapidly as the work for the Bureau of Aircraft Production. Quartermasters' supplies are also being manufactured with scarcely any sign of a decrease.

While finishing up the odds and ends of war contracts, manufacturers are seriously engaged in an endeavor to rebuild their somewhat shattered sales organizations. Service departments of dealers have been hit even harder than sales departments, and to get both back on a somewhat normal basis is proving a tremendous task. The report which seems to have circulated in some localities that dealers throughout the country are overstocked is discounted here. Both in the high-priced and low-priced lines it is stated that dealers have not enough cars to meet demands, even though that demand is below normal.

Manufacturers like Cadillac and Dodge, whose plants were undisturbed by war work because the Government took their commercial product practically as it stood, are in a fortunate position. There are quite a few others who are also able to turn their plants directly into peace work without an internal reorganization. The plants in this situation are simply going ahead with their pre-war plans as if they had never been interrupted.

The Essex car, which will be built in the Hudson plant and sold largely through the Hudson dealer organization, is being shipped to distributors. This car will sell for \$1,395, which is the price placed upon it before manufacture was curtailed.

The small Overland model is now going through production and will be vigorously marketed within a few weeks. Beside these two, which are really not new models but simply models which were temporarily held out of manufacture pending the release of steel, there is no prospect for any marked introduction of new products until spring, and it is doubtful if there will be many until later in the year. The war ended so suddenly and the engineering brains of the country were so taken up with work that there was no opportunity

design and development during the war period. The result is that the new designs are just getting down on the drafting boards at the present time, and it will be spring before the experimental models are on the road.

Truck manufacturers will doubtless be rounding out their lines within the next few months. The Acason company is just about to start production on a new 1-ton design and it is expected that several other truck companies will have more complete lines as soon as they are able to free themselves from war orders.

A situation which is bothering passenger car manufacturers is the seeming expectancy on the part of the general public of big price reductions in the near future. This has resulted in tying up buyers who would otherwise be ordering cars. To combat this, a vigorous campaign is being pushed by manufacturers generally to bring before the public the knowledge that there will be no general price cut for months to come. Maxwell and Chalmers have guaranteed their prices to be stationary until June, 1919, and this stand will also be taken by many others who desire to clear up the impression that automobiles are due for a marked decrease in prices.

A very interesting phase which indicates the spirit of the manufacturer at the present time is the keen study being given to the subject of tractor manufacture. There is a marked tendency on the part of the larger factory to spread out into truck and tractor manufacture. This was noted to some extent before the United States entered the war, when companies such as the Maxwell Motors Corp. brought out a tractor. The General Motors Co. has already announced its intention of manufacturing a low-priced tractor on a large scale, and the Maxwell company will be ready to go ahead with it as soon as it is able to clear up its war contracts.

An embarrassing situation in regard to cancellations has arisen in connection with concerns which are making their standard product for the government. Many of these concerns had brought out new designs or altered designs, which were intended for the commercial market. Cancellations in whole or in part have caused large quantities of surplus material to gather which must be used up before the altered designs can be put into production.

## Endorse Federal Road Commission

### Chicago Meeting Unanimously in Favor of It—Graham Proposes Uniform Law

CHICAGO, Dec. 13—A Federal Highways Commission was proposed and definitely assured of the support of the Highways Industries Association and the Association of State Highway Officials at the three-day joint session of these bodies which was brought to a close to-night. As was forecast in AUTOMOTIVE INDUSTRIES last week, the meeting came out unequivocally in favor of the appointment of such a commission, which would be formed of five big, broad-minded men upon whom would devolve the duty of mapping, building and maintaining a system of national roads approximating 50,000 miles, to serve fully 90 per cent of the population of the United States, to cost in the neighborhood of \$25,000 a mile and to be fed by a system of state and county roads built by the individual states and counties with aid from the Federal Government.

With a view to encouraging and stimulating the already rapidly expanding use of trucks for interstate highway transportation, George M. Graham, president of the Pierce-Arrow Motor Car Co., proposed a uniform vehicle law which would wipe out the disadvantages under which interstate highway shippers now operate because of the great diversity of individual state laws.

#### Must Fit Trucks to Road

Referring to the alleged damage done to roads by trucks, Graham stated that the truck is as much sinned against as sinning. As a means to fit the trucks to the road, Graham suggests a minimum allowable weight for any truck with body and load of 24,000 lb. and that a plate giving the maximum allowable weight of any truck be attached to the vehicle. Exceeding this weight would be considered prima facie evidence of a misdemeanor.

Trailers also would be included under this measure. Below are the recommendations which Graham makes and which he would see incorporated in

uniform motor vehicle laws to be passed by the individual states.

#### Oil Industry Asked to Lift Restrictions

WASHINGTON, Dec. 16—The Fuel Administration has asked the oil industry to lift all its voluntary restrictions on crude oil prices and distribution and on refined products. This removes the entire oil industry from Government supervision. Unless events prove the necessity of again exercising control, says the announcement, this release will be permanent. The Administration points out, however, that licenses now outstanding will remain in force until the President's proclamation of peace, and all agreements made heretofore will continue subject to cancellation or assignment on request of the Fuel Administration. The allocation of supplies of petroleum products for the Allies will end Feb. 1 and the priority orders for export of gasoline and kerosene will expire at the same time. However, the allocation of aviation gasoline for the Allies and the American Expeditionary Forces will continue until further notice is given.

#### S. A. E. Visits Standard Aircraft Plant

NEW YORK, Dec. 16—At the invitation of the Standard Aircraft Corporation, 80 members of the Metropolitan section of the S. A. E. paid a visit to the plant at Elizabeth, N. J., to-day. During the morning, a tour of inspection was made through the various shops under the guidance of J. M. Meirick, superintendent of publicity, and B. L. Williams and other officials of the company. The visitors were shown through the wing and body shops, inspection, assembly and testing departments, where several H. S. 2 L. flying boats, Handley-Page giant airplanes and De Havillands are in process of construction. All of these are equipped with Liberty engines.

After a lunch provided for the visitors in a large dining room capable of seating 800, built for the officers and office staff of the company, the visitors were shown motion pictures which have just been taken in connection with Government publicity, depicting the work in the plant. Another picture showed the launching of the first American-made Handley-Page airplane, the Langley, which was made at this plant in ninety days and flown July 6.

H. B. Mingle, president of the company, made a short address to the S. A. E. members in which he expressed the hope that the company would be able to continue building airplanes for commercial uses. The company is now completing its Government contracts, and already the force of men has been considerably reduced. At the period of maximum production between 4,000 and 5,000 men and women were employed.

#### Shuler Moves to Louisville

DETROIT, Dec. 18—The Shuler Axle Mfg. Co. has removed its entire business and equipment from this city to a new plant in Louisville, Ky.

Height .....	12 ft. 6 in.
Width .....	96 in.
Weight, Vehicle, Body and Load**	24,000 lb.
Weight on tire per inch of width.....	800 lb.

Speed (M.P.H.)	Maximum	Suburban	City
Pneumatic tired vehicles under 6000 lb.....	30	20	15
Other pneumatic tired vehicles.....	25	20	15
Solid tired vehicles, 4000 to 28,000 lb*.....	25	15	12
Buses:			
6000 lb.....	30	20	15
7000 lb.....	30	18	15
8000 lb.....	25	20	12
Trailers:	Same as Trucks		

\*With following exceptions:

4000 lb.....	25	20	18
8000 lb.....	30	18	15
12,000 lb.....	18	15	12
16,000 lb.....	16	15	12

\*\*Highway Commissioner has discretionary power to increase this weight to 28,000 or more, depending on condition of roads.



## To Validate "Illegal" Contracts

### Measure Introduced to Insure Payment on Contracts Made Verbally or by Wire

WASHINGTON, Dec. 16—Important Congressional activities are expected this week that will affect automotive industries and war manufacturers generally. Opposition to the appropriation of \$2,185,000 for increased airplane mail service and for \$1,000,000 for extended motor truck mail service is expected to provoke keen discussion on the floor of the House.

In addition a very important bill introduced last week by Congressman Dent to provide relief for the War Department and allow it to make payments where Army contracts have not been made for war materials will come up.

This bill was introduced into the House to remove the present obstacle created by Controller Warwick of the Treasury, when he informed the War Department that he would not honor contracts that had not been "legally" executed, such as contracts that were made over long distance telephone verbally, or by telegraph, etc. Briefly, it authorizes the Secretary of War or his agents to accept and pay for articles or merchandise which had been ordered for the prosecution of the war but for which contracts had not been "legally" made.

The bill was discussed before the Committee on Military Affairs late last week by the Committee and Benedict Crowell, Assistant Secretary of War, Major General George W. Goethals, Director of Purchase, G. H. Dorr, Assistant Director of Maintenance, and Controller of the Treasury Walter W. Warwick.

The chief objection to the bill arising in the discussion was that it was too broad and allowed too free interpretation. It was further opposed in this meeting because it confers judicial powers on the Secretary of War, making the allowances provided by the Secretary of War final and conclusive.

There are three classes of contracts which enter under the "illegal" class, according to General Goethals:

1—Where a contract has been made and not signed by the proper officers, and where the contractor has delivered his material and been paid for it and the payments are illegal because the contract was not regularly signed.

2—Where the Government has received materials, signed no contract, and made no payments.

3—Where an order has been given to a contractor to make preparations to go to work, where he has expended the money, but delivered nothing under the contract at the time the armistice was signed.

General Goethals stated that it would be impossible at this time to tell how many contracts had been entered under these classes or their value but he estimated that there were thousands of contracts and millions of dollars involved.

It developed at the hearing that following the Spanish-American war a similar condition arose and many cases arising at that time are still in the Court of Claims, and, said the War Department officials, they are trying by means of this new bill to avoid a similar condition with the consequent business troubles that would arise.

Congressman Caldwell objected to the bill because he said there is no provision restraining the Secretary of War and further because the people who will pass on the contracts are, in many instances, or were, connected with companies involved, prior to the war.

The bill will come up this week and according to business men in Washington, there is urgent need that it be passed promptly by Congress or amended and passed promptly. Hundreds of manufacturers have been in Washington in the last few days solely on this matter and they state it creates a most perplexing problem for them particularly because their banks are fearful due to the doubt raised as to whether the manufacturers will receive just payment or not, and furthermore because in many cases the contractors have sub-contract arrangements which they are obliged to honor while their own arrangements with the Government are not being honored.

Following is the bill: "Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That where during the present emergency and prior to November 12, 1918, an individual, firm or corporation has made an agreement with officers or agents acting under authority of the Secretary of War for the purchase or use of land or improvements thereon, the manufacture or sale of equipment, material, or supplies for services rendered, or other lawful purposes connected with the prosecution of the war, and said agreement has been partly or wholly performed or expense has been incurred by the individual, firm or corporation in preparation for such performance, and, notwithstanding said agreement, has not been made in the form, or signed in the manner required by law, it shall be lawful to make payments under the terms of said agreement to the extent that performance thereof has heretofore been received and accepted by the United States or shall hereafter be received or accepted by officers or agents acting under authority of the Secretary of War, if the latter shall find the public interest require such acceptance;

"Provided that payment under such informal agreement shall not exceed the fair value of the property transferred or delivered and accepted by the United States, as determined by the Secretary of War, and where no property has been transferred, delivered, or accepted payment shall not be in excess of the actual cost incurred in preparation for performance as such cost is determined by said Secretary:

"Provided further, that no liability shall be incurred by the United States by reason of the passage of this Act, excepting such amount only as the Secretary of War shall find to be fairly and equitably payable under such agreement, which amount when received and accepted shall be in full of all claims and demands whatever arising out of or by virtue of such agreement, and nothing in this Act shall be construed to confer jurisdiction upon any court to entertain a suit against the United States upon any agreement of the character herein referred to, but the allowance made by the Secretary of War shall be final and conclusive."

WASHINGTON, Dec. 18—The House Military Affairs Committee to-day authorized Congressman Dent, chairman, to draw up a bill which will allow the Treasury Department to pay manufacturers who hold Government contracts

which were not legally executed and which have been held up heretofore by a decision of the Controller of the Treasury. The new bill will be a modification of the bill presented last week on this matter.

### Would Place Air Mail Under Army

WASHINGTON, Dec. 18—That the Government would save many millions of dollars by operating its air mail service under the supervision of the Army instead of the Post Office was maintained yesterday on the floor of the House by Representative La Guardia of New York, recently a Major in the Aviation Service. Congressman La Guardia, who favors an air mail service but opposes what he terms needless expenditure of millions of dollars for the Post Office Department to experiment with planes and train personnel when the Army and Navy Marine Corps already have established air organizations, promised the House a more extended talk on this matter in the near future, at which time he said he would give "the inside story."

### Use Argon for Aircraft

WASHINGTON, Dec. 18—The Navy Department is building a plant at Fort Worth, Texas, for the production of argon from natural gas for use in lighter-than-air aircraft. Argon is an inert, non-inflammable element without the hazard of fire or explosion.

### Truscon Enters General Field

DETROIT, Dec. 18—The Truscon Steel Co., which for a number of years has been producing pressed steel parts primarily for use in its own products, is entering the market and is prepared to furnish pressed steel parts of various kinds for other manufacturers.

### N. A. P. A. Branch in Kansas City

KANSAS CITY, Dec. 15—The twenty-second branch of the National Association of Purchasing Agents was organized in Kansas City Dec. 10, with the following temporary officers: President, M. E. Wilcox, Weber Engine Co.; secretary, E. E. Stigall, Kansas City Railways Co. The following visitors assisted the 25 local purchasing agents in effecting the organization: D. D. Ranken, assistant purchasing agent of the Du Pont companies, president of the National Association of Purchasing Agents; L. F. Boffey, editor of The Purchasing Agent, secretary of the national society; J. C. Densmore, purchasing agent of the University of Chicago, treasurer of the national association, and J. A. Hecker of the Curtis Mfg. Co., secretary of the St. Louis branch of the national organization.

### Klaxon Equipment Division for Detroit

DETROIT, I Co. has established its motor eq Grand Blvd. of Frank B.

## England Plans Post-War Show

Will Stage Event at Olympia Hall in November—Aviation Exhibits Likely

LONDON, Nov. 24—Special to AUTOMOTIVE INDUSTRIES—Within just one week from the announcement of the armistice terms the motor trade in England decided on a program of exhibitions for next year, the time being too short to hold the usual Olympia exhibition this November in accordance with pre-war rules.

The first post-war exhibition will be held in November, 1919, at the Olympia Hall, and while many post-war models will be marketed long before that date and are actually being announced now, that date will mark the first great bringing together of the post-war models. The Society of Motor Manufacturers and Traders will handle the show.

Other exhibitions are being discussed but dates have not been fixed. The increased importance of motor trucks and farm tractors points to a combined exposition of such vehicles at which will also be exhibited farm machinery specially designed for use with motor tractors.

Aviation expositions will be held throughout the British Isles. The lack of public interest in aircraft which existed previous to 1914 is now passed and aviation exhibitions will without doubt be great events, particularly as it is now recognized that there are many commercial uses for the airplane.

The war has added much stimulus to motor boating and some form of national motor boat and marine exhibit is being discussed. Such an exhibit in addition to catering to pleasure craft will include motor barges, fishing vessels and many other types using the explosion engine.

### Republic Issues \$3,000,000 Notes

NEW YORK, Dec. 17—The Republic Motor Truck Co., Alma, Mich., has issued \$3,000,000 of first mortgage and collateral trust 7 per cent serial gold notes for the purpose of reducing current floating indebtedness and to provide additional working capital for the further expansion of the business. Maturities are as follows: Series A, \$500,000, Nov. 1, 1920; series B, \$500,000, Nov. 1, 1921; series C, \$1,000,000, Nov. 1, 1922; series D, \$1,000,000, Nov. 1, 1923.

### Fiat's After-War Policy

NEW YORK, Dec. 16—There has been some speculation as to what would be the post-war program of the Fiat Co., Turin, Italy. It is not the intention of the company to concentrate on a single model; the number of types, however, has been reduced to what is considered to be a minimum. The lowest-priced vehicle will

be a light car; a special type of two-seater developed to meet European conditions. For the full touring model the engineers have decided on the 6-cylinder engine in preference to the 8 or 12. It has been decided that all models, from the cheapest to the most expensive, shall be fitted with electric lighting and starting specially designed for that particular chassis. Another mechanical change of interest is the adoption of detachable cylinder heads.

The after-the-war models are as follows:

	Model 500	Model 501	Model 502	Model 503
Engine, vertical monobloc	4 cyl.	4 cyl.	6 cyl.	6 cyl.
Horsepower	8-12	12-16	25-35	35-45
Weight, complete with touring body (lbs.)	1200	1900	3100	3900
Speed with full touring body (miles)	38-40	44-47	50-56	56-63
Wheelbase (in.)	95	105	130	143
Track (in.)	43	49	55	48

Commercial vehicles will form a separate and distinct branch of the Fiat after-the-war production. An agricultural tractor department has already been established and tractors are being supplied to the public.

## Price Changes

### Overland Reduces Price \$110

TOLEDO, O., Dec. 15—The Willys-Overland Co. has reduced the price of its Model 90 touring car, effective immediately, from \$1,095 to \$985.

### Cole Price Reduction of \$300

INDIANAPOLIS, Dec. 15—The Cole Motor Car Co. has reduced prices on all models of the Aero-Eight, effective at once. New and former prices follow:

Model	New Price	Old Price
871, roadster	\$2,595	\$2,895
872, 4-pass.	2,595	2,895
870, 7-pass.	2,595	2,895
Sedan	3,595	3,895
Limousine	3,695	3,995
Coupe	3,795	4,095
Town car	3,795	4,095

### Velie Prices Reduced

NEW YORK, Dec. 16—The Velie Motor Vehicle Co. has reduced the prices of its two models \$75 and \$65 respectively, effective at once. Following are the new and old prices:

Model	New Price	Old Price
33, 2- and 5-pass.	\$1465	\$1540
39, 4-pass. sport.	1975	2040

### Selden Trucks Go Up

ROCHESTER, Dec. 16—The Selden Truck Sales Co. has revised its price list. Following are the new prices effective Jan. 1:

Model	New Price	Old Price
TXR, 1-ton int.-gear.	\$1900	
TWL, 1-ton worm-gear.	2200	\$2100
JCB, 2-ton int.-gear.	2750	
JWB, 2-ton worm-gear.	3050	2950
NL, 3½-ton worm-gear.	3850	3650
DL, 5-ton worm-gear.	5000	4950

## Chicago Show Dates Jan. 25-Feb. 1.

Dealers Get Coliseum and Armory—Garden and Armory for New York Event

CHICAGO, Dec. 18—The Chicago Automobile Dealers' Assn. has completed all arrangements and set the dates for its show. The event will be held in the Coliseum and the First Regiment Armory as in previous years, with the first week, Jan. 25 to Feb. 1, devoted to passenger cars and the second week, Feb. 3 to 6, devoted to trucks.

The annual meeting of the National Association of Automobile Dealers will be held in the Hotel La Salle during the show, the dates being Jan. 28 and 29. During the New York show the N. A. D. A. will hold an eastern division meeting. The date probably will be Feb. 5.

NEW YORK, Dec. 16—In addition to Madison Square Garden the New York Automobile Dealers Association has secured the 69th Regiment Armory in which to house its big exhibit Feb. 1 to 15. The 69th Regiment Armory is a short square distant from the Garden and contains more space than there is in the Garden, which more than doubles the original size of the show.

The dual show will be equally good in both buildings. The armory exhibition is not to be an overflow, but an exhibition on an equal basis with the Garden show, with some of the best known cars in the industry in each building.

Manager Charles A. Stewart, who is operating in the association offices in the Woodward Hotel Annex at Broadway and Fifty-fifth Street, states that there will be quite an automotive equipment show in both buildings. In place of the usual 10 x 10 spaces given to the accessory people the spaces this year are to be 12½ x 12½, and in the armory they will all be arranged around the outside of the main floor. In the Garden the spaces will be in the gallery directly above the boxes.

### Bosch Brings \$4,150,000

NEW YORK, Dec. 18—The plant and business of the Bosch Magneto Co. was sold last week by Alien Property Custodian Palmer for \$4,150,000. It is stated that the company has been bought in by present interests and that it will be continued practically without change.

### Burnett Returns to Cadillac

DETROIT, Dec. 18—Leo N. Burnett has been released from active service in the Navy and returns to the Cadillac Motor Car Co. to resume charge of the advertising department. John A. Cleary, who was borrowed from the Automobile Sales Corp., Philadelphia, to fill Mr. Burnett's post for the duration of the war, has again taken up his duties as sales promotion manager for the Philadelphia concern.

# Further Light on Airplane Production History

Lieut. Emmons Reveals Details of Engine and Plane Plans—  
Life of Liberty Engine Put at Sixty Days—Foreign  
Estimate of Cost \$20 Per Horsepower

WASHINGTON, Dec. 16—At a meeting held last Saturday further outlining the airplane engine production during the war Lieut. H. H. Emmons, U. S. N., added interesting information to the official history of aircraft production which was published in AUTOMOTIVE INDUSTRIES recently.

A Liberty airplane engine, said Lieutenant Emmons, consumes an average of 20 to 25 gal. of gasoline per hour, depending upon the altitude, speed, etc. The original program for airplanes standing at the time war was declared, said Lieutenant Emmons, called for 332 planes. This was shortly after increased to 1000 planes, and then 3 weeks after the declaration of war, and following the receipt of information from abroad, the program was increased to 22,000 planes and was immediately approved by the Secretary of War.

## Great Quantity of Tools

In describing the difficulties encountered in the production of the Liberty engine, the lieutenant told that 2500 to 3000 jigs, tools, etc., had to be designed and manufactured especially for each manufacturer engaged in Liberty engine production, and from 80 to 85 per cent of these first made were found to be useless through poor work.

He stated that Major J. G. Heaslett, formerly of the Studebaker Corp., and during the war in complete charge of inspection, production and engineering at Detroit, was the man who was directly responsible for the large production of airplane engines which resulted up to the signing of the armistice. Major Heaslett, he said, working with a committee composed of H. M. Leland, Lincoln Motors Co.; C. H. Wills, Ford Motor Co., and Messrs. Bell and Roberts, of the Packard Motor Co., had full charge and complete authority for all engine production, and it was because of the work of this committee and of Major Heaslett that production amounted to 31,814 engines up to Nov. 11, 1918.

The Liberty engine, said Lieutenant Emmons, is rated at 410 hp., but often reaches 475 hp., and in several instances under special conditions has been developed to produce 526 hp. Its life at the front is estimated at 60 days. Airplane mechanics are instructed to overhaul at least once every 50 hours as compared with an overhaul every 20 hours with other airplane engines. The highest endurance record made by an airplane equipped with a Liberty engine was 162 hours in the air.

In discussing costs Lieutenant Emmons stated that the foreign nations figure the cost of an engine at \$20 per

horsepower. This would have placed the cost of the Liberty engine at more than \$8,000, and was immediately regarded as too high by the American officials who first set a bogey price of \$5,500 and later reduced this to \$4,000 after the manufacture showed it to be about the proper price.

The Wright-Martin Co., it was stated, received \$5,500 apiece for several thousand Hispano-Suiza engines it produced, this high figure being due to the royalties which had to be paid to Spain, as that country controls the Hispano-Suiza patents. The King of Spain, it was said, is the actual owner.

Discussing foreign engines and the American manufacturers' difficulties with them, Lieutenant Emmons said that when the specifications and drawings of the LeRhône engines were received they were almost unintelligible. They called, for example, for the use of mild steel when they should have specified chrome nickel, and the American authorities found it necessary to tear down an engine and analyze it to learn what metals were used in its manufacture before it was possible to make it.

There were 2500 LeRhône engines ordered, of which 1500 were delivered up to the signing of the armistice. These were made by the Union Switch Co., and were praised by the foreign chief engineer of the LeRhône factory abroad to be the best rotary engines he had ever seen.

## Bugatti Production Difficult

The mission sent abroad by our authorities early in the war recommended the use of the Bugatti engine in our planes and insisted upon its use from overseas, partly because they did not know fully about the Liberty engine and also because they thought that the Bugatti might prove to be a very satisfactory machine.

The Bugatti engine sent to this country as a sample had never made over a 35 hr. test. It had suffered an accident in France and arrived in this country with a bent crankshaft. The American authorities, after straightening the shaft, found it necessary to redesign the engine before going into manufacture on it.

In discussing airplanes it was said that the DeHaviland-4 plane was the only combat plane in which this country had reached quantity production. One hundred sets of parts for the Handley-Page plane had been completed and shipped abroad. These were shipped in part sets because of the size of the planes and the consequent advisability of assembling them abroad. We were just

entering into production on the USD9A, which is a substitute for the British DH9.

Three thousand Le Pere airplanes had been ordered from the Fisher Body Co. and Packard Motor Car Co., of which 25 were completed. Lieutenant Emmons paid high tribute to the Ford Motor Car Co., telling that they put 3 crews of men to work immediately when they received the orders for the Liberty engine cylinder, each crew experimenting to find the best production methods, and the company selected a method by which drawn steel tubes were cut in two by a special machine with a special die, heated, welded with cone-shape tops and then completed with bull-dozer machines.

## Army Fliers Map Air Lanes

WASHINGTON, Dec. 13—On their way from San Antonio to Houston, Tex., to-day, the four Army planes engaged in mapping a Southern air route across the continent had completed 1300 miles of reconnaissance from San Diego, Cal., where they landed at Kelly Field last evening.

The squadron left the Pacific Coast on Dec. 4 with five planes. One was lost in the fog near the mountains on the first day out and was forced to put back. The telegraph report received to-day at the Division of Military Aeronautics stated that the ground under the air route traveled between Alpine and Del Rio, Tex., was bad for landing fields, but from Del Rio east to San Antonio was excellent. The planes are photographing as they proceed East. The course they are flying to-day from San Antonio to Houston is 200 miles and it is expected that the flight will proceed from Houston straight to Gerstner Field, Lake Charles, La., and from there to Montgomery, Ala.

## 43,000 Army Trucks Purchased

WASHINGTON, Dec. 18—The annual report of the Quartermaster-General of the Army shows that the following purchases and deliveries were made up to June 15, 1918:

Type	Total ordered plus on hand at beginning of June 15, 1918	Total delivered to June 15, 1918
Trucks and chassis..	45,335	22,278
Trailers .....	1,213	696
Mobile machine shops	199	123
Passenger cars.....	8,369	8,277
Motorcycles .....	19,279	16,030
Side cars .....	17,899	14,636
Bicycles .....	13,796	12,314

## Army Planes for Air Mail

WASHINGTON, Dec. 15—The War Department turned over 100 DeHaviland-4 and twelve Handley-Page airplanes to the Postoffice Department to-day for air mail service. The DeHaviland planes can carry 400 lb. of mail and can be altered to carry 1200 lb. if necessary. The Handley-Page planes can carry more than a ton. The New York-Chicago airplane



route has been slightly changed, and Elizabeth, N. J., has been announced as the return terminal. Bellefonte, Pa., is the first regular stop, Leighton, Pa., the first emergency landing station and Cleveland the next stop, with an emergency station at Clarion, Pa. The last stop before Chicago is at Bryan, Ohio, where mail will be discharged and taken on.

#### Ban Aerial Acrobatics Over Cities

WASHINGTON, Dec. 13—Aviators have been ordered to refrain hereafter from low flying and from acrobatics carried on in the vicinity of cities, towns and buildings. All acrobatic flying hereafter must be finished at an altitude not lower than 1500 ft. These orders are the result of increased flying accidents. Commanding officers have been instructed to take most stringent steps to carry out the order.

#### Offers Prizes for Flights

WASHINGTON, Dec. 16—The Air Service Clubs Association, which is an association of officers and members of the United States Military Aviation Forces, will encourage tests in the air for both heavier-than-air and lighter-than-air machines and will award prizes for meritorious achievements. A committee will be appointed to pass upon these tests and flights.

#### 4045 Planes in Use Nov. 20

WASHINGTON, Dec. 16—On Nov. 20 there were 4045 pursuit, observation and bombing planes in use at the front by the American Expeditionary Forces, according to a letter from General Pershing to Secretary of War Newton D. Baker. Of this number 2675 were obtained from France and the remainder, 1370, from the United States. Up to Nov. 23, 1918, 8933 reserve military aviators had been trained in the United States. Total mechanics trained at American schools number 14,176.

#### Wants Air Mail to Alaska

WASHINGTON, Dec. 13—The extension of airplane mail service from this country to Alaska has been asked by Thomas Riggs, Jr., Governor of Alaska.

#### Brazil to Have Air Service

WASHINGTON, Dec. 13—Brazil will shortly have an air mail service between its principal cities. The Government has granted concessions to a corporation allowing it to establish airplane mail service between the various capitals of the states of Brazil. Activities will comprise carrying of small parcels of mail, and, with further development of aviation, carrying of passengers. The number of trips, and the tariff will be regulated by the Government. All mail matter transported must be properly stamped and post-marked. In time of war the Government may take over the service.

## P. H. Lyon Heads Jobbers; Manufacturers Now Members

CHICAGO, Dec. 18 — Automotive Equipment Association is the new name of the National Association of Automobile Accessory Jobbers, altered yesterday by constitutional amendment at the winter meeting of the organization. Another important constitutional amendment give to manufacturers full membership and places them on an equal footing with jobbers. Heretofore, manufacturers have been admitted only to associate membership.

Following the usual procedure, Vice-President Phil H. Lyon of the Chanslor & Lyon Co., San Francisco, was advanced from the post of vice-president to that of president. He succeeds S. F. Beech of the Motor Car Supply Co., Chicago. R. R. Englehart of the Seig Co., Davenport, Ia., advances from chairman of the board of directors to the vice-presidency and is succeeded by Robert A. Stranahan of the Champion Spark Plug Co., Toledo.

#### Lame Start for Chicago-New York Air Mail Service

NEW YORK, Dec. 18—To-day marked the inauguration of the first long-distance airplane mail service in the United States when two planes departed almost at the same time from New York and Chicago to fly the 1000 miles between these centers. Neither plane reached its destination, which in each case was a sub-station approximately 200 miles from the starting point whence the mail was to have been relayed to another sub-station a similar distance from the first and thence to the end of the line.

Leon D. Smith, an army flier, started from Belmont Park, L. I., in a Liberty-engined De Haviland, but was forced to land at Bellefonte, Pa., 236 miles from the starting point; "from here the mail was forwarded to Chicago by train. Delay at the Chicago end was caused by inability of the planes to reach that city from Defiance, Ohio. It was expected that a start would be made from Grant Park, Chicago, at 10 a.m., but this was impossible. Officials state that it will be several days before the service is operating smoothly.

Only first-class mail will be carried, the rate being 6 cents an ounce or fraction; parcels not exceeding 30 in. combined length and girth may be sent. It is expected that the service will cut the time between the two cities five to six hours.

#### Ajax Issues \$1,000,000 Stock

NEW YORK, Dec. 18—The Ajax Rubber Co. has issued new common stock in the amount of \$1,000,000 to provide additional working capital for the company. Stockholders of record on Dec. 27 will be permitted to subscribe for the new issue of 20,000 shares of a par value of \$50 each on the basis of 10 new shares for each 71 old shares of stock now held at \$55 a share. The right to subscribe will expire Jan. 15. Including the new stock,

the company will have outstanding 162,000 shares, bringing the outstanding stock from 7,100,000 to 8,100,000.

#### Federal District Managers Meet

DETROIT, Dec. 18—District sales managers of the Federal Motor Truck Co. gathered here to-day for a sales convention which will continue on Thursday and Friday. The gathering will threaten the sales policy of the concern, which is now getting back on a commercial basis after extended war work on Class B trucks and Federal trucks for the government.

#### Recent Personnel Changes

A. C. Stebbins, president of the Lansing Co., and vice-president of the Capital National Bank of Lansing, Mich., has been appointed general manager of the Auto Body Co. of this city, succeeding H. E. Bradner, who withdrew from active management of the institution on account of ill health. He continues as president of the company.

K. R. Jacoby, who has been assistant to C. A. Earl, first vice-president of the Willys-Overland Co., Toledo, has been elected to a vice-presidency in charge of purchases of the company.

B. W. Knowles, formerly chief engineer and factory superintendent of the Electric Products Co., Cleveland, has been appointed chief engineer of the Baker R. & L. Co. of the same city.

C. C. Winningham, formerly advertising manager of the Hudson Motor Car Co., Detroit, and more recently engaged in the Department of Labor, Washington, has established an advertising agency in Detroit with headquarters in the Book Building. No one has been named to succeed Mr. Winningham.

#### War Machinery Crumbling

WASHINGTON, Dec. 17—The war machinery here is fast crumbling. The War Industries Board, which is already to a great extent through, plans to turn over several more important departments to the Department of Commerce and Department of Interior on Jan. 1. Members of the Priorities Division have closed their desks and returned to their peace time duties. C. C. Hanch, head of the Automotive Section, is still continuing his work, which he thinks may be carried into the early Spring because of the difficulties arising from contract cancellations, but which, according to statements by Bernard M. Baruch, will probably be terminated with the beginning of the New Year, when contractors may have to deal directly with the War Department and not through the Section.

The Fuel Administration is preparing to turn over its departments on oil and gas to the Department of Interior and cease activities on Jan. 1. At the Bureau of Aircraft Production, where complete silence is maintained with regard to aircraft contract cancellations because it is feared that public announcement might have ill effects on the markets, activities are solely confined to this one phase of work and everyone is marking time awaiting Congress' decisions.

as to further appropriations for airplane activity.

The War Trade Board is rapidly modifying the restrictions on exports and imports and is one of the few departments which are continuing actively. The Motor Vehicle Section of the Quartermaster Department, which has been in charge of procurement and purchase of motor vehicles, is preparing to end activities by February 1, 1919. By that time it is expected that all contracts will be in such shape that the work of this division can be transferred to the army.

The Motor Transport Corps is also marking time, awaiting the decision of Congress and the General Staff. It is expected that this corps will be permanent and will continue its activities of operating and maintaining army motor vehicles to some degree.

The Division of Military Aeronautics, waiting on Congress for its decisions, is engaged solely in the work of returning aero squadrons from the front and maintaining those few which will be kept up there. The preliminary training of cadet aviators has ceased. The Ordnance Department, Quartermaster Department, Engineer Corps, in fact all the various army divisions are discharging men and terminating their war duties as fast as possible. The important civilian heads are returning rapidly to their peace time work.

#### Postoffice Bill Passes

WASHINGTON, Dec. 19—The Annual Postoffice Appropriation Bill, carrying \$357,350,000, including \$2,185,000 for air mail service and \$1,000,000 for motor truck mail service, passed the House yesterday with but one important amendment, which cuts the air mail appropriation to \$300,000 and requires the postoffice to use army aviators instead of organizing a new flying corps and stipulates the airplanes to be turned over to the postoffice by the War Department. It provides that the War Department shall supply more than 200 planes and more than 200 separate engines, and that these will be operated and maintained by the army under the control and direction of the Postmaster General. The bill now goes to the Senate.

The planes to be turned over by the War Department are specified in a section of the amendment as follows: "The Secretary of War is hereby directed to deliver immediately to the Postmaster General 100 De Havilland Fours, 100 Handley-Paige, 10 Glenn Martin day bombers; all planes to be completely assembled and with spare parts; 50 Hispano-Suiza 300 hp., 20 Hispano-Suiza 150 hp., 100 Liberty engines with spare parts, these to be out of any equipment the War Department has on hand or under construction; the War Department appropriation to be credited with the equipment turned over to the Postoffice Department."

The \$1,000,000 appropriation for the operation of the motor truck mail service passed without change. The expenditure on any other appropriation for the improvement of highways was prohibited by striking out this clause of the bill.

#### Truck Club Has Dealer Division

NEW YORK CITY, Dec. 18—The election of officers for 1919, the formation of a dealers' division and a strong talk by H. S. Quine of the Goodyear Tire & Rubber Co. were the features of the annual meeting of the Motor Truck Assn. of America held here to-night. The 1919 slate elected follows: Charles M. Geiger, president; John M. Wierk, L. E. Campbell and A. C. Bergmann, vice-presidents; Joseph Husson, secretary, and William P. Held, treasurer.

## Lift Lid on Nearly All Exports

### Practically Everything Can Now Be Sent to Allies—Ships for Trade Routes

WASHINGTON, Dec. 14—An almost unlimited export of commodities to the United Kingdom, France, Italy, Japan and other colonies was announced to-day by the War Trade Board, effective at once.

The commodities which will be allowed for export have not been specifically named, but include practically everything not on the conservation list, which has already been considerably reduced and which does not include, at this time, automotive products.

Each individual application for license, however, will be reviewed separately by the War Trade Board. At the same time the board will adopt a liberal policy of export for all countries for all materials except foodstuffs and with the sole exception of Germany, against which there will be no relaxation of blockade during the armistice period. The board expects also to open up completely export shipments to the neutral countries, including Norway, Holland, Sweden, Switzerland and Spain within a few days.

Ships with an aggregate carrying capacity of 800,000 tons have been designated to be turned over by the Quartermaster Department of the Army to the Shipping Board for return to trade routes, and this is expected to be one of the important factors in further reducing restrictions against export. It is expected that the ships will be used principally for trade with South and Central America.

#### W. T. B. to Consider Import Applications

WASHINGTON, Dec. 16—The War Trade Board will now consider applications to import platinum, antimony, tin and tin concentrates from Russia, including Siberia and Finland. It will also give consideration to the importation of other commodities, but will give preference to those named above and to seeds, roots and skins. A limited amount of cargo space is now available for shipments from Vladivostok to points on the Pacific Coast of the United States.

#### Spanish Duty on Cars Changed

WASHINGTON, Dec. 15—Passenger automobiles which have heretofore been dutiable on gross weight in shipments to Spain are now dutiable on the basis of net weight, according to a commerce report. It is expected that this new plan will remove the discrimination which has existed by reason of the fact that automobiles might be unpacked in the free port of Cadiz and entered on the net weight, whereas duty was charged on the gross weight in other ports. It was reported that a number of automobile manufacturing companies had established warehouses in the free port of

Cadiz to take advantage of this condition. Under the new ruling nothing will be gained by such procedure, and the Consul General reports that the dismantling of automobiles in the free port of Cadiz is no longer permitted.

The same order provides that forgings or castings for the construction of automobiles imported in the condition in which they left the forge or foundry shall be dutiable as manufactures of forged or cast metal according to the weight. Other parts, whether finished or partly finished, are to be classed as automobile parts. On leaving free ports automobile parts will be subject to duty proportionately as automobiles.

#### Articles Removed from Export List

WASHINGTON, Dec. 15—The following articles are included among the commodities which have been removed from the export conservation list, according to an announcement made to-day by the War Trade Board:

Alloys, as follows: Cadmium; nickel; titanium; uranium; zirconium.  
Aluminum, all articles containing 10 per cent or more (in weight) of metallic aluminum.  
Antimony; articles containing antimony; ore.  
Brass, and all articles containing 10 per cent or more (in weight) of brass.  
Brass pipe.  
Brass plates.  
Brass sheets.  
Brass tubes.  
Brass wire.  
Cadmium, as follows: Alloys; metal.  
Chromium ore, and any metal or ferroalloy thereof.  
Cobalt ore, and any metal or ferroalloy thereof.  
Copper, as follows: All articles containing 10 per cent or more (in weight) of copper; pipe; plates; rods; sheets; tools; scrap; tubes; wire.  
Ferroalloys, as follows: Ferrocobalt; ferrochromium; ferrocobalt; ferromanganese; ferromolybdenum; ferrotitanium; ferrotungsten; ferrovanadium; ferrovanadium; ferrozirconium.  
Lead, as follows: Pipe; sheet.  
Machines, as follows: Oil-well drilling, and accessories.  
Manganese ore and any metal or ferroalloy thereof.  
Manganese oxide.  
Nickel, all articles containing 10 per cent or more (in weight) of nickel.  
Nickel alloys.  
Ore, as follows: Antimony; chromium and any metal or ferroalloy thereof; cobalt and any metal or ferroalloy thereof; manganese and any metal or ferroalloy thereof; radium; strontium; titanium; tungsten and any metal or ferroalloy thereof; uranium; zirconium.  
Pyrites.  
Titanium and its compounds.  
Titanium ores.  
Uranium, as follows: Alloys; ores.  
Vanadium.  
Zinc or spelter.  
Zirconium, as follows: Alloys; metals; ores or concentrates.  
Carbon electrodes.  
Cells, electrolytic.  
Electrodes, as follows: Carbon; graphite (plumbago).  
Electrolytic cells.  
Generators, suitable for searchlights.  
Radio and wireless apparatus and all accessories.

#### New York-Valparaiso Boat Service Resumed

WASHINGTON, Dec. 15—Direct passenger service by boat has been resumed between New York and Valparaiso, following orders by the United States Shipping Board for the release of the tonnage. It is expected that, however, will only be given to immediate commercial needs for the time being.

## Rubber Imports Still Decline

November Strikes New Low Level—Total for 11 Months Far Behind Last Year

NEW YORK, Dec. 16—Importations of crude rubber have been steadily declining during the past 11 months and during the month of November reached a new low level when the total tonnage to come in amounted to only 3363 tons. As compared with November, 1917, when 13,611 tons were imported, this is a loss of 10,248 tons. Similarly, there was a big drop in the figures for November this year as compared with October, the loss being 6146 tons.

The total imports for the 11 months to date are approximately one month's supply below those for the same period last year, taking an average month's imports as a guide. During this period in 1917 imports totaled 158,906 tons as compared with 144,003 tons for the first 11 months of 1918. The loss in this case is 15,903 tons. Following are the statistics as compiled by the Rubber Association of America:

	1917 Tons	1918 Tons
January .....	12,788	16,084
February .....	10,162	12,108
March .....	18,624	17,161
April .....	13,000	12,708
May .....	18,411	16,288
June .....	15,096	24,124
July .....	17,290	16,092
August .....	17,290	10,421
September .....	13,664	5,151
October .....	8,970	9,509
November .....	13,611	3,363
Total .....	158,906	144,003

### Restrictions on Import of Rubber Removed

WASHINGTON, Dec. 16—All restrictions on the quantity of crude rubber imports from overseas have been removed, according to an announcement made here to-day by the War Trade Board. Applications for licenses to import crude rubber will now be considered without limit as to quantity. The War Trade Board also announces that it withdraws the Government option price and will require no further undertakings relative to maximum values. It will continue to require guarantees similar to those asked in the past. Modification of rubber imports, however, will not allow importation of rubber from any other than the country of origin until after Feb. 13, 1919.

### Re-Exports of Rubber Decline

WASHINGTON, Dec. 15—Re-exports of raw rubber, including waste and reclaimed, declined in quantity from 81,775,700 lb. in the first 9 months of 1916 and 101,749,400 lb. in the first 9 months of 1917 to 31,209,900 lb. for the first 9 months of 1918, and the value fell from \$57,985,880 in the first named period and \$70,869,089 in 1917 to \$18,396,514 in 1918. Imports of raw rubber in England, in-

cluding waste and reclaimed, totalled \$84,241,355 for the first 9 months of 1916, \$91,893,137 for the first 9 months of 1917, and decreased to \$44,856,792 for the first 9 months of 1918, while the quantities decreased to 79,221,400 lb. in 1918 as compared with 148,720,800 lb. in 1917 and 128,141,000 lb. in 1916.

### Great Reduction in Rubber Exports from London to the U. S.

WASHINGTON, Dec. 15—In the 10 months ending October, 1918, rubber exports from London to the United States totalled \$3,743,639 as against \$39,770,603 for the same period of the year previous, according to a Commerce Report.

### Exports to Federated Malay States

WASHINGTON, Dec. 16—Automobiles, tractors and parts and accessories can now be exported to the Straits Settlements and the Federated Malay States. The restrictions against these exports which have been in effect since May 16, 1917, have been revoked, according to a cablegram received here from the American consul-general at Singapore.

### Preference for Certain South American Exports

WASHINGTON, Dec. 15—Ocean shipments for exports to the east coast of South America will be controlled under a preference arrangement by the War Trade Board in co-operation with the Shipping Control Committee of the United States Shipping Board. "Shipping preference No. 1" will be awarded in exceptional cases when shipment is of the utmost importance and all shipments given this preference will have priority over all other shipments. In order to expedite the completion of export contracts entered into prior to the recent relaxation of the granting of licenses, the Shipping Control Committee will give priority in loading to shipments covered by export licenses dated prior to Nov. 12, 1918.

It will not be necessary for the holders of licenses to make further application or secure any endorsement to get this priority. Holders of licenses already issued and applicants for new licenses who believe that they are entitled to "shipping preference No. 1" can file a request with the War Trade Board.

Exporters should expect, says the War Trade Board, under present shipping conditions, that there may be considerable delay in exporting commodities licensed subsequent to Dec. 8, 1918, and not covered by "shipping preference No. 1."

### Making of Contracts Discontinued

WASHINGTON, Dec. 16—Making of contracts by the various War Department divisions for the purpose of clearing up stocks held on hand by manufacturers has been stopped by an official order issued late last week, and for the present no further contracts on war materials are being made.

## M. T. C. Will Keep Its Vehicles

No Sale of Cars or Trucks—Taxi Plan of Pooling Transportation Successful

WASHINGTON, Dec. 13—All passenger cars and standardized trucks now in the possession of the Motor Transport Corps in this country will be retained by the Army, according to an official announcement made here to-day. Non-standardized trucks and Nash Quad trucks will be turned over to the Post Office Department to fill its requirements, or, states the announcement, possibly, in the case of the Nash trucks these will be put on the market for sale. Rumors that the Army would sell large numbers of Dodge, Cadillac and other passenger cars at low prices are erroneous. None of this equipment will be sold.

### \$200,000 Saved a Month

In its monthly report the Army Motor Service, which is the taxi service for the Army in Washington and elsewhere, shows a saving in expense of operation of passenger vehicles in the Army amounting to \$200,000 for November as compared with the expenses of October.

Prior to Nov. 1 cars for the use of the Army were assigned to individuals or to various departments. Now, with the exception of 33 cars assigned to heads of departments, all passenger equipment of the District of Columbia is pooled and motor busses are operated on a sort of taxi system between the various principal buildings.

These busses and the passenger cars are for official use only. Thirteen principal stations have been established for them and telephone service can call these cars for official business similarly to the usual call for taxicabs.

In the month of November 14,899 trips were made in the District of Columbia covering 106,608 miles. Prior to Nov. 1 the average number of cars in operation per day was 257 passenger cars and 2 busses. Since Nov. 1 141 passenger cars and 11 busses have operated daily.

The taxi system has been so successful that it will be inaugurated at once in New York, Philadelphia, Chicago, St. Louis and Atlanta.

### Trucks in U. S. Also Pooled

The motor trucks used by the Army in the United States have also been pooled and are now operated for the benefit of the Army as a whole under the Motor Transport Corps management. The reduction of expense on trucks has not yet been reported, but it will be far greater than that on passenger service.

The number of garages for Army vehicles in Washington has been reduced by means of the taxi system and pooling from 16 to 8. Eventually all cars under the corps will be driven by enlisted men, thereby reducing the wage account and insuring better care for the equipment.



**Elliot C. Morse Returns to New York**

WASHINGTON, Dec. 16—Elliot C. Morse, formerly vice-president of the Chalmers Motor Car Co., and the past year in Washington as the general representative of the Willys-Overland Co. in Government contract matters, is leaving Washington to head the export work for the Willys-Overland interests in New York City.

A. C. Harrington, vice-president of sales of the Packard Motor Car Co. of New York, has resigned to handle the national truck accounts for the Packard factory. The new office of manager of distribution, created to fill Mr. Harrington's place, will be held by H. Bertram Lewis, advertising manager. In addition to the direction of carriage, truck, used vehicle, custom body and accessories sales, Mr. Lewis will supervise the advertising and motor transportation departments. Charles B. Morse, manager of direct advertising, and William Carl Chapman, publicity manager, will handle the company's advertising under his supervision.

T. T. Fauntleroy has been appointed sales engineer for the Lakewood Engineering Co., Cleveland, with headquarters at 1034 Widener Bldg., Philadelphia. He was formerly New York branch manager for the Gurney Ball Bearing Co. and latterly has been manager of the central sales district for the same company.

Prescott C. Ritchie, Western representative of the Westinghouse Automobile Equipment Department, moved his headquarters from Indianapolis to the Conway Building, Chicago.

Captain Edward Vail, who left the Waltham Watch Co. to follow the flag, has been appointed on an adjustment board and probably will have his headquarters in New York. He expects to be released from service in February.

Herbert C. Severance, secretary and sales manager of the Racine Rubber Co., Racine, Wis., and one of the best known figures in the American tire and rubber industry, died at his home in Racine on Nov. 23. Mr. Severance was born in Cambridge, Mass., on Oct. 28, 1878.

T. J. Turk, formerly connected with the Kissel Motor Car Co. and the General Motors Truck Co., has resigned his position as assistant general manager of the Inter-State Motor Co.

**Wants American Agencies**

NEW YORK, Dec. 15—J. R. Bournigal, P. G., Puerto Plata, Dominican Republic, has become affiliated with a company styled Ecos Del Norte, which at present is operating as a manufacturer's representative. The firm is anxious to affiliate itself with manufacturers of American specialties, with the object of representing such manufacturers.

## Men of the Industry

### *Changes in Personnel and Position*

**British Representative Coming**

NEW YORK CITY, Dec. 15—Capt. A. S. F. Morris, R. A. F., managing director of Morris, Russell & Co., London, England, is expected to arrive in New York shortly, and will make his headquarters at the New York office of the company, 14-16 Church Street. He will be here in the interest of this firm, which is looking for representation for car accessories and parts.

**England Sees Development of Commercial Aviation**

*(Continued from page 1064)*

The increased use of gasoline has already led to suggestions for greater production of petroleum and the possible use of other grades of fuel. The war has impressed on Great Britain in many ways the importance of gasoline in the entire transportation system of the nation and the development of fuels is certain to receive much attention.

Nothing definite has been done in the laying out of aerial highways further than that it is recognized that there will be main routes such as London to Edinburgh; London to Glasgow; London to Paris; London to Dublin; London to Russia; London to the Riviera; London to Africa, and other routes pointing toward India and Australia.

Laws governing aerial transportation and aerial navigation have already been considered and conferences will soon be called to deal with these and kindred questions. There must be settled the question of the right of any nation to control of the air above its land and also above its 3-mile water limit, which zone of air might for convenience be called the terrestrial air limit.

The conclusion is that a 3-mile limit for air surrounding the boundaries of a country along the water will not suffice and that a conference will be necessary to determine the best limit.

A host of problems will arise in connection with international flying, such as passports, customs regulations, signals, aerial traffic regulations, aerial trespassing, and injury to persons and property due to aerial navigation.

While aviation has been brought to its present success largely through government requirements in the war, sentiment is fairly general that commercial aviation should be as free as possible from government control and that the great experiments in business flying must be made by individuals and individual corporations. It is not incumbent upon the state to carry on such work. The state must take up very early all questions relating to necessary legislation.

**Don E. Bailey Dies**

SAN FRANCISCO, Dec. 16—Don E. Bailey, for 10 years intimately connected with the Bailey-Drake Co., which he founded, died Nov. 29 from pneumonia, following an attack of influenza. Mr. Bailey organized the Bailey Specialty Co. in San Francisco and this was later changed to the Don E. Bailey Co. In 1914 Mr. Drake, then general sales manager of the Remington Arms Union Metallic Cartridge Co., resigned that position to enter the firm, when the name was changed to Bailey-Drake Co. At present the company has branches in San Francisco, Seattle and Kansas City, the principal headquarters having recently been moved from San Francisco to Chicago.

**Prominent Maine Dealer Dies**

PORTLAND, Dec. 15—Albert M. Speare, Jr., one of the most widely known automobile men in New England, and president of the Portland Automobile Dealers' Association, died here yesterday after a brief illness. He had handled some of the best known cars on the market, and he was the distributor of Dodge Brothers cars since that line was introduced into Maine.

**Harry Biggs Appointed General Sales Manager of Studebaker**

CHICAGO, Dec. 15—Harry Biggs has been appointed general sales manager of the Studebaker Corp., South Bend. He was formerly Chicago manager for the Frank Seaman Advertising Agency.

**McAdoo Leases Houk Home**

LOS ANGELES, Dec. 16—W. G. McAdoo, former secretary of the treasury and director of railroads, has leased the Los Angeles home of the late George W. Houk. He will move in Jan. 1 and occupy the premises for three months.

**Turner Goes to Buick**

NEW YORK, Dec. 15—Frank Turner, formerly comptroller of the Du Pont Co., has been appointed comptroller of the Buick division of the General Motors Co., with headquarters at Flint, Mich. J. B. Broad is appointed to the vacant office of the Du Pont Co.

**Tractor Show in Milwaukee**

MILWAUKEE, Dec. 14—One of the largest and most comprehensive exhibitions of tractors and power farm machinery ever staged under one roof was that which accompanied the thirteenth annual convention of the Wisconsin Implement Dealers' Association at Milwaukee, Dec. 10, 11 and 12. The entire Auditorium was pressed into service to accommodate the display, the general sessions, and sectional meetings. The machinery exposition contained more than 350 distinct exhibits, from giant tractors to automatic milkers. Farm lighting systems were an interesting feature.

## AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>		
Muriatic, lb.	.02	-.03
Phosphoric (85%)	.35	-.39
Sulphuric (60), lb.	.006	
<b>Aluminum:</b>		
Ingot, lb.	.33	
Sheets (18 gage or more), lb.	.42	
Antimony, lb.	.13%	-.13%
<b>Burlap:</b>		
8 oz., yd.	.17½	-.17½
10½ oz., yd.	.21½	-.22

<b>Copper:</b>		
Elec., lb.	.26	
Lake, lb.	.26	
<b>Fabric, Tire (17½ oz.):</b>		
Sea Is., combed, lb.	1.65-1.70	
Egypt, combed, lb.	1.25-1.35	
Egypt, carded, lb.	1.20-1.30	
Peelers, combed, lb.	1.05-1.20	
Peelers, carded, lb.	.95-1.05	
<b>Fibre (½ in. sheet base), lb.</b>		
	.50	

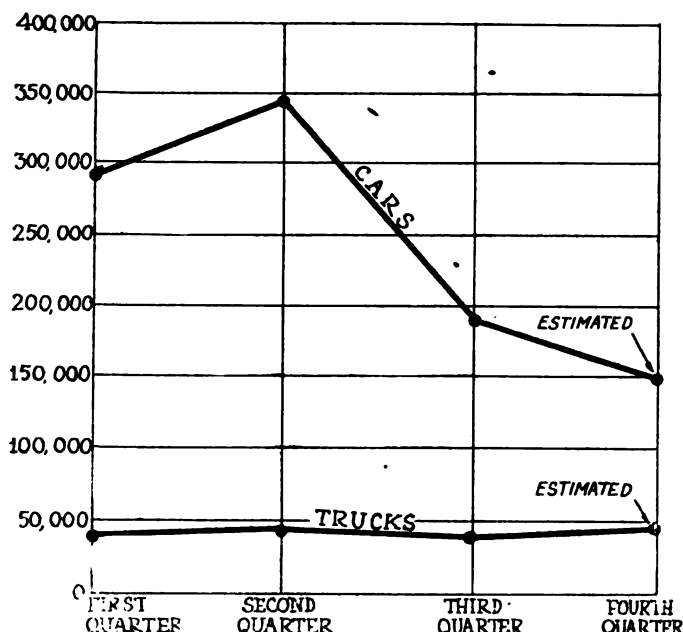
<b>Graphite:</b>		
Ceylon, lb.	.09	-.22
Madagascar, lb.	.10	-.15
Mexico, lb.	.03%	
Lead, lb.	.06%	-.07%
<b>Leather:</b>		
Hides, lb.	.18	-.35%
Nickel, lb.	.40	
<b>Oil:</b>		
<b>Gasoline:</b>		
Auto, gal.	.24½	
68 to 70 gal.	.30½	
<b>Lard:</b>		
Prime City, gal.	2.30-2.35	
Ex. No. 1, gal.	1.62	
Linseed, gal.	1.63-1.65	
<b>Menhaden (Brown), gal.</b>		
	1.35-1.36	
<b>Petroleum (crude),</b>		
Kansas, bbl.	2.25	
Pennsylvania, bbl.	4.00	

<b>Rubber:</b>		
<b>Ceylon:</b>		
First latex pale crepe, lb.	.56	
Brown crepe, thin, clear, lb.	.53	
Smoked, ribbed sheets, lb.	.54½	
<b>Para:</b>		
Up River, fine, lb.	.63½	
Up River, coarse, lb.	.37½	
Island, fine, lb.	.54	
Shellac (orange), lb.	.74	-.75
Speiter	.08½	-.08%
<b>Steel:</b>		
Angle beams and channels, lb.	.03	
Automobile sheet (see sp. table).		
Cold rolled, lb.	.06½	
Hot rolled, lb.	.03½	
Tin	.71	
Tungsten, lb.	2.00-2.50	
Waste (cotton), lb.	.12%	-.17

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes when seconds up to 15 per cent are taken per 100 lbs.	Primes only per 100 lbs.
Automobile body stock	\$5.95	\$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat, fender, door and apron, or splash guard stock	6.05	5.95
Crown fender, cowl and radiator casing, extra deep stamping	6.55	6.45
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20
<b>Automobile Sheet Extras for Extreme Widths:</b>		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
<b>Black Sheet Extras to Apply to Narrow Widths:</b>		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		



The effect of wartime conditions on the automotive industry may be gaged by taking the figures shown on this chart in relation to the 1917 production of 1,718,000 cars and 160,000 trucks

## Automobile Securities on the Chicago Exchange at Close Dec. 14

Net				Net				Net			
Bid	Asked	Ch'ge		Bid	Asked	Ch'ge		Bid	Asked	Ch'ge	
Auto Body Company	5	8	-2	Motor Products Corp.	40			Ajax Rubber Co.	66	68	+2
Briscoe Motor Car, com.	11			Nash Motors Co., com.	175	200	+25	Firestone T. & R., com.	125	130	..
Briscoe Motor Car, pfd.	40	55	..	Nash Motors Co., pfd.	87	92	+5	Firestone T. & R., pfd.	99	101	..
Chandler Motor Car	108½	110½	+4½	National Motor Co.	9	12½	..	Fisk Rubber Co., com.	60	65	..
Chevrolet Motor Car	144	146	..	Packard Motor Car, com.	105	115	-10	Fisk Rubber, 1st pfd.	97	103	..
Cole Motor Car Co.	90	105	..	Packard Motor Car, pfd.	97½		+2½	Fisk Rubber, 2d pfd.	80	84	+4
Continental Motors, com.	8½	8½	-½	Palge-Detroit Motor, com.	23	25	..	Fisk Rubber, 1st pfd. conv.	90	97	..
Continental Motors, pfd.	92	96	..	Palge-Detroit Motor, pfd.	8½	9½	..	Goodrich, B. F., com.	56	57	+1
Edmunds & Jones, com.	20	22	+2	Peerless Motor Truck	17	20	+3	Goodrich, B. F., pfd.	104	106	+2
Edmunds & Jones, pfd.	75	90	..	Pierce-Arrow Mot. Car, com.	43½	44½	..	Goodyear T. & R., com.	210	217	-15
Electric Storage Bat.	50	54	..	Pierce-Arrow Mot. Car, pfd.	103½	104	+1½	Goodyear T. & R., 1st pfd.	104	106	+2
Federal Motor Truck	31	35	..	Premier Motor Corp., com.	4			Goodyear T. & R., 2d pfd.	100	101	-1
Fisher Body Co., com.	35½	37½	-½	Premier Motor Corp., pfd.		75	..	Kelly-Springfield, com.	64	66	+2
Fisher Body Co., pfd.	92	93	-½	Prudden Wheel Company	15½	17½	+ ½	Kelly-Springfield, pfd.	80	91	-8
Ford Motor of Canada	225	235	+10	Reo Motor Car Co.	21½	22½	-½	Lee Tire & Rubber Co.	22	24	+2
General Motors, com.	125½	126½	-1	Republic Motor Truck, com.	35½	38	+2½	Marathon Tire & Rubber		55	..
General Motors, pfd.	80½	82½	+ ½	Republic Motor Truck, pfd.	89	92	+1	Miller Rubber Co., com.	142	148	..
Hupp Motor Car, com.	4½	5	..	Saxon Motor Car, com.	8½	10½	+ ½	Miller Rubber Co., pfd.	96	98	..
Hupp Motor Car, pfd.	81	85	..	Scripps-Booth Corp.	21	25	..	Rubber Products Co.		101	..
Kelsey Wheel Co., com.	28	30	..	Stewart Warner Speed Corp.	77	79	+2	Portage Rubber Co., com.	145	149	..
Kelsey Wheel Co., pfd.	85	90	..	Stromberg Carburetor Co.	31	36	+5	Swinehart T. & R. Co.	50	60	..
Manhattan Electric S. com.		48	..	Studebaker Corp., com.	51½	52½	-1	U. S. Rubber Co., com.	74	75	+12
Maxwell Motor, com.	28½	29½	..	Studebaker Corp., pfd.	93	97	+4	*U. S. Rubber Co., pfd.	108	108½	+½
Maxwell Motor, 1st pfd.	52	53	+ ½	Stutz Motor Car Co.	52	54	+2				
Maxwell Motor, 2d pfd.	20½	21½	-½	United Motors Corp.	23½	25½	+ ½				
McCord Mfg., com.	80	85	..	*White Motor Co.	47	48	+1				
McCord Mfg., pfd.	90	95	..	Willys-Overland, com.	24½	25½	-½				
Mitchell Motor Co.	25	35	-5	Willys-Overland, pfd.	88	89	+1				

\*Ex Dividend.

**Holt Back on Peace Work**

PEORIA, Dec. 15—The Holt Mfg. Co., which has been engaged for the past 18 months in manufacturing tractors for the war department to be used in Europe, has returned to a peace basis, all war contracts having been cancelled. For a time, three shifts of employees, working 8 hours each, were required to keep pace with the orders. The company has employed 6000 men the greater part of the year.

From now on, the plant will be devoted exclusively to the manufacture of tractors for agricultural and commercial purposes. Camp Herring, the War Department's instruction school for the training of tractor drivers and mechanics, operated adjoining the Holt plant, has been closed and the barracks and other buildings will be dismantled. As rapidly as a trainload of tractors was shipped, a squad of drivers and mechanics, sufficient to take care of each machine, was sent along. In all 5000 tractor drivers and mechanics were trained at Camp Herring, and these men are now returning from Europe and, in many instances, will be seeking employment from tractor owners. Their thorough training will render them invaluable to farmers who favor tractors.

**Canadian Hayes to Make Axles**

CHATHAM, ONT., Dec. 16—It is stated that the Hayes Wheel Co. will shortly begin the manufacture of complete axles in addition to its present line of wheels, hubs, rims, etc. The company has been handling a large shell contract for the Canadian Government in a special plant. The plant was laid out and equipped with a view to converting it for the construction of passenger car axles and the present plan is to convert the plant as quickly as possible.

**Killen-Straight on the Block**

APPLETON, Wis., Dec. 14—The plant and other assets of the Killen-Straight Mfg. Co., Appleton, Wis., manufacturer of tractors and gas engines, were sold at receiver's sale on Dec. 12 to A. W. Priest, an Appleton manufacturer, who intends to use the plant for the production of pumps, blowers and similar mechanical devices and discontinue the tractor line. The purchase price is \$22,000, which requires confirmation by the Circuit Court on Dec. 23. The Killen-Straight Co. was placed in the hands of a receiver early in June this year.

**Happy Farmer Increases Capital**

BUCYRUS, OHIO, Dec. 16—The Ohio Happy Farmer Tractor Co. has increased its capitalization from \$20,000 to \$40,000. The new issue consists of 200 shares of common stock of a par value of \$100.

**Four-Wheel La Crosse Tractor**

LA CROSSE, WIS., Dec. 16—The La Crosse Tractor Co. is shortly to enter the market with a four-wheel type of farm tractor. This will be known as model G, and though it differs considerably from

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

its predecessor, model F, it is not entirely a new model, but is essentially a modification of the former, in which two front wheels take the place of the single front wheel used heretofore.

**Detroit Office for General Steel**

MILWAUKEE, Dec. 15—The General Steel Co., manufacturer of die blocks, piston rods and tool steel, will hereafter be represented in the Michigan district by D. J. Crowley, 823 Dime Bank Building, Detroit.

**\$7,628,783 for Army Cars**

WASHINGTON, Dec. 14—A statement of expenditures in the annual report of the Chief of Ordnance shows that a total of \$7,628,783.67 was expended for the fiscal year of 1918 for Army motor cars.

**The Use of Measuring Wires***(Continued from page 1056)*

the first or simple formula for 60-deg. threads rarely equal 0.0001 in., and then only when the helix angle is large.

It has been claimed that measurements of effective diameter made by the three-wire method result in values which are smaller than those secured by other means, such as by thread micrometers. This contention is probably justified in some cases and may be due to insufficient care in making measurements. It is important in making measurements that as little pressure as possible be applied on the wires with the measuring micrometers. Since the wires rest in a V-thread, a given pressure exerted on the top of the wire will have a magnified effort of distorting the wire where the contact is made on the sides of the thread. This will result in the measurement over the wires being less than it should be. Furthermore, if the wire is standardized under a light pressure and then used with a larger pressure the diameter of the wire which is substituted in the formula for computing the effective diameter will be larger than it should be. This difference is multiplied by the factor 3 in the formula and the tendency is to make the result small. Excess pressure is often placed upon the wires during the measurement by use of ratchet or friction stops on micrometers; or by an unskilled operator, and sometimes on account of the arrangement of the wires and the screw thread when the measurements are taken. It is poor practice to support the screw being measured on two wires which are in turn supported on a horizontal surface, for if the screw is of large diameter the weight of the screw causes a distortion of the wires and interferes with the measurement.

**Studebaker to Double Capacity**

SOUTH BEND, Dec. 16—According to present plans of the Studebaker Corp., the South Bend plant will add 7000 employees during the next year and double the present capacity of the factory. The plant will be in complete operation by the summer of 1920. The new plant will have a capacity of 100,000 finished automobiles annually, and with the 60,000 annual output of its combined Detroit plants, the corporation will more than double its capacity in the manufacture of cars.

**\$15,000,000 Studebaker Notes Issued**

NEW YORK, Dec. 16—The Studebaker Corp. has completed the financing plan which has been on the boards for several weeks and this takes the form of an issue of \$15,000,000 in 7 per cent serial notes maturing in various amounts from Jan. 1, 1921, to Jan. 1, 1929.

**"The Automobile After the War"***(Continued from page 1058)*

a publicity campaign appropriate to the section of the country and the kind of purchasers to be reached; keeping a large stock of parts of different cars and models ready to be delivered to owners; a large stock of accessories and an up-to-date shop sufficiently well equipped to carry on even very important repairs; maintaining a large number of show cars by means of which it would be possible to demonstrate to the prospective buyer the dominant qualities and advantages of each model. As to the methods of payment, cash or different installment plans should be offered to the buyer. This is an indispensable condition of popularizing the automobile among small manufacturers, doctors, veterinary surgeons, etc. In this connection Mr. Cote mentions the "automobile bank" which was organized for this purpose but failed. Here is a field in which financiers can take the initiative and start a financial organization in which the manufacturers could well afford to participate.

**Branch Office vs. Direct Agency**

Mr. Cote is in favor of direct agencies and thinks that this is the best method for both the buyer and the manufacturer. Further, he thinks that these should be located throughout France and its colonies. On the other hand, he believes it would be a serious mistake not to take advantage of independent organizations which already possess a number of garages and repairshops. These would prove valuable auxiliaries to the automobile industry, and there is no reason why sufficient guarantees could not be offered to such organizations to include them in a general association as described above, and having a purely commercial purpose.

Mr. Cote is very much in favor of combining and centralizing in an independent and democratic way manufacturers and sales organizations to lead the automobile industry to triumphant success. This success can be attained by co-operative but not by isolated efforts.



# Calendar

## ENGINEERING

### S. A. E. Meetings 1919

- Jan. 8—Minneapolis Section, S. A. E.—Hotel Radisson. "Governors for Tractors and Truck Engines."
- Feb. 4-6—New York. Winter Meeting. Society of Automotive Engineers, Engineering Societies' Building.
- Feb. 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Radiator Cooling Fans."
- March 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Tractor Service and Sales."
- April 2—Minneapolis Section, S. A. E.—Hotel Radisson. "Implements Designed for Tractor Belt Power and Their Characteristics."

## MOTOR SHOWS

- Dec. 25-Jan. 1—Los Angeles, Cal. Automotive Exposition.
- January—Detroit, Mich. Detroit Automobile Dealers' Assn. H. H. Shuart, Manager.
- January or February—Milwaukee, Wis. Milwaukee Auto Trade Assn. Bart J. Ruddle, Manager.
- Jan. 24-30—Milwaukee, Wis. Eleventh Annual, Milwaukee Automobile Dealers, Inc., Auditorium. Bart J. Ruddle, Manager.
- Jan. 25-Feb. 1—Chicago. Passenger cars, Coliseum.
- February—Grand Rapids, Mich. Grand Rapids Automobile Business Assn. E. T. Conlon, Manager.
- Feb. 1-15—New York. Automobile Dealers' Assn. Charles A. Stewart, Manager, Hotel

- tel Woodward, Broadway and 55th St.
- Feb. 3-5—Chicago. Trucks, Coliseum.
- Feb. 15-22—Louisville, Ky. Louisville Auto Dealers' Assn.
- Feb. 15-22—Newark, N. J. N. J. Auto Exhibition Co. Calude Holgate, Manager.
- Feb. 15-22—Minneapolis, Minn. Northwestern Automotive Exposition, Overland Building.
- Feb. 15-22—Minneapolis, Minn. Minneapolis Auto Trade Assn. Walter B. Wilnot, Manager.
- Feb. 17-22—Des Moines, Iowa. Tenth Annual, Des Moines Automobile Dealers' Assn. C. G. Van Vleet, Manager.
- Feb. 15-22—Albany, N. Y. Albany Automobile Dealers' Assn. State Armory.
- Feb. 17-24—Passenger Cars; Feb. 24-27, Trucks—South Bethlehem, Pa. Lehigh Valley Auto Shows Co. J. L. Elliott, Manager.
- Feb. 24-March 1—Kansas City, Mo.—Kansas City Motor Dealers' Assn. E. E. Peake, Manager.
- March—Great Falls, Mont.—Montana Automobile Distributors' Assn.
- March—Philadelphia, Pa. Philadelphia Automobile Trade Assn. Passenger cars.
- March—Motor Truck Assn. Trucks.
- Mar. 3-8—Columbus, O. Columbus Automobile Show Co., Memorial Building. W. W. Freeman, Manager.
- March 3-8—Buffalo, N. Y. Buffalo Automobile Dealers' Assn.
- March 1-10—San Francisco, Cal. Motor Car Dealers' Assn. G. A. Wahlgreen, Manager.

- March 10-15—Syracuse, N. Y. Syracuse Automobile Dealers' Assn. Harry T. Gardner, Manager.
- Second or third week March—St. Louis, Mo. St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Manager.
- March 15-22—Boston, Mass. Boston Automobile Dealers' Assn. Chester I. Campbell, Manager.
- March 22-29, Passenger Cars; April 1-5, Trucks—Brooklyn. Brooklyn Motor Vehicle Dealers' Assn. I. C. Kirkham, Manager.
- Third week March—Trenton, N. J. Trenton Auto Trade Assn. John L. Brock, Manager.
- Probably March—Chicago. Chicago Automobile Trade Assn.
- March—Philadelphia. Philadelphia Automobile Auto Trade Assn. A. L. Maltby, Manager.
- March—Pittsburgh. Automobile Dealers' Assn. of Pittsburgh. John J. Bell, Manager.
- March—Syracuse, N. Y. Syracuse Automobile Dealers' Assn. Harry T. Gardner, Manager.
- March—Utica, N. Y. Utica Motor Dealers' Assn. W. W. Garabrant, Manager.
- Late March or early April—Cleveland, Ohio. Cleveland Auto Show Co. Fred H. Caley, Manager.
- April 5-12—Montreal, Can.—National Motor Show of Eastern Canada, Victoria Rink. T. C. Kirby, Manager.

- Not decided—Bridgeport, Conn. Auspices of City Battalion. B. B. Steiber, Manager.
- Not decided—Harrisburg, Pa. Harrisburg Motor Dealers' Assn. J. Clyde Myton, Manager.
- Not decided—Hartford, Conn. Hartford Automobile Dealers' Assn.
- Not decided—Indianapolis, Ind. Indianapolis Auto Trade Assn. John B. Orman, Manager.
- Not decided—Kansas City, Mo. Kansas City Motor Dealers' Assn. E. E. Peake, Manager.

## TRACTOR SHOWS

- Feb. 10-15—Kansas City, Mo. Fourth Annual Tractor Show. Sweeney Building. Kansas City Tractor Club. Guy H. Hall, Sec.
- Feb. 18-22—Wichita, Kan. Annual Mid-west Tractor and Thresher Show. Wichita Tractor and Thresher Club. Forum.

## CONVENTIONS

- Dec. 30-Jan. 1—Chicago, Ill. Twelfth Annual Meeting American Society of Agricultural Engineers. J. W. Dickinson, Secretary, Ohio State University, Columbus.
- Jan. 12-14—New York. Meeting. Society Automotive Engineers.
- Feb. 25-28—New York. Sixteenth Annual Convention. American Road Builders' Assn.

## War Adjustment Committee for M. A. M. A.

NEW YORK, Dec. 15—The Motor and Accessory Manufacturers Assn. has appointed a War Adjustment Committee with full power to act and to establish, if necessary, a Washington office. The committee has been formed to do such work as is necessary for M. A. M. A. members in matters relative to reconstruction policies, and particularly to cancellation of Government contracts. Members of the committee are: Chairman, Charles E. Thompson, president Steel Products Co., Cleveland; Christian Girl, president Standard Parts Co., Cleveland; Alexander W. Copland, president Detroit Gear & Machine Co., Detroit. R. M. McConnell will represent the committee in Washington.

## Simplex Will Be Continued

NEW BRUNSWICK, N. J., Dec. 15—The entire assets and good will of the Simplex Automobile Co. will be placed on public sale at 10 a. m. Dec. 20 by the Wright-Martin Aircraft Corp., which owns and controls the Simplex company. The sale is merely for the purpose of simplifying accounting methods between Wright-Martin and its subsidiaries and does not mean that the Simplex company will cease to exist. Wright-Martin has every intention of continuing the

company as a going concern and is understood to have plans well afoot for a post-war model:

## Army Trucks for Post Office

WASHINGTON, Dec. 15.—Reports to the effect that the Post Office Department has requisitioned 10,000 parcel post trucks for use in the mail service are untrue. Although the Post Office contemplates using this many and possibly more than this number of trucks, it is making its requisitions only as the occasion warrants. The trucks will in all instances be requisitioned from the War Department and will not be purchased from manufacturers owing to the law which orders the War Department to turn over motor trucks to the Post Office for mail service as they are requisitioned.

## Clutches and Controls for Detlaff

DETROIT, Dec. 15—The A. J. Detlaff Co. will hereafter confine its entire plant to the production of clutches and control sets, which have formed a large proportion of its output since its inception, in 1903. For the past year the company has been working on a 100 per cent war basis, building Type B clutches and controls, Type AA clutches and Quad control sets, and is well fitted to continue supplying these parts for the trade.

## Registration Gain in Massachusetts

BOSTON, Dec. 15—Figures compiled by the Massachusetts Highway Commission for the first eleven months of this year relative to the motor registrations, etc., show that the industry in the Bay State weathered the war very well. Instead of a big falling off in the listing of vehicles there was a general gain, when a comparison is made with the same period of 1917. Here are the comparative figures:

	1917	1918	Increase
Cars .....	147,301	160,486	13,175
Trucks .....	26,964	33,011	6,047
Total vehicles ..	174,274	193,497	19,223
Motorcycles .....	11,065	12,862	1,797
Dealers, etc. ....	2,379	2,493	114
Licenses .....	69,487	67,523	-1,964
Renewals .....	144,742	167,312	22,570
Examinations .....	17,336	17,241	-95
Receipts .....	\$1,969,813	\$2,184,408	\$214,595

\*Decrease.

## Selden Declares Dividend

ROCHESTER, N. Y., Dec. 15—At a meeting of the board of directors of the Selden Truck Sales Co., held at the general offices, a dividend of 5 per cent was declared on the first preferred stock, payable Jan. 2, 1919. At the same meeting a quarterly dividend of 2 per cent was also declared payable to stockholders of record as of Jan. 2, 1919. It is stated that shipments during the month ended Dec. 7 were greater by 28 percent than those of any month in the past two years.

# Accomplishments of the Signal Corps

## Need of Purchasing Foreign Planes Early Realized—Plane Production at Rate of Nearly 3000 a Year 6 Months After Declaration of War

WASHINGTON, Dec. 13—That the Signal Corps fully realized the need for purchasing foreign combat planes until the United States was in a position to manufacture its own in sufficient quantities is one of the important points brought out in the annual report of General George O. Squier.

It was just prior to June 30, 1918, that John D. Ryan was appointed to take over this work and head the Bureau of Aircraft Production. A general policy was outlined with the opening of the war which included plans to fill vacancies in Allied flying schools with American cadets, the purchase of all the combat planes from France which could be spared, pending our own production of battleplanes, the establishment of schools and flying fields in this country, the building of training planes in this country, and the building of such types of battleplanes in this country as indicated by the needs of our Army at the front.

Within 6 months from the time war was declared, says the report, advanced training planes were being produced at the rate of 2934 per annum, and in the 7 months from December, 1917, to June, 1918, 910 battleplanes were turned out. The Curtiss JN4-D and the Standard J training planes were adopted with the OX5 and Hall-Scott A-7A engines. These planes were turned out to the number of 1204 up to June, 1918.

In explanation of the expenditures from the \$640,000,000 aviation appropriations, the report states that during the 12 months ended June 30, 1918, \$208,000,000 was expended exclusive of that money spent for training field construction and for operations. The expenditure exclusive of training fields and operations resulted in securing:

- 8,488 airplanes.
- 12,626 engines.
- 911 balloons.
- 115,655 instruments of various kinds.
- 2,717 hangars.
- 379 squadron equipments.
- 317,353 items of aviators' clothing.
- 33,909 items of motor transport.

For training fields and operations \$165,000,000 was expended, making a total expenditure of \$373,000,000 and leaving a balance of \$267,000,000. It was this appropriation of \$640,000,000, it will be remembered, that Congressmen and others claimed had been wastefully dissipated.

The itemized account of the expenditures and production show that Liberty engines were estimated at \$4,400 per unit, Hispano-Suiza 300-hp. engines estimated at \$5,000 per unit, OX5 engines \$2,000 per unit and 80-hp. Le Rhone engines at \$2,100 per unit.

Production of the Liberty engine started in December, 1917, with 22 engines and reached a total of 1102 for the month of June, making a total production up to June 30, 1918, of 2390. Up to the same time, 5474 OX5 engines had been produced. Twelve hundred and four training planes, 397 pursuit planes, 370 artillery planes and 143 bombing planes had been purchased

abroad besides 228 various types of experimental planes.

The JN4 training plane was estimated in the Government contracts at \$4,750 per unit. Also included in the tabulations are motor transport items which show that 7642 motor trucks at \$2,650 each and 3898 passenger cars at \$1,000 each were purchased for the Signal Corps besides numerous trailers, motorcycles and bicycles. Following is the complete report by General Squier:

### Report of the Chief Signal Officer

WAR DEPARTMENT,  
OFFICE OF THE CHIEF SIGNAL OFFICER,  
Washington, Sept. 28, 1918.

SIR: The following report of the operations of the Signal Corps for the fiscal year 1918 is submitted:

The work to May 20, 1918, comprised the development of the Army's aviation program, supply of the Army's telephone, telegraph, radio and annunciator-buzzer systems, supply of its flag, panel and projector and other signaling requirements, its pigeon, motorcycle dispatch, meteorological and time services and the photographic work for the pictorial history of the war.

### Aviation

On May 20, 1918, an executive order created the Division of Military Aeronautics and the Bureau of Aircraft Production, and relieved the Signal Corps of its aviation duties, with the exception of the design and manufacture of all radio apparatus required in the air service. In their annual reports the officers of the new division and bureau will cover their activities, as all aviation personnel, equipment and records have been transferred to them by virtue of the above executive order. Accurate records are available in the new division and bureau created which will enable a minute report of these activities to be prepared at some future time.

It is considered advisable, however, to briefly state some salient facts in this connection which, it is believed, can be safely given at this time.

One of the first steps taken by the Chief Signal Officer at the outbreak of the war was to outline some air program commensurate with the resources of the nation and the importance of the part to be played by our army in the war. It was necessary to have this in sufficient detail to form some estimate which could be presented to Congress as a basis for

### Personnel Data

	1917								1918					Total
	April	June	July	August	September	October	November	December	January	February	March	April	May	
Nonfliers.....			127	71	444	530	1,124	701	856	1,454	1,145	54	1,640	8,146
Trained fliers.....	52	94	38	—2	74	330	327	333	663	434	2,206	1,652	1,737	7,938
Total officers.....	52	94	165	69	518	860	1,451	1,034	1,519	1,888	3,351	1,706	3,377	16,084
Cadets.....				1,104	562	628	646	785	476	504	1,052	—70	—334	5,153
Enlisted men.....	1,100	108	997	9,491	578	1,891	14,167	51,191	4,875	17,072	19,197	4,378	9,832	142,779
Civilian employees <sup>1</sup> .....	210	414	239	473	655	746	665	852	870	972	1,349	1,473	920	9,838
Plane and engine contractors employees.....		7,298	967	926	2,121	1,622	3,234	5,224	8,609	9,272	3,554	5,929	8,047	56,803
Examining boards <sup>2</sup> .....		8	4	—	5	3	2	20	18	—17	—5	—10	—5	23
Ground schools.....		8												7
Flying schools.....	2	2	1	1	2		1	9				2	5	25
Balloon schools.....	1					1		1				2		5
Photographic schools.....							2		2					4
Schools for mechanics.....							6	1	8	11	2	—13		15
Hours flown.....					6,863	6,707	8,808	11,965	24,891	50,807	57,212	81,356	98,358	346,967
Flying deaths (United States).....	3			4	5	2	4	8	10	26	20	18	26	126

<sup>1</sup>Includes about 13 per cent of Signal Corps proper.

Norm.—Squadrons trained, equipped, and on fighting front, June, 1918, 8; July, 1918, 40; August, 1918, 52; September, 1918, 58.

<sup>2</sup>Approximate.

**Statement of Condition of Current Appropriations, Including Cash Disbursements  
Thereunder, June 30, 1918**

Appropriation and Allotment	Amount of Appropriation or Allotment	ORDERS AND AUTHORITIES		Balance	CASH DISBURSEMENTS		
		Fixed Price	Cost Plus <sup>1</sup>		Reported	Unreported	Total
<b>Increase for Aviation-Signal Corps, 1918:</b>							
Equipment division—							
201. Airplanes and spare parts.....	\$122,700,000.00	\$78,539,212.50	\$128,576,174.00	\$84,415,396.50	\$81,441,140.89		\$81,441,140.89
202. Engines and spare parts.....	280,770,000.00	39,410,652.25	208,142,885.00	33,216,462.75	67,687,903.80		67,687,903.80
203. Transportation.....	35,248,800.00	42,938,630.73		7,689,830.73	19,190,008.89		19,190,008.89
204. General equipment.....	11,427,800.00	34,979,741.53		23,551,941.53	22,332,938.50		22,332,938.50
205. Maintenance.....	22,050,000.00	17,948,955.00		4,101,044.40	4,822,886.89		4,822,886.89
206. Special clothing.....	1,858,440.00	2,520,512.63		662,072.63	2,154,788.34		2,154,788.34
207. Machine guns, ammunition, and bombs.....	37,500,000.00	29,249,033.29		8,250,966.71	29,281,207.62		29,281,207.62
208. Acquisition of plants.....	6,000,000.00	2,595,599.83		3,404,400.17	1,036,952.54		1,036,952.54
209. Miscellaneous.....	7,063,400.00	7,748,617.75		685,217.75	6,008,772.14		6,008,772.14
<b>Total.....</b>	<b>524,618,440.00</b>	<b>255,930,956.11</b>	<b>336,719,050.00</b>	<b>68,031,575.11</b>	<b>233,956,599.61</b>		<b>233,956,599.61</b>
<b>Construction division—</b>							
221. Purchase of land.....	950,000.00	695,429.19		254,570.81	583,065.27		583,065.27
222. Lease of land.....							
223. Construction of buildings, United States.....	30,506,400.00	50,863,057.71		20,357,257.71	41,317,796.75		41,317,796.75
224. Construction of buildings abroad.....	10,000,000.00	10,673,577.65		673,577.65	19,020,095.09		19,020,095.09
<b>Total.....</b>	<b>41,456,400.00</b>	<b>62,232,664.55</b>		<b>20,776,264.55</b>	<b>60,920,957.11</b>		<b>60,920,957.11</b>
<b>Balloon division—</b>							
241. Balloons.....	11,800,000.00	9,780,156.85		2,019,843.15	1,863,302.39		1,863,302.39
242. Accessories.....	1,000,000.00	477,853.25		522,146.75	277,177.79		277,177.79
243. Balloon buildings.....	995,000.00	98,884.16		896,115.84	1,387,973.77		1,387,973.77
244. Transportation.....	5,000,000.00	1,243,749.26		3,756,250.74	694,148.33		694,148.33
245. Gas.....	5,000,000.00	3,479,402.50		1,520,597.50	6,499,864.22		6,499,864.22
246. Miscellaneous.....	3,324,550.00	1,830,845.18		1,493,704.82	695,755.77		695,755.77
<b>Total.....</b>	<b>27,119,550.00</b>	<b>16,910,891.20</b>		<b>10,208,658.80</b>	<b>11,418,222.27</b>		<b>11,418,222.27</b>
<b>Schools division—</b>							
261. Aeronautical schools, maintenance.....	1,056,000.00	1,016,223.48		39,776.52	1,190,367.42		1,190,367.42
<b>Finance division—</b>							
281. Expenses on special duty at home and abroad.....	67,200.00	50,140.00		17,060.00	50,140.00		50,140.00
282. Pay of Reserve Corps and traveling expenses.....	31,627,862.00	14,074,995.85		17,552,866.15	3,053,039.73		3,053,039.73
283. Pay of civilian employees.....	5,720,000.00	3,849,807.67		1,870,192.23	3,879,636.82		3,879,636.82
284. Vocational training.....	120,000.00	238,085.73		118,085.73	161,500.12		161,500.12
285. Subsistence and travel of students.....	756,000.00	0.00		756,000.00	0.00		0.00
286. Experimental investigations.....	1,458,548.00	2,710,108.40		1,251,650.40	1,614,473.02		1,614,473.02
287. Miscellaneous expenses.....	900,000.00	137,543.16		762,456.84	158,895.78		158,895.78
288. Departments and depots.....	1,000,000.00	185,595.14		814,404.86	262,667.74		262,667.74
289. Reserve for foreign expenditures.....	4,000,000.00	17,400,000.00		13,400,000.00	17,400,000.00		17,400,000.00
290. Expenses for the Aircraft Board.....	100,000.00	47,250.00		52,750.00	58,169.59		58,169.59
<b>Total.....</b>	<b>45,749,610.00</b>	<b>38,673,615.95</b>		<b>7,075,994.05</b>	<b>26,638,522.80</b>		<b>26,638,522.80</b>
<b>Total, increase for Aviation-Signal Corps, 1918.....</b>	<b>640,000,000.00</b>	<b>374,764,351.29</b>	<b>336,719,050.00</b>	<b>71,483,410.29</b>	<b>334,124,669.21</b>	<b>3,726,605.71</b>	<b>337,851,274.92</b>
<b>Sales section—Obligations<sup>2</sup>.....</b>		<b>157,969,653.42</b>	<b>18,955,250.00</b>	<b>176,924,903.42</b>	<b>25,966,739.95</b>		<b>25,966,739.95</b>
<b>Total disbursements, increase for Aviation-Signal Corps, 1918<sup>2</sup>.....</b>					<b>360,091,409.16</b>	<b>3,726,605.71</b>	<b>363,818,014.87</b>
<b>Other aeronautical appropriations and allotments:</b>							
Aviation, seacoast defenses.....	2,839,010.98	21,407.12		2,817,603.86	24,511.14		24,511.14
Aviation, seacoast defenses, insular possessions, Hawaii.....	438,677.97	84,445.00		354,232.97			
Aviation, seacoast defenses, insular possessions, Philippines.....	578,110.36	2,078.66		576,031.70	52,509.70		52,509.70
Aviation, seacoast defenses, Panama Canal.....	500,000.00	482,000.00		18,000.00	485,739.00		485,739.00
Aviation, Navy, 1917-18, Navy transfer under act Mar. 4, 1915 <sup>2</sup> .....	350,000.00	350,000.00		0.00	333,000.00		333,000.00
Signal service of the Army (no year).....	4,500,000.00	4,333,484.59		166,515.41	4,375,000.00		4,375,000.00
Signal service of the Army 1917-18, aeronautics act June 15, 1917 <sup>2</sup> .....	31,846,067.16	31,846,067.16		0.00	41,024,350.46		41,024,350.46
Signal Service of the Army 1918, aeronautics act May 12, 1917 <sup>2</sup> .....	10,800,000.00	8,421,162.79		2,378,837.21	20,121,191.82		20,121,191.82
<b>Total, other aeronautical appropriations and allotments.....</b>	<b>51,851,866.47</b>	<b>45,540,645.32</b>		<b>6,311,221.15</b>	<b>66,416,302.12</b>		<b>66,416,302.12</b>
<b>Total, all aeronautical appropriations and allotments.....</b>	<b>691,851,866.47</b>	<b>578,274,650.03</b>	<b>355,674,309.00</b>	<b>242,097,092.56</b>	<b>426,507,711.28</b>	<b>3,726,605.71</b>	<b>430,234,316.99</b>
<b>Signal service appropriations and allotments:</b>							
Signal Service of the Army 1917-18, Signal Service act June 15, 1917 <sup>2</sup> .....	15,421,698.84	15,421,698.84		0.00	( <sup>3</sup> )		( <sup>3</sup> )
Signal Service of the Army, 1918 <sup>2</sup> —							
Signal Service act May 12, 1917.....	\$1,000,000						
Signal Service act Oct. 6, 1917.....	40,000,000						
<b>Total.....</b>	<b>41,000,000.00</b>	<b>43,378,837.21</b>		<b>2,378,837.21</b>	<b>(<sup>3</sup>)</b>		<b>(<sup>3</sup>)</b>
Maintenance, etc., fire control installations at seacoast defenses.....	141,339.43	78,876.30		62,463.13	129,667.10		129,667.10
Maintenance, etc., fire control installations at seacoast defenses, insular possessions.....	12,506.58	12,041.53		465.05	10,780.46		10,780.46
Maintenance, etc., fire control installations at seacoast defenses, Panama Canal.....	10,650.68	9,334.12		1,316.56	10,525.66		10,525.66
Washington-Alaska Military Cable and Telegraph Systems, 1918-19.....	50,000.00	49,904.22		95.78	49,905.00		49,905.00
Signal equipment Enlisted Reserve Corps, 1918.....	300,000.00	300,000.00		0.00	298,500.00		298,500.00

<sup>1</sup>Cost plus obligations are included under fixed price column, except for airplanes and engines.



Statement of Condition of Current Appropriations, Including Cash Disbursements  
Thereunder, June 30, 1918—Continued

Appropriation and Allotment	Amount of Appropriation or Allotment	ORDERS AND AUTHORITIES		Balance	CASH DISBURSEMENTS		
		Fixed Price	Cost Plus <sup>1</sup>		Reported	Unreported	Total
Commercial Telephone service at Coast Artillery Posts, 1918— Act May 12, 1917..... \$8,500 Act Oct. 6, 1917..... 5,000							
	13,500.00	13,500.00		0.00	13,416.00		13,416.00
Fire control in insular possessions.....	12,834.38	4,251.59		8,582.79	10,196.68		10,196.68
Fire control at fortifications.....	16,026.90	8,826.94		7,198.96	7,338.80		7,338.80
Fire control at fortifications, act June 15, 1917.....	446,761.96	213,611.73		233,150.23	349,550.00		349,550.00
Contingent expenses seacoast fortifications.....	51,038.68	46,573.30		4,465.38	49,000.00		49,000.00
Board of Ordnance and Fortifications.....	15,088.43	689.13		14,399.30	13,254.09		13,254.09
Supplies, services and transportation, etc., 1918.....	16,882.73	15,000.00		1,882.73	15,000.00		15,000.00
Supplies, services and transportation, 1917-18.....	100,000.00	100,000.00		0.00	100,000.00		100,000.00
Ordnance and Ordnance Stores, Bureau of Ordnance, 1917-18.....	9,600.68	1,086.00		8,514.68	1,086.00		1,086.00
Total, Signal Service appropriations and allotments.....	57,617,928.29	59,654,230.91		2,036,302.62	1,058,235.81		1,058,235.81
Replacing Signal Corps supplies and equipment, 1917-18.....	136,918.43	136,281.34		637.09	133,600.00		133,600.00
Replacing Signal Corps supplies and equipment, 1918-19.....	361,954.21	124,944.23		237,009.98	125,000.00		125,000.00
Total, replacing appropriations.....	498,872.64	261,225.57		237,647.07	258,600.00		258,600.00
Grand total.....	749,968,667.40	638,190,106.51	355,674,309.00	243,895,748.11	427,824,547.09	3,726,605.71	431,551,152.80

<sup>1</sup>Cost plus obligations are included under fixed price column, except for airplanes and engines.<sup>2</sup>Unreported cash disbursements consist of cash in the hands of disbursing officers U. S. A.<sup>3</sup>Sales section, obligations include orders and authorities for materials, etc., purchased by the "Signal Corps" (old) for resale. A portion of this amount.<sup>4</sup>Cash disbursements against sales section, obligations are included under the total withdrawals of I. A. S. C. appropriation.<sup>5</sup>This is an allotment given the "Signal Corps" by the "Navy Department."<sup>6</sup>The total of these two items comprises one appropriation "Signal Service of the Army 1917-18, act June 15, 1917."<sup>7</sup>Includes withdrawals from Treasury for Signal Service part of the appropriation.<sup>8</sup>The total of these two items comprises one appropriation "Signal Service of the Army 1918."<sup>9</sup>Withdrawals from Treasury for Signal Service part of the appropriation included in withdrawals under aeronautical appropriations.

NOTE.—For the fiscal year 1918, the appropriations for both the Signal Corps and Aviation were disbursed from one office in the Bureau of Aircraft Production as a plan agreed to by the Chief Signal Officer of the Army, the Director of Aircraft Production and the Director of Military Aeronautics, which was approved by the Secretary of War. The financial statement therefore covers all of these activities.

appropriations of funds to begin this work. A program was formulated and certain general estimates prepared to inaugurate the work, and in due course Congress appropriated the sum of \$640,000,000 for the purpose. This money became available July 24, 1917.

Due to long years of practical neglect of aeronautics since the Wright Bros. brought out the original flying machine, the outbreak of war found the United States with but a handful of flyers and very few training machines. There was practically no aviation industry in this country, and the number of professional men trained as aeronautical engineers and designers was so small as to be practically negligible. In this respect the problem of developing the air program was unique. The United States had built ships before, had manufactured clothing, built cantonments, guns, ammunitions, etc., and had a splendid body of men trained in these professions; but, outside of a few men, there was no one in the United States with experience in the design or building of even training planes.

How, then, was this problem to be met? Within a few days after the outbreak of war, without proceeding through the regular diplomatic channels, an appeal was made to the military attachés of France, England and Italy to send to this country forthwith the most experienced and trained flyers, aeronautical engineers and designers who could be spared to assist us in this work. As a result, within a very short time, there arrived a number of foreign officers from these countries, who reported for duty officially to the Chief of Staff, and were immediately placed on the working staff of the Chief Signal Officer, directly in his office. Special authority was obtained from Congress to pay the mileage of these officers sent here for duty, and they were utilized in every possible way from the beginning in developing both a system of schools and the matériel required. Simultaneously a strong technical commission was sent to Europe. This policy has been continued to the present day without interruption, and new officers with the latest experience are continually arriving to replace the officers who have finished their tour of duty here. At the same time special designers from England, France and Italy were brought to this country to design machines for the United States; some of them already have produced very promising results. Coincident with this the small group of aeronautical engineers which this country had available were set to work individually on a different type of machine, and some of these machines already have been approved for production.

Within a very few days after the outbreak of war an arrangement was made between the War Department and Canada by which the United States was to receive the designs worked out for flying fields; and in order to hasten the training of our aviators during the construction of our training schools, American cadets were sent to Canada, France and Italy to be trained in their flying schools. In addition to this an arrangement was made by which 10 flying squadrons of the air service were to be trained by the British Government and also equipped with machines and transport complete and ready for service at the front, in exchange for providing flying facilities for the Royal Flying Corps of Canada during the winter months. This resulted in the movement of the Royal Flying Corps establishment to the new fields constructed at Fort Worth, Tex. This exchange also resulted in a tremendous stimulus being given to our own flying schools, which in the meantime had been completed, as it furnished a standard of training in our midst which served as a pacemaker to our own cadets.

For the period of 14 months from the outbreak of the war to the end of May, when the aviation section of the Signal Corps was turned over to the new Division of Military Aeronautics and the Bureau of Aircraft Production, the following table shows briefly the increase effected:

	April 1, 1917	May 31, 1918	Increase (per Cent)
Officers.....	52	16,084	30,930
Enlisted men.....	1,100	147,932	13,440
Civilian employees.....	210	9,838	4,680

It will be seen from the above that the Signal Corps turned over to the Division of Military Aeronautics and the Bureau of Aircraft Production, 16,084 officers and 147,932 enlisted men, and that the increase from April 1, 1917, to the time of this transfer was 31,000 per cent for officers and 13,000 per cent for enlisted men. Of these, there were 7938 officer flyers who successfully graduated from the ground and flying schools, an increase for the period of 15,246 per cent in the commissioned flying personnel. The statement on Personnel Data gives the details of these increases. There were 167 deaths due to flying accidents of the year in the United States, or one to every 147,840 miles of recorded flight, a lower ratio of deaths than that of our allies.

In reporting upon the accomplishments of the year it must not be overlooked that the greatest thing done, in a fundamental way, was the creation of an industry capable of supplying the needs of the future for aircraft and aircraft accessories, there being now engaged in this work about 350 concerns, employing an industrial army of 200,000 men and women. This accomplishment is all the greater when it is realized that everything pertaining to aircraft equipment is of a highly technical nature, extremely difficult to produce.

**Matériel.**—When the United States entered the war, it was evident that the time was fast approaching when the reservoirs of raw material for the allies were to be found only in the United States and that America's effort should be so organized from the beginning as to furnish a continuous flow of this necessary raw material, not only for our own program but for those of our allies as well. In other words it was clear that the spruce, the fabric, the dope and the oil must be produced as a part of our program on a scale to supply also the air programs of our allies.

Manifestly, therefore, each step made in the beginning must be made with a view to our allies as well, and no policy must be restricted to the United States alone. Just as our land units were later assigned to English and French units so must our materials be freely pooled and assigned to our allies as well as ourselves. The closest co-operation was established, therefore, with our allies in determining the scope of America's efforts. In addition, the needs of our own navy and the navy of Great Britain also were included in the army's program for furnishing these essentials.

One of the serious mistakes which the allies had fallen into at the time the United States entered the war was the development of a multiplicity of types of engines and planes which made it impossible to have a large number of any one of these types. As a further consequence, the trained personnel on the ground to operate and repair the machines had grown to such a proportion that it was estimated from 30 to 50 men were required on the ground to keep each one of the many types of planes in the air on the fighting line. Manifestly, unless this large number of trained men per fighting plane could be reduced by some means it would be hopeless to expect within a reasonable time to put into the air thousands of flying planes, because a single thousand planes on this basis would require from 30,000 to 50,000 men in attendance.

Common sense, therefore, dictated the following general policy, which was followed:

(a) To fill up all vacancies in allied flying schools with the maximum number which could be accommodated, to gain time in training our flyers while our schools were being built. This was done to the limit which could be accepted by each of the allied governments in Canada, Italy, England and France.

(b) To purchase from France all the combat planes which the French could possibly spare from their own needs, for delivery at the earliest moment, to supply our forces overseas, pending the time our own production of battle planes could be developed. This was done, and, furthermore, raw materials and even mechanics to help make these planes were furnished by the United States, and at the present time satisfactory deliveries are being made on these contracts entered into early in the war.

(c) To establish schools and build flying fields for training aviators in this country.

(d) To provide training planes to train aviators in this country.

(e) To build such types of battle planes in this country as the needs of our army at the front should indicate, and supply such additional aviation equipment as was required for overseas use.

The accomplishment following these policies is best shown by referring to the statements, Aviation Equipment Production and Personnel Data, which form a part of this report. The former shows month by month the actual deliveries of aviation equipment from July 1, 1917, to June 30, 1918, and the latter the monthly personnel increases for the same period.

The following comments refer to the data contained in the statement, Equipment Production:

**Primary Training Planes.**—Obviously, the first task was to provide an adequate number of training planes for our cadets. The Curtiss JN4-D and the Standard J types were selected and passed upon by the Joint Army and Navy Technical Board as the two available planes then in this country. In the quantity production of completed planes the limiting factor is the production of engines. The OX5 engine and Hall-Scott A-7A were the only two available engines, and the Standard J, while not the equal of the JN4-D plane, was approved by the said Joint Army and Navy Board because it would accommodate the Hall-Scott A-7A engine until such

time as the production of the Curtiss OX5 engines could be increased. The production of primary training planes was within six months fully adequate to the needs of the service.

**Advanced Training Planes.**—After the production of primary training planes was secured, and it was necessary to develop planes for advanced training, and within six months these planes were being produced at the rate of 3924 per annum.

**Battle Planes and Engines.**—In the development of battle planes the first problem to be solved was that of the engine. Common sense required that the most approved types of European engines which could be made in this country should be ordered. This was done, the first large contract for Hispano-Suiza engines being given July 30, 1917, while the first contract for Liberty engines was not let until Sept. 4 of that year. By the end of May, 1918, more than 2000 of these foreign motors had been produced by American factories. It was early apparent, however, that the tendency was toward greater horsepower than was being developed by any approved foreign engine. Consequently, coincident with the production of such approved types of foreign engines as were available for production in this country, a new engine, late known as the Liberty engine, was developed and placed in production. While the production of this engine at the end of May, 1918, was not as great as the production of the approved types of foreign engines which had been earlier arranged for, nevertheless, the wisdom of this course is becoming daily more apparent, since the foreign types produced here, although used by our allies on the Western Front, are not thought to be of sufficient horsepower to put in planes for overseas shipment, and the Liberty engine has become the main reliance of our battle program. It has proved satisfactory not only to our own Army and Navy, but to the air services of our allies as well. It is not an invention, but stands as the accomplishment of American adaptability and foresight. The development of the Liberty motor was required by the logic of the situation, which the event has proved to have been correctly estimated. The production of battle planes had necessarily to follow the production of engines. The best aeronautical talent available in this country was employed to that end. The assistance of Mr. Orville Wright, at Dayton, Ohio, has been of great value, but necessarily the accomplishment in this field must be due to the hearty and loyal co-operation of the representatives of the allies. This we received in the fullest measure and their able and generous assistance was utilized to the utmost.

**Overseas Plane Production.**—Out of the appropriation available our allies produced in their factories the following planes for American units:

	Training	Battle
1917		
December.....	394	5
1918		
January.....	196	4
February.....	233	90
March.....	130	98
April.....	122	90
May.....	11	290
June.....	118	315
Total.....	1,204	910

**Balloons.**—The supply and equipment of the balloon organizations have been adequate to the service.

**Machine Guns.**—While this office was responsible for obtaining the armament, ammunition and bombs required out of the available appropriation, the same was done through the Chief of Ordnance. These articles are being delivered in sufficient quantities.

**Raw Materials.**—Due to the fact that there was at the beginning of the war practically no airplane industry in this country, there was an inadequate supply of nearly all raw materials necessary in their construction. A broad foundation had to be laid in this regard to meet not only our own requirements, but those of the allies, who were coming to depend more and more upon this country. The production of spruce had to be tremendously increased, necessitating the building of mills, railroads and other equipment. As it was impossible to produce the millions of yards of linen fabric required a suitable cotton substitute was developed which is now being manufactured in this country in quantities sufficient to meet the needs of both America and her allies. This accomplishment, heretofore thought to be impossible, ranks among achievements of the first importance. The dope which is used on the fabric of airplanes presented many difficulties not only to us but to our allies. This and other

## Appendix A.—Aviation Equipment Production (Actual Deliveries)

		1917												1918						
	Estimated Average Price per Unit	June	July	August	September	October	November	December	January	February	March	April	May	June	Total for Year					
Number of cost plus plane and engine contractors employees.....		7,298	8,265	9,191	11,312	12,934	16,168	21,392	30,001	39,273	42,827	48,756	56,803	64,297						
Number of plane contractors.....			6	5	5	4	7	13	10	8	10	12	13	13						
Number of engine contractors.....					4	4	6	8	8	7	8	8	10	12						
Planes:																				
JN-4-D.....	\$4,646.00	147	56	87	171	279	293	313	485	153	311	320	380	112	2,960					
JN-4-H, training.....	4,750.00								7	179	153	61		2	402					
JN-4-H, gunnery.....	4,750.00											9	81	222	312					
JN-4-H, bombing.....	4,750.00												49	51	100					
SJ-1.....	4,500.00			16	22	61	38	110	215	373	445	313	7		1,600					
S-4-B.....	5,250.00						1	20	22	20	25	11	1		100					
S-4-C (S-5).....	5,000.00												35	38	73					
Penguin.....	2,025.00											12	32	14	58					
Bristol fighter.....	6,750.00												13	9	24					
De-H-4.....	6,512.00																			
Training, purchased abroad.....								394	196	233	130	122	11	118	1,204					
Pursuit, purchased abroad.....								2	2	2	45	21	240	83	397					
Artillery, purchased abroad.....										26	21	55	59	209	370					
Bombing, purchased abroad.....								3	2	62	32	23		21	143					
Experimental planes, various types.....			20	28	34	11	27	34	13	31	12	8	10		228					
Engines:																				
OX-5.....	2,000.00	160			269	154	377	216	198	429	835	1,003	1,148	845	5,474					
A-7-A.....	2,182.00				82	117	166	202	319	353	355	320	139	130	2,183					
Gnome 100.....	2,314.00				43	5	3	9	15	2	41	1		6	161					
Le Rhone 80.....	2,100.00												14	54	68					
Hispano 150.....	3,600.00						93	147	85	170	306	444	530	413	2,188					
Hispano 180.....	3,600.00													6	6					
Hispano 300.....	5,000.00														2					
Lawrence.....	500.00										7	29	30	48	114					
Liberty 12.....	4,400.00							22	39	70	122	415	620	1,102	2,390					
Fiat, purchased abroad.....													40		40					
Balloons:																				
Balloons.....	6,141.00	8	2	3	2	5	22	37	51	36	46	50	72	85	411					
Balloon cloth, M yards.....	650.00									58	69	154	248	371	900					
Ferro silion, tons.....	261.00					20		224	120	56	270	140	74	20	924					
Caustic soda, tons.....	78.40				16	93	25	106		200	100	124		76	740					
Hydrogen cylinders.....	21.80	800	500	1500	500	500	12,000	18,000	1,500	100	2,000	10,100	15,900	6,900	69,500					
Cable, M feet.....	120.00				120		60	300	6	120		317	136	72	1,131					
Winches.....	7,000.00											15	5	4	24					
Propellers:																				
Propellers, training.....	84.81		30	30	30	87	675	1,036	982	1,223	3,037	4,567	3,918	4,467	20,084					
Propellers, combat.....	136.40										43	53	408	435	939					
Propellers, experimental.....			24	10	18	20	72	56	30	56	81	57	58	15	497					
Lumber:																				
Mahogany, M feet.....											2,985	1,591	951	1,612	7,139					
Walnut, M feet.....											840	644	386	214	2,084					
Spruce, M feet.....				184	3,159	3,953	4,660	3,183	3,503	10,663	10,441	10,671	8,354	5,958	64,729					
Fir, M feet.....						65	1,656	1,497	1,982	6,112	3,484	4,493	4,683	3,035	27,007					
Oak, M feet.....											286	21			307					
Birch, M feet.....											631		8		639					
Guns, ammunition, and bombs:																				
Machine guns, Lewis.....	601.70						4	3	66	1,376	1,707	1,450	1,922	3,840	10,368					
Machine guns, Marlin.....	370.67						7	5	2,122	3,123	3,078	7,845	4,565	1,609	22,354					
C. C. gears.....	85.00					5	1		30	50	84	463	851	784	2,268					
Mechanical gears.....	42.23									3	22	35	65	130	255					
Gun mounts.....	135.00						41	241	1,017	991	1,617	1,813	1,089	8,456						
Ring and post sights.....	18.00								470	730	47	2,525	2,074	1,204	7,050					
Wind vane sights.....	16.00								22	116	746	2,671	2,074	1,204	6,838					
Gun stems.....	3.70							113	492	629	1,069	1,126	800	424	4,653					
Ball A-1, M rounds.....	46.10												3,240	2,160	5,400					
Armor piercing, M rounds.....	68.72											703	751	451	1,905					
Incendiary, M rounds.....	105.00											185	601	900	1,686					
Tracer, M rounds.....	105.00											225	751	1,899	2,875					
Barlow heavy.....	100.00											42	1,441	343	1,828					
Dummy drop, Mark I.....	1.80																			
High capacity, Mark I.....	20.50									96	881	2,013	3,060	5,352	11,402					
High capacity, Mark II.....	19.25												2,823	9,901	12,724					
High capacity, Mark III.....	16.25											62	103	524	689					
Incendiary, Mark I.....	15.25											3,000	11,361	11,804	26,165					
Incendiary, Mark II.....	14.25												27	550	577					
Bomb sights, Mark I-A.....	67.30									4	7	33	130	440	614					
Releases, Barlow, heavy.....	56.00								1	1	1	15	1	708	727					
Instruments:																				
Air pressure gauge.....	1.85	40							402	499	1,430	1,848	700	1,379	6,258					
Air speed indicator.....	35.00	8						54	35	272	305	695	482	271	2,114					
Altimeter.....	60.00						400	919	732	1,773	1,740	1,400	2,529	425	9,998					
Safety belts, standard.....	5.00								51	696	1,116	1,396	553	565	4,287					
Clocks.....	13.10	25						80	503	1,836	1,954	2,597	1,205	1,225	10,300					
Compass.....	25.00	90								64	1,126	1,384	1,929	4,503						
Fire extinguisher.....	5.00	220					100	220	376	568	2,751	50	3,287	826	8,178					
Oil pressure gage.....	1.50	3							414	661	915	2,102	1,624	2,088	7,804					
Thermometer.....	8.00	51						102	643	652	1,675	1,533	2,396	934	7,935					
Safety belts, gunners.....	10.00												45	261	306					
Tachometer.....	35.00	41						26	210	646	2,332	4,053	3,263	2,516	13,046					
Rotating map cases.....														4	4					
Pilots' and observers' switch panels.....	11.75											23	352	615	990					
Negative lenses.....	13.25	5											50	2,291	2,341					
Unit sights.....	55.00								44	77	186	235	188	994	1,724					
Tachometer shaft assemblies.....	5.00							29	365	1,387	5,628	1,403	1,220	1,586	11,618					
Dreyer oxygen apparatus.....	160.00	2										2	96	466	501					
Oxygen tanks, No. 12.....	5.15											6	1	2,970	7,023					
Gasoline gages.....	10.00						150	5			17	158	1	48	379					
Radio receiving sets.....										850	285	651	2,480	1,482	5,748					
Radio transmitting sets.....										224	194	698	634	369	2,119					
Radio combination sets.....												42	787	47	876					
Radio interphone units.....												1,634	966		2,600					
Cameras, aero.....	406.87					10	93	10	67		119	64	140	144	647					
Cameras, enlarging.....	125.00						7	2	23	110	115	150	56		463					
Cameras, gun.....	150.00						2	20	30	50	100	80	50	20	352					
Hangars:																				
Balloons.....	5,493.33			1		2						4		2	9					
Canvas.....												620	712	358	2,140					
Metal.....												64	184	320	568					



## Appendix A.—Aviation Equipment Production (Actual Deliveries)—Continued

	Estimated Average Price per Unit	1917							1918						Total for Year
		June	July	August	September	October	November	December	January	February	March	April	May	June	
Dope:															
Acetate.....	\$4.75								2,034	191,405	25,300	71,550	35,225	139,017	464,531
Nitrate, gallons.....	1.80									500		1,550	7,190	16,950	26,190
Plane fabric:															
Linen, yards.....	1.00										312,125	628,793	620,530	179,187	1,740,635
Cotton, yards.....	.60							10,716	119,777	251,674	319,445	402,371	718,272	1,342,491	3,164,746
Plane tape, M yards.....	40.00									700	750	2,504	1,341	366	5,661
Castor beans planted, acreage.....											12,800	49,400	87,300	89,550	239,050
Castor oil, gallons.....							108,500	187,935	210,000						506,435
Squadron equipment:															
Service.....	64,091.78								81	150					231
Supply.....	71,392.07								24	9					37
Repair.....	65,000.00								6	4					14
Construction.....	232,619.51								44	53					97
Clothing:															
Boots, pairs.....	4.62	9				288	212		4	4,500	4	840	2,200	2,550	10,596
Coats.....	15.40	84		60	141	1,405	3,964	813	6,750	6,147	7,612	11,582	3,100	3,607	45,181
Gauntlets.....		11				11,604	9,508	17,044	5,320	4,721	1,811	16			50,024
Gloves.....	15.15	2			400		300	126		916	792				2,534
Goggles.....	4.50	5				12	750	691	1,242	6,007	14,320	9,111	5,907	4,079	42,119
Guards.....	6.95	4				270	1,730	124							2,124
Helmets.....	4.20	35			400	1,680	3,260	4,034	3,162	11,111	7,871	12,026	10,103	6,500	60,147
Masks.....	1.12	1			200				4	1	3,005	1,152	20	1,120	5,502
Moccasins, pairs.....	7.70							2,022	604	1,067	2,914	2,508	1,522	4,000	14,637
Scarfs.....	1.09	1									3	3,153	1,500	1,500	6,156
Sweaters.....	5.08				200	600	2,760	1,740		600	1,467	1,352	4,100	2,600	15,419
Suits.....	19.50				385	265	225		2,749	589	3,742	11,842	10,583	6,480	36,870
Trousers.....	2.75					1,270	4,099	37	6,750	2,218	2,668	4,945	1,655	2,400	26,042
Motor transport:															
Motor trucks.....	2,650.00	28	47	249	111	980	539	1,136	854	864	838	702	658	664	7,642
Motor-truck, bodies.....	220.00			1				235	50	144	293	246	443	1,336	2,748
Trailers.....	575.00			72		28	116	28	8	20	206	484	808	1,418	3,190
Motor cars.....	1,000.00	4	8	27	50	406	529	542	587	455	413	326	125	430	3,896
Motorcycles.....	300.00	38	132	21	321	127	1,259	792	743	581	533	759	1,207	814	7,289
Motorcycle side cars.....	75.00	38	97	21	281	108	1,076	1,050	757	489	664	1,250	1,140	699	7,630
Bicycles.....	35.00					204	804	315	189						1,512
Percentage forgings, finished, semi-finished, and raw materials, costing about \$9,000,000, weighing over 23,000 tons, actually freighted on steamers to allies account American plane production.....						14	15	17	12	9	17	3	4	5	96
Dollars actually spent during the month, in thousands (from accounts current).....		\$1,127	\$7,980	\$255	\$6,065	\$13,626	\$23,467	\$39,151	\$35,193	\$28,797	\$34,384	\$39,209	\$45,267	\$45,266	\$321,784

chemicals required are now being produced in this country in sufficient quantities for their requirements as well as our own. There was a great deficiency in the production of castor oil. This necessitated the planting of over 108,000 acres of castor bean plants as well as the establishment of the necessary crushing plants and refineries. It is thought that this problem has been solved.

**Instruments.**—It will be noted in the statement, Aviation Production Equipment, that there were about 20 types of instruments developed and in production to June 30, 1918, as necessary to give airplanes, pilots and observers the greatest possible usefulness. It may be said that the making of these instruments is a new industry for America. Their production must keep abreast of the battle-plane production, as such planes without them are useless for battle purposes.

**Expenditures.**—During the 12 months ended June 30, 1918, there was expended a total of about \$373,000,000. From this should be deducted approximately \$165,000,000 spent for completing training fields and for training and operation purposes in this country and abroad. This leaves a balance of about \$208,000,000 expended in obtaining these items:

Airplanes.....	8,488
Engines.....	12,626
Balloons.....	411
Instruments of various kinds.....	115,655
Hangars.....	2,717
Squadron equipments.....	379
Items of aviators' clothing.....	317,353
Items of motor transport.....	33,909

In addition to this it should be remembered that the expenditure of this sum does not bear a direct relation to the cost of the articles produced, for the reason that much of it is locked up in inventories of uncompleted articles and in facilities for production which will ultimately reduce the cost of additional articles. Out of the appropriation of \$640,000,000 there was then a balance of approximately \$267,000,000 unexpended, which should in time produce the estimates of material upon which the original program was based.

**Summary.**—It is unnecessary to repeat the story of the Liberty engine, although many of the details are yet to be told. The whole conception of a standardized American engine, utilizing the special American genius for quantity production, for service not only in the program of the United States but for universal service for all of the allies, was a national undertaking which, for daring and farsightedness, it

Funds available:	
Act May 12, 1917.....	\$10,800,000.00
Act June 15, 1917.....	31,846,067.16
Act July 24, 1917.....	640,000,000.00
	682,646,067.16
Disbursements to June 30, 1918.....	378,318,388.64
To balance.....	309,327,678.52

is believed, will be an increasing cause of pride for the American people. On Oct. 12, 1918, the completion of the 10,000th Liberty engine was celebrated in Detroit. There is no possible yardstick to measure the present and potential value of the Liberty engine. It cannot be measured by any money standard. One has only to consider what would be the result at this moment of subtracting from the allied air programs the Liberty engines as a whole to obtain some idea of this accomplishment.

The American-made DeHaviland battleplane, modified to receive the Liberty engine, is at the moment recognized as one of the best battleplanes anywhere on the Western Front, and the delivery of these planes in France has already overtaken for the moment the creation of the necessary facilities and personnel for their use.

The development of a fabric which can be furnished by America in required quantities and at price slightly over half that of the formerly used linen fabric, of which there was a limited supply, is another achievement of American ingenuity and enterprise.

The creation of special radio apparatus, the details of which cannot be mentioned here, permitting new control of the operations of airplanes en masse, is another contribution to the credit of American engineers and American manufacturers.

In short, it was always the general allied cause which controlled the decisions in founding this industry, rather than the needs of the United States alone, and this is obviously the only correct point of view. After four years of war, in which the United States entered but a year and a half ago, the allies are depending largely upon America, to a greater and greater degree as the days pass, for the castor oil for their engines, the fabric to cover the planes and the dope with which to treat the fabric, the spruce and fir to make their planes, and the engines to propel them.

GEORGE O. SQUIER,  
THE SECRETARY OF WAR. Major General, Chief Signal Officer.

# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

Vol. XXXIX  
Number 26

PUBLISHED WEEKLY AT 239 WEST 39th STREET  
NEW YORK, DECEMBER 26, 1918

### Hudson Wants Some New Dealers

*A Rare Opportunity is Offered in Connection with the Hudson this Year. Dealers Will Do Well to Investigate.*

Hudson Distributers are now prepared to disclose interesting details concerning the money-making opportunities that go with the Hudson line this year.

The Super Six has been one of the most profitable and easiest-selling cars on the market. The production, while larger than that of any other fine car, has not permitted the extension of the territory beyond certain limits. Its dealers have taken the leading position in their respective communities. They have prospered, as every automobile dealer knows.

This year we are embarking upon an enlarged program. The opportunities are even greater than they have been in the past.

New territories will be developed. Some new dealers will be named in localities where the representation in the past has not come up to Hudson standard.

If you are interested in knowing what Hudson offers this year, we suggest that you immediately get in touch with the Hudson Distributer in your territory, or that you write us for further information.



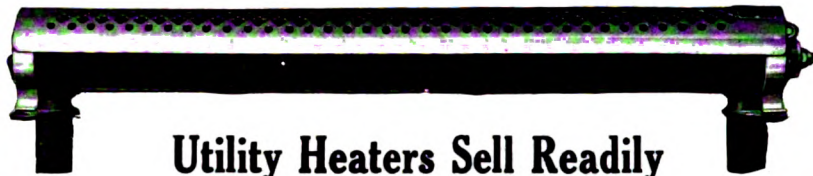
**Hudson Motor Car Company**  
Detroit, Michigan





# UTILITY

## Automotive Products



### Utility Heaters Sell Readily

and are easily installed on any car. And they make satisfactory customers who will buy other Utility products from the dealer.

UTILITY heaters are in greater demand than ever this winter. Motorists have resolved to be comfortable since they know a UTILITY heater costs nothing after it's installed.

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UTILITY  
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For All Cars \$1.75

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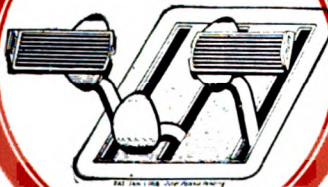
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Sales Department:

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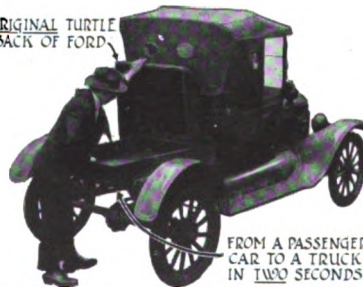


UTILITY PEDALS  
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CAR TO A TRUCK  
IN TWO SECONDS

UTILITY DISAPPEARING TRUCK BODY  
For Fords. Price \$38.50



# **AUTOMOTIVE INDUSTRIES**

## **the AUTOMOBILE**

VOL. XXXIX

NEW YORK—THURSDAY, DECEMBER 26, 1918—CHICAGO

Nd. 26

## **Political Plan of Organization Satisfactory**

### **For Relatively Small Establishments**

#### **Combined Work of Employees' Representatives and Supervisors' Committee Suggests Added Values—A Typical Method Reviewed**

By Harry Tipper

**I**N all organizations gathered together for common purposes it is necessary that certain disciplinary measures be agreed upon as a basis for the organization. In order that the group may operate together it is necessary that for certain specific causes the right of discharge should be maintained without review.

For this reason practically all the legislative organizations which have been adopted by various individual concerns have stated in the agreement that the right of discharge is not changed by the formation of the organization and that for certain causes varying to some extent with the necessities of the work immediate discharge without review is the result.

#### **Causes for Immediate Discharge**

In an oil company the carrying of matches onto the refinery premises contrary to the fire rules and the necessary safety may constitute a reason for immediate discharge without review where such an item would not be an infraction of the rules in other lines of business.

In general, the causes for which an immediate discharge without review is retained in the preamble agreement to these organization developments group themselves under three heads:

1—Those disciplinary measures required by law. In general this is stated in so many words in the agreement between the employer and the employee requiring an obedience to all regulations prescribed by the State and

national laws governing the working conditions in the industry affected. This, of course, is absolutely necessary not only that the legal requirements may be fulfilled but in order to provide a basis for the observance by the individual employees of any regulation which may be imposed by the legislative organization within the industrial unit. It is obvious that the basis for orderly agreement within the industrial unit must be a strict observance of the regulations imposed by the political government of which all industrial units are a part.

2—Those measures demanded by the insurance companies and other bodies as a corollary to protection against damage. These regulations come in the same category as the legal restrictions previously mentioned, but they are usually stated specifically so that they may be thoroughly understood by the employees and their observance agreed upon in the case of each particular rule.

3—The third division included in the causes for immediate discharge without review is peculiar to the industry in which the unit is engaged and in some cases peculiar to the organization. In it are present those items which in the opinion of the governors of the industrial unit and the representatives of the employees are sufficiently serious to eliminate the man as a useful member of the industrial organization and therefore unworthy of any reconsideration.

This point is quite important, as it is obvious that a

constant review of cases which relate to infractions of rules which are for the general benefit of the body of workers and the operations of the industry, loading the committees with the necessity for examination of matters so obviously detrimental would work a constant hardship on the orderly part of the organization and result in a reduction of the benefits to be derived as well as a lack of operating discipline.

The example organization plan which we are considering in this article has been picked out because it has been used in several cases of organizations involving a small number of employees where the difficulties of meeting are not so severe and where the operations of the legislative organization can be handled from the point of view of closer contact and understanding.

As in most of the new forms of organization, this example follows the political organization as it is represented in the arrangement of Congress. It follows the lines, however, much more closely than some of the organizations which have been adopted in the machinery business, and it is of much longer standing.

The original organization plans were made in 1914. They have been running for nearly 4 years. This is important in considering the value of the plans, as time must be allowed for the shaping together of such an organization before it will fulfill properly all the functions for which it has been created.

The general plan of this organization exactly parallels the political organization of the United States, consisting as it does of a House of Representatives taken from the body of general employees by election, a Senate representing those salaried employees who are in charge of the execution of the plans of the company, and the supervision of departments, and a Cabinet representing the officers of the firm and the general executives.

In fact, it goes further in this direction in that it calls for a joint standing committee appointed by the House and the Senate to act in a similar way to the conference committees of the House and Senate of the United States in bringing an agreement upon matters of importance before they are submitted to the Cabinet.

The only difference between the organization for legislative purposes in this company and the political organization under which we all live is the lack of provision for the carrying of a regulation or policy over the veto of the Cabinet. But in practice this is not very important, as the combined agreement of the House and Senate upon a matter has been accepted as usual practice and put into operation by the Cabinet.

There is one example in this country of a legislative organization in a business which provides for the carrying into the operations of the company of a policy agreed upon by a two-thirds majority over the veto of the board of directors, and in the case of this one example the lodgment of that much power in the hands of the employees

has been highly successful. However, it is hardly necessary that this should be followed in the present state of industrial organization and it should grow out of the workings and values of the organization rather than be included in the plan which is stated.

There are a number of points which should be called to the attention of the man who is interested in labor developments in this type of organization. It has been used mainly in organizations of a smaller size carrying on the payrolls less than 1000 workers, and some of its provisions would not be applicable to organizations of a much larger character. It has been used also where the turnover is not quite so large as the usual percentage to be observed in the machinery industries and where the permanence of the employees has resulted in an agreement and a co-ordination that will be impossible for a long time in the machinery industries where the turnover is so large.

### Election of Members

To be eligible for election to the House of Representatives an employee must have been in the employ of the company continuously for at least 6 months. An indication of the permanence of employment in this business is to be found in the fact that over four-fifths of the employees are eligible for election.

It is to be noted that every department of the company is privileged to elect one representative no matter how small a department may be. This is a significant departure from the plans which have been presented so far emanating from the machinery and metal industry, where the election of representatives is determined by the plant or geographical location and not by departments.

One representative is allowed for each fifteen employees in a department. The small number of employees to each representative is, of course, governed by the smaller size of the establishment and has no particular bearing upon the success of the scheme.

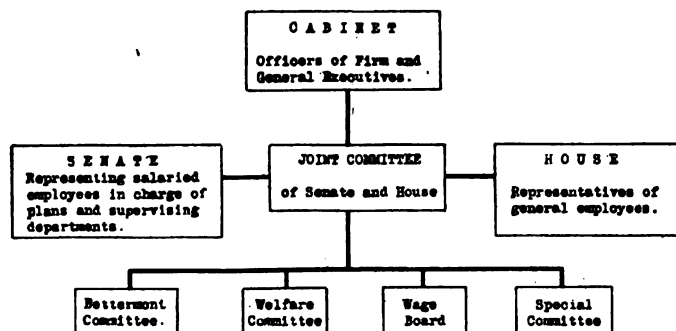
The procedure in developing the Senate is quite different. There is no election in this case, but an appointment by the members of the Senate by a majority vote after the applicant has secured the endorsement of the firm and not less than one member of the Senate. The Senate, in other words, represents the detailed operating supervision of the organization, and its value arises out of its familiarity with the necessities and conditions in each department and not out of the fact that it consists of employees. All members of the Senate having charge of plans and supervision are representatives of the officers, equipped, however, with a much more intimate knowledge of the necessities and the conditions.

This provision of the Senate as a standing body is an extension of the conference system among department heads so as to bring it into co-ordination with the House of Representatives as a part of the legislative machinery. It will be noted that here again there is a definite departure from the practice as outlined in the plans of the machinery and metal organizations which have been created during the last 3 years.

Of course it is true that in most of these large concerns in the machinery and metal fields the conference and committee system between heads of departments is a regular part of the business procedure, but so far as we have been able to observe it has not been co-ordinated definitely with the other machinery as a part of the legislative organization.

It seems as though the knowledge of those supervisors who are handling the detail operations of the various departments of a manufacturing organization would be able with their knowledge of the intimate conditions to

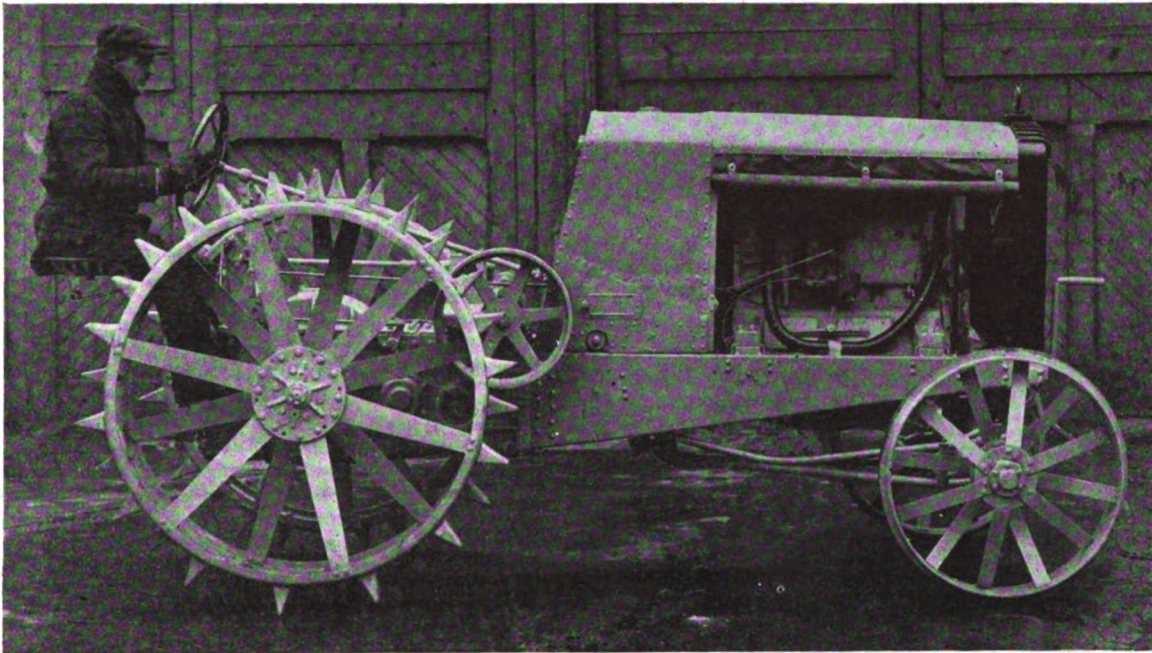
(Continued on page 1088)



*Co-operative organization for legislative and judicial functions*

# S. W. H. Tractor a New Cleveland Product

A 3-Plow Machine with Pressed Steel Semi-Frame Bolted to Front End of Transmission Housing—Engine and Transmission Independent, Insuring Accessibility



*Accessibility is a feature of the new S. W. H. 3-plow tractor. About 30 per cent of the weight rests on the front wheels*

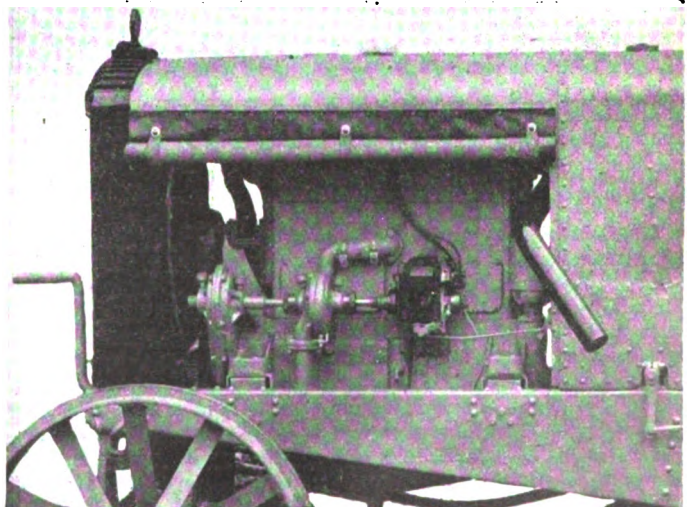
**D**URING the past year a striking departure has been made in tractor development. Very few of the newer tractors have the channel steel frames, built-up front axle and other remnants of the experimental period of tractor history. In fact, the later models show much evidence of careful design and are less indicative of attempts to produce something strikingly original. Smoothness of lines and protection of all working parts against dust, etc., have become more marked features.

A new tractor of strictly modern lines has just been announced by the S. W. H. Engineering Co., Cleveland, Ohio. It is a 3-plow tractor of the four-wheel type, and we are informed that its design was laid down only after a careful study of what farmers actually require of a tractor and what others had done to produce a machine to meet these requirements.

## Novel Frame Construction

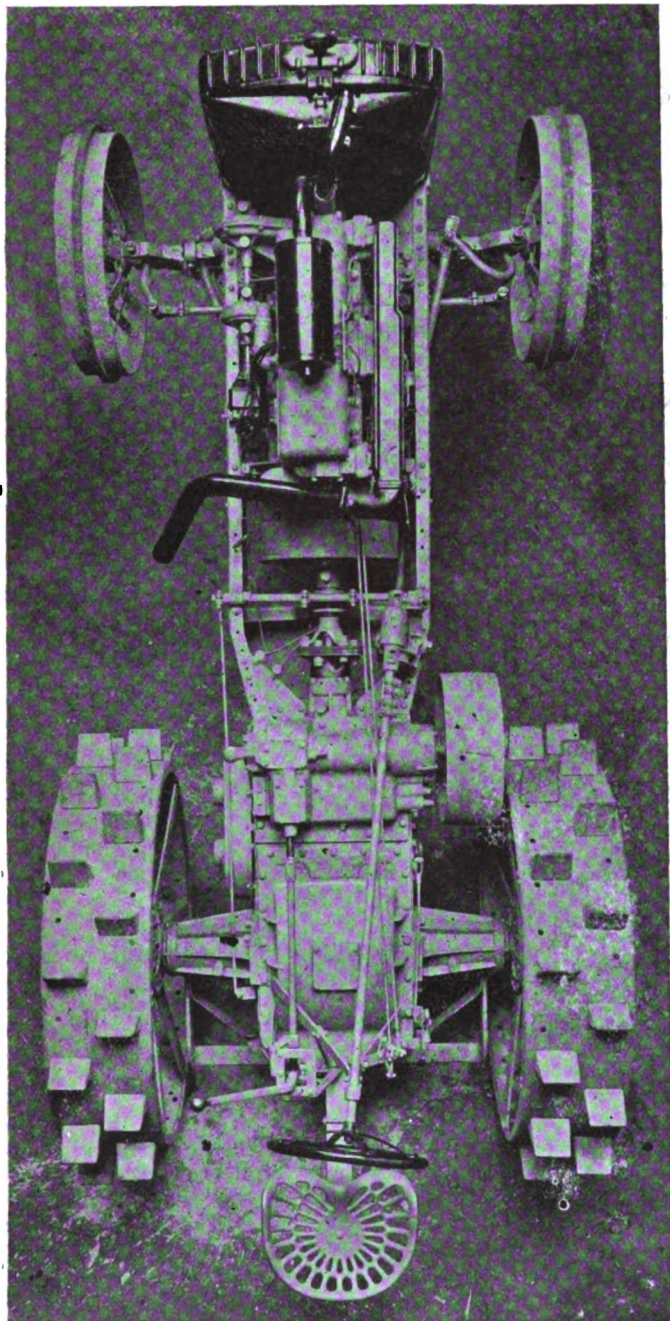
One of the most interesting features of the S. W. H. tractor is its frame construction. The housing for the transmission and rear axle is a single casting. The rear axle shafts extend through this housing at the rear, and are supported in bearings carried in cast iron extensions bolted to the housing on both sides. The front end of the transmission case is machined off flat, and to the faced surface thus formed is bolted the rear end of the frame. As the rear end of the frame members is of very deep section, this makes a very rigid construction. The frame supports the engine, radiator and other minor parts. Near its forward end there is a cross member to the center of which are riveted two brackets, forming a swivel support of the front end of the frame on the front spring. As a result of this swivel support of the forward end

of the tractor, the wheels can accommodate themselves perfectly to any unevenness of the ground, and the spring support protects the forward end of the tractor against undue shocks and jars. About 30 per cent of the total weight of the tractor rests on the front wheels, and the frame members were designed to take care of this load. To combine lightness with strength, the frame members are made up of 3/16 in.



*The S. W. H. engine is of stock type, designed to use kerosene*





*A novel form of frame construction is employed*

pressed steel, the section tapering from the forward to the rear end. Owing to the low depth of the frame members at the forward end the steering lock is not unduly restricted. We understand that a patent on this frame construction has been applied for.

#### Engine a Stock Type

The engine is a special heavy duty tractor type, designed to burn kerosene. It is a four-cylinder engine of 4½ in. bore by 6 in. stroke, and is of the valve-in-head type. All moving parts are inclosed. There is pressure feed lubrication to the main and connecting-rod bearings and all other parts are lubricated by splash. The crankshaft is of large diameter, and is carried in bronze-backed, babbitt-lined bearings. Ignition is by a high tension magneto with impulse starter. The carbureter—a Stromberg plain tube type—is located as close to the engine as practicable, and all the air drawn in is first passed through an air cleaner so as to remove all particles of dust and grit. Fuel feed is by gravity. A supply of 30 gal. kerosene is carried and in addition 3 gal. of gasoline. The engine is of the open flywheel type, which permits of ready access to the clutch and even of the removal of same without

disturbing any other part. On the forward part of the engine is carried a 21-in. radiator fan, which is driven by a wide flat belt.

An integrally built governor of the fly-ball type maintains the engine speed at 900 r.p.m., at which speed the engine develops approximately 37 hp. The governor is completely enclosed, and is said to be very sensitive, governing the engine speed within very close limits. An oil pressure gage is mounted on the rear of the fuel tank, where it can at all times be readily seen by the operator, and indicates the pressure under which the oil is fed to the bearings. This pressure normally is about 30 lb. per sq. in.

#### Thermostat and Motometer

Special attention has been given to the design of the cooling system. The tractor is equipped with a Modine spirex radiator, having a core measuring approximately 22 by 23 in. The shell of the radiator is an integral iron casting, and has the core secured to it by 8 cap screws, so that after taking out these screws the core may be removed from the shell. The radiator is provided with a large filler spout with quick opening cap and motometer. To the back of the radiator is fitted a hood or shroud, in which turns the 21 in. fan, the provision of this hood tending to increase the efficiency of air circulation through the radiator. The water is circulated by means of a centrifugal pump, and a thermostat is installed to regulate the temperature of the cooling water in the engine jacket. Maintaining the engine cylinders at a uniform high temperature, not only increases the efficiency, but also tends to facilitate the burning of kerosene.

The clutch used is a Borg & Beck dry plate type, 12 in. in diameter, and is carried directly in the flywheel of the engine. By reason of the special frame construction, this clutch can be removed without disturbing the engine or transmission. Between the clutch tail shaft and the transmission primary shaft is incorporated a Thermoid three-disk flexible coupling. The disks of this coupling are of Sea Island patent fabric, and rubber. They are 5/16 in. thick and 8 in. in diameter, and they furnish a very strong flexible connection between clutch and transmission. Not the least advantage of this flexible coupling is that it materially relieves shocks in case the clutch grabs or the load on the tractor suddenly increases by the plow striking rocks, stumps, etc.

#### Rear Axle and Transmission One Unit

The rear axle and transmission form a single unit. The transmission is of the inclosed, spur gear type, and all shafts are mounted on anti-friction bearings, both Hyatt roller and ball bearings being used. All gears are cut and heat treated, and are fitted to splined sections of the shafts. The gearing within the transmission housing affords two forward speeds and one reverse. However, on the outside of the housing there is a pair of gear wheels, under a quick removable cover, which can be interchanged in order to obtain a smaller reduction to the rear wheels. With the standard set of gears (28:34) the reduction ratio from the engine to the rear wheels on low speed is 54.5:1, which corresponds to a tractor speed of 2 1/3 m.p.h., while the reduction ratio on the high gear is 37:1, which corresponds to 3½ m.p.h. If the cover over the outside pair of gears is removed, and these gears are interchanged, the low speed reduction will be reduced in such a way as to give a tractor low speed of 3½ m.p.h. and a high speed of 5½ m.p.h. It is thus possible by means of the interchangeable set of outside gears to get a speed range of from 1½ to 9 m.p.h. The regular plowing speed is 2 1/3 m.p.h., which is obtained at an engine speed of 900 r.p.m. There is said to be a marked tendency toward higher plowing speeds, and this tractor will make such speeds available as soon as the moldboard plow is adapted for operating at higher speeds. At 2 1/3 m.p.h. the tractor develops maximum drawbar pull of 3500 lb. and a sustained drawbar pull of 3000 lb., and at 3½ m.p.h., the sustained drawbar pull is 2000 lb.

#### Power Take-Off

The belt pulley, which is 18 in. in diameter with 6½ in. face, is driven through a pair of bevel gears, and is controlled by the same friction clutch as the drive to the rear wheels. It turns at 550 r.p.m., which corresponds to 2600 ft. per min.



belt speed. A sliding gear renders the power take-off inoperative when the tractor is in motion. The differential used is of the same dimensions as that of the Class B standard war trucks. A contracting brake is fitted to the differential, to permit of holding the tractor on bad hills and of locking it in position while doing belt work.

The rear axle drive shafts are 3 in. in diameter, and are machined with a long taper to which the wheels are fitted. A rather unconventional type of drawbar is provided. This is made of flat bar stock, bent up yoke-shape, and is secured to opposite ends of the axle housing. It is braced at the corners to insure the necessary rigidity. In addition to serving as a drawbar, this piece serves also as a step for the operator. The height of the hitch from the ground is 17 in., in accordance with the S. A. E. standard, and the drawbar has a lateral adjustment of 24 in.

The front axle, which is of the company's own design, is a steel drop forging of I beam section, heat treated. The steering knuckles are also drop forgings, and are provided with renewable bushings through which pass the hardened and ground steering pins. The weight of the machine is transmitted to the front wheels through liberal sized thrust bearings on top of the steering knuckles, inclosed so that they will always be submerged in oil. The tie-rod is tubular, of large diameter, and carried back of the axle, where it is protected against injury. The clevises at both ends of this rod are fitted with hardened and ground pins, turning in removable bushings inserted in the end of the steering arms.

#### Front End Spring-Mounted

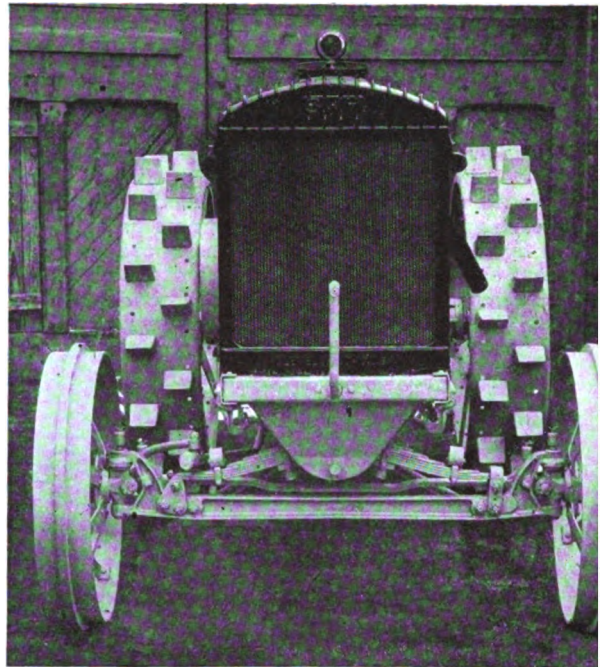
A half elliptic cross spring, 35½ in. long by 2 in. wide, supports the forward end of the tractor on the front axle. This spring is located directly above the axle, its right-hand end being connected to the axle by means of a spring bolt and two plates, and the other end swinging on shackles links. Self lubricating bushings are fitted in the spring eyes and in the hole in the front axle. The spring is made comparatively long in order to apply the weight to the axle as near the wheels as possible, and thus reduce the bending moment on the axle. A hole is drilled near each end of the axle to receive the wishbone type of radius rod construction. These radius rods are tubular and are provided with forged connectors at the forward end, secured into the axle. At their rear end the two tubes connect to a single forging, which is formed with a ball of 2 in. diameter, this ball being supported in a socket secured to a cross member of the frame. Thus the front construction is absolutely free to accommodate itself to uneven roads.

The second cross member from the front end is an inverted channel section and has riveted to it the bracket for the front spring. The second cross member from the rear is of deep channel section and has the spherical socket for the triangular radius rod riveted to it. The center line of the front spring hinge pin produced passes through the center of the ball, thus insuring a high degree of flexibility. This cross member is connected with the rear cross member by a central channel piece so that the thrust on the front axle is taken directly against the front end of the transmission case. Just back of the second rear cross member the frame tapers toward the center slightly and the rear end of the frame is composed of a large plate, the upper and lower edges of which are flanged over so as to form a channel and the two ends attached to the frame are also flanged and riveted rigidly to the side rails. Two gussets brace the upper flange of this cross member to the frame side rails and a continuous flat plate forms a gusset between the second rear cross member, the frame sides and the back member. Suitable additional reinforcements are used in the corners of the rear plate.

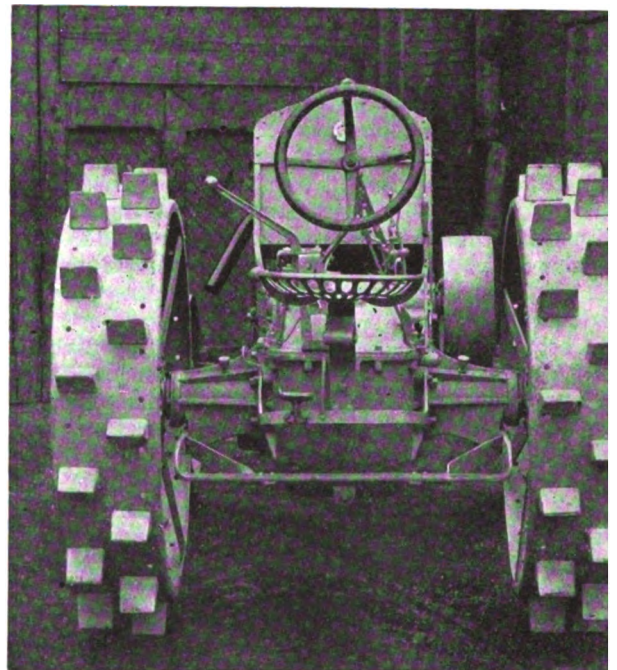
#### Connection Between Frame and Transmission

The rear plate of the frame is drilled to take ten ¾-in. cap screws, and the frame is bolted directly to the front face of the transmission. The whole design of this frame is such as to insure great rigidity while at the same time it is light.

Front wheels of 30 in. diameter and 6 in. width of face are fitted, these wheels having rims ¾ in. thick. A mud band of 1 in. square cross section is shrunk over the rims of these wheels at their middle in order to insure more positive steering. The hubs are malleable castings, and are bored out to



*A semi-elliptic cross spring supports the forward*



*Rear axle and transmission form a unit. Transmission is enclosed*

take removable Hyatt liners. Each front wheel is mounted on two Hyatt roller bearings, and the thrust is taken on thrust washers of large diameter, care being given inclosure of these bearings so as to exclude dust and lubricant. Flat spokes are used.

The rear wheels are also of the flat spoke type, the hubs being riveted to rolled and flanged steel rims, 48 in. in diameter with 12 in. face and ¼ in. thickness. The hubs are malleable iron. The rear wheels are secured to the axle shafts by means of taper, key and nut. The rear wheels are punched to take either grousers or angle cleats, ever is most suitable for the condition of the ground on the tractor is to work.

#### Control Details

In view of the fact that tractors often must be operated by boys and women, the designer of the S. W. H. tractor

made special endeavor to render the control easy. All of the control members are centralized so that they can be easily reached from the driver's seat. A wide flat spring, secured to the rear end of the transmission case, carries the driver's seat. It is provided with a safety leaf and a rebound clip. The steering post, which is supported by a triangular bracket on the transmission case, is very strongly inclined, and has secured to it a 17 in. diameter steering wheel with wood rim. Spark and throttle control levers are mounted directly underneath the steering wheel, on the steering post bracket, and are operated by the right hand. The brake in the transmission is operated by a lever within easy reach of the operator's right hand. The clutch throwout treadle runs entirely around the rear of the transmission case, and may be actuated by either foot. The gear shift lever is located slightly to the

left of the steering wheel, and is operated by the left hand. It operates in a control gate or quadrant which has the different positions marked upon it. When the tractor is at rest, the lever is in the neutral position, and in order to pick up one of the speeds, all that is necessary is to slide the lever forward or back, to register with the correct slot, then to swing it toward the center of the tractor.

The S. W. H. tractor has a wheel base of 90 in., a tread at the front wheels of 56 in. and a tread at the rear wheels of 52½ in. Its overall dimensions are as follows: Width, 64½ in.; length, 12 ft. 2 in.; height, 5 ft. 6 in. The minimum ground clearance is 13 in., and the weight of the tractor without lugs, water or oil, is 4525 lb. The spade lugs weigh about 100 lb. per wheel, so the tractor as shown in the illustration weighs about 4725 lb.

## Political Plan of Organization Satisfactory

(Continued from page 1084)

arrive at an agreement with the employees' representatives so that the matter submitted to the Cabinet would represent not merely a demand from the employees but an agreement between all those immediately concerned with the matters discussed.

Under this plan it would seem that the time of the general executives and the officers of the company could be conserved that the agreements would be arrived at more rapidly, a great many matters disposed of without reaching the heads of the institution and in addition the minor executives would be trained thoroughly in the methods of handling human relations in industry to the great advantage of the whole institution.

It will be noted also that in this plan the jurisdiction of the House and Senate is not restricted to the discussion of certain matters but that it may consider any matters that affect the interests of the employees or the concern. This has, of course, its disadvantages as well as its advantages.

If the organization were not functioning properly a great deal of time might be wasted by the discussion of matters which would be impossible of solution and the intrusion in affairs which concerned the operations and not the legislation of the business.

On the other hand, the agreement between the employees and the supervisors through the medium of the machinery provided in this way might be carried much further and conduce to a much greater degree of understanding without the limitations which are usually imposed upon the business of such bodies.

In actual practice it has developed that in the course of the 3 or 4 years the members of both bodies have come together sufficiently in their understanding of the value of these bodies and their use of the machinery so that their discussions are devoted to things which are pertinent and their agreements have been valuable to the business.

The judicial procedure in the review of complaints carries a complaint to a sub-committee of a joint conference committee consisting of an equal number of representatives from the House and the Senate which reviews the case and makes a decision. If this review is not satisfactory to the employee he may appeal to the House and Senate which then appoint a special board for the purpose of acting upon the case, this board consisting of two members of both houses and a fifth brought in by mutual consent. The decision of this board is final. It may reinstate, it may discharge, but there is no appeal from its decision.

The writer has been struck with the number of ap-

peals which are allowed in the judicial procedure of some of the co-operative organizations developed. It is not wise that individual grievances should be permitted to pass through a judicial process which may defer the final action for a long period of time. Neither is it wise that employees should be able to appeal from one court to another on insignificant and ridiculous pretext because of some dissatisfaction with the result.

It looks as though one review and one appeal should enable most cases to be judged fairly and disposed of justly, besides accelerating the decision so that the final action can be taken within a reasonable period and the employee notified of the results in his case.

This is a very important point as there is a possibility of a great deal of dissatisfaction in the adjustment of personal grievances and the dissatisfaction can be vastly increased by the length of time through which it is possible to appeal a matter from one body to another.

In the interests of both supervisor and employee the procedure should be as just as possible and also as rapid, and its limitation of the judicial procedure to two boards of review and decision is recommended to the reader's attention as a suggestion of advantage in the development of this type of organization.

In these cases where plans have been in operation for several years it is possible to measure the value of their actions to a degree which would not be possible in the case of the newer developments in this respect. There is considerable detailed information as to the action of these organizations upon wages, upon hours, holidays, etc., which will make it possible to determine the success with which they have attacked some of the problems. The consideration of these items will therefore be left over to the next article.

## Production of Rubber in Fiji Islands

ACCORDING to a published statement of His Majesty's Trade Commissioner to New Zealand, who has lately visited the Fiji Islands, the rubber industry is receiving much attention in those islands, and New Zealand farmers have planted large plantations there that have produced quantities of rubber reported to be of a very high grade. It is claimed that there are thousands of acres in the Fiji Islands that are well adapted to this industry, and it is expected that extensive developments will follow. The price of rubber at present seems very low, since the market is so greatly restricted because of the war, but it is expected when normal conditions are restored that this will become a profitable industry in these islands, where labor is comparatively cheap.



# Electrical System of the Liberty Engine

Generator and Battery Supply the Current for Ignition—Special Type of Interrupter Used Comprising Three Breakers in Parallel—Storage Battery Designed to Permit of Upside-Down Flying

By J. Edward Schipper

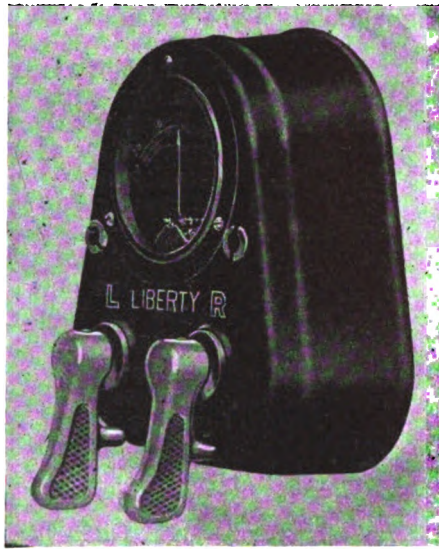
ONE of the most interesting engineering problems that had to be dealt with in working out the details for the Liberty aircraft engine was that of the electrical system. After much discussion it was decided to use the generator-battery type of ignition. A special design of the Delco system was produced, which has given excellent satisfaction and which incorporates ingenious features which may eventually prove to be of use in commercial fields.

The system consists of a low-voltage generator, a voltage regulator, an extremely light-weight battery, a double distributor system, duplex switch, and the various units necessary for the control of the apparatus. Referring to the previous article on the Liberty engines, which appeared in *AUTOMOTIVE INDUSTRIES* of December 12, the generator is driven from the vertical shaft which also drives the oil and water pumps. The regulator is so designed that it keeps the voltage between 10 and 10½ volts. The generator operates in conjunction with a special light-weight Willard or Exide 8-volt battery which supplies electrical energy for starting and while idling at low speed. Above 650 r.p.m. of the engine the generator supplies all the cur-

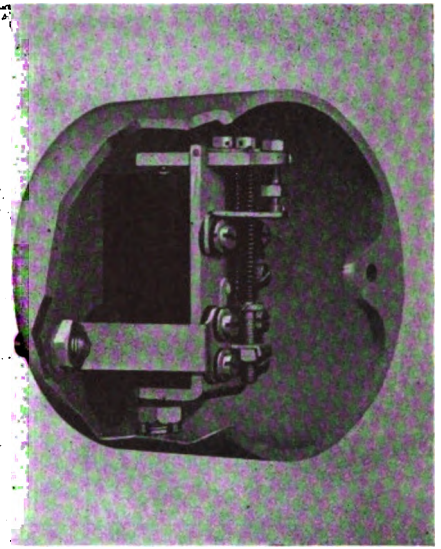
rent required for ignition and charges the battery.

The ignition system is double, there being two spark plugs in each cylinder, as well as duplicate distributors, which latter are mounted upon the camshaft housing of the engine and driven directly from the camshaft. The two distributors are ingeniously synchronized. Each cylinder receives sparks from both distributors, the right hand distributor supplying the plug nearest the distributor and the left-hand distributor the plug nearest the propeller.

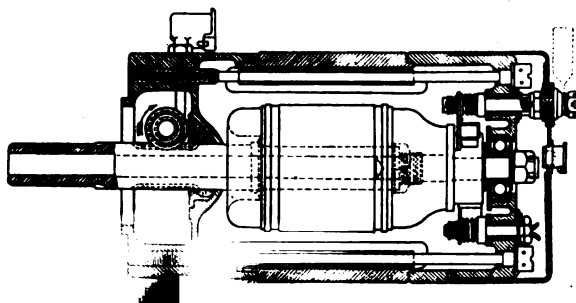
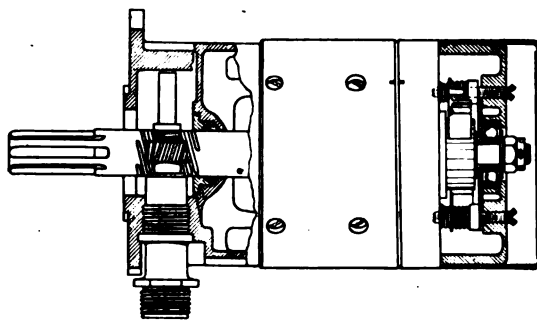
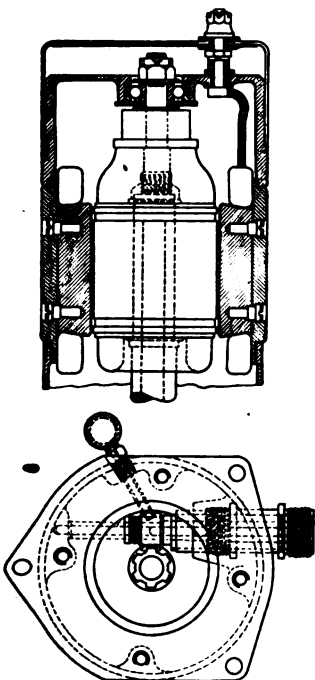
The current is controlled through a duplex switch. Either switch lever, when used alone, causes the battery to supply the ignition current. When both switches are turned the generator is automatically connected in circuit. As the generator does not furnish sufficient current to carry the ignition load, when the engine is running at less than 650 r.p.m., it is not advisable to turn both switches on at such speeds, since this causes the battery to discharge through the generator. Thus, starting is accomplished by turning one switch handle, and when the engine is running at above 650 r.p.m. the second switch lever is turned to the "on" position, so that the current will then flow from the generator. An ammeter is incorporated in the switch assembly.



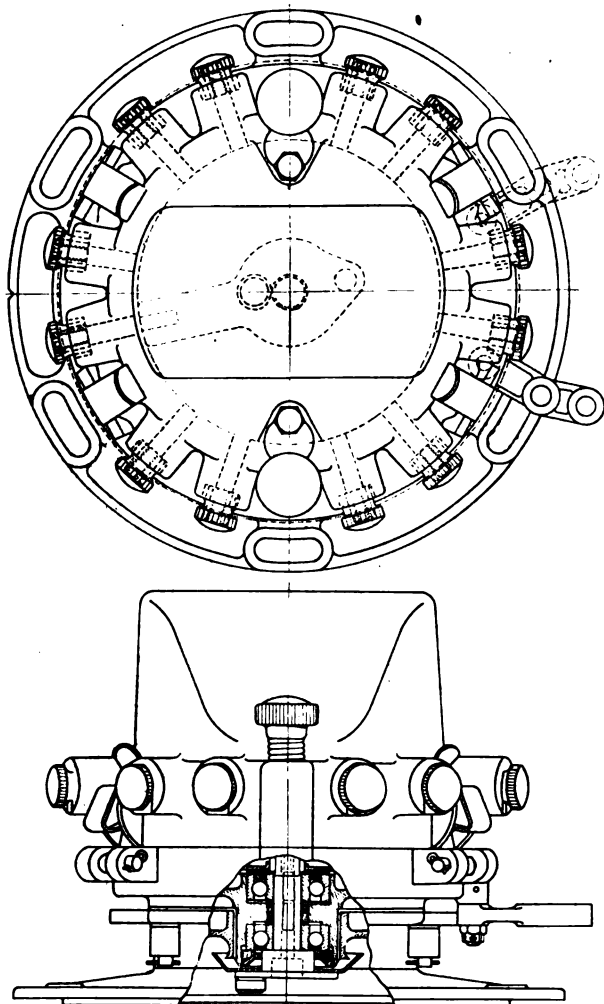
Combination switch and ammeter



Voltage regulator back of switch



Sectional 1



Two outside views of ignition unit

The generator is a four-pole, shunt-wound unit, mounted vertically on the engine crankcase. It is directly driven at  $1\frac{1}{2}$  times crankshaft speed. As indicated by the sectional view, the tachometer drive is incorporated in the generator base, being secured by means of a worm gear off the armature shaft.

The voltage regulator controls the generator field current through the magnetically operated regulator contact points. This regulator is usually mounted on the dash directly behind the switch and is connected in circuit as shown in the diagram herewith.

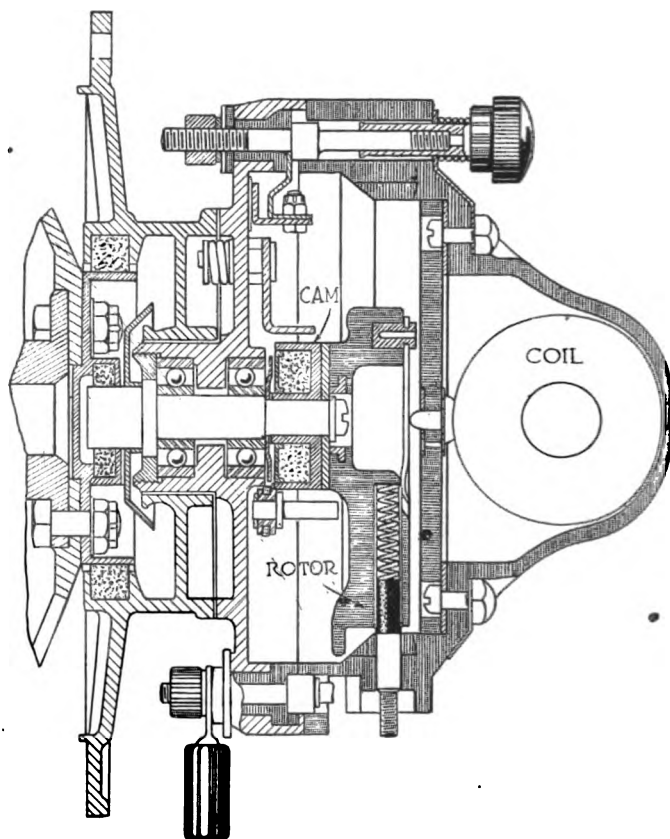
Probably the most interesting unit in the entire system is the breaker-distributor. Two distributors, each operated by the camshaft as described, provide each cylinder with two independent and simultaneous sparks at the duplicate plugs. The distributors are interchangeable and each distributor incorporates both an ignition coil, sealed in the Bakelite head, and the breaker mechanism. The timing range is 40 deg.—30 deg. advance and 10 deg. retard—measured on the crankshaft circle.

Both breaker mechanisms are operated by cams having twelve lobes, or one lobe per cylinder. The cam operates pivoted contact arms which close and open the low voltage circuit at the proper instant for firing. The unusual features of the breaker mechanism are the two main contact arms, each performing the same function at the same time for reliability, and, as a safety feature, an auxiliary contact arm which prevents the engine from operating in the reverse direction.

An illustration is given showing the arrangement of the two main contact arms and the auxiliary contact. The auxiliary contact arm is so set that when the engine is running ahead the auxiliary contact points break before the main contact points, so that the action of the auxiliary contact points has no effect whatever. Should the engine begin to rotate backwards, the auxiliary contact points will not separate until after the main contact points have separated. Since the auxiliary contact points are connected in series with a resistance, the current after the main contacts are broken is so weakened that no spark will result and the engine therefore cannot function in a reverse direction.

It is, of course, necessary in this arrangement that the two pairs of main contact points operate simultaneously in order to get synchronized sparks. To provide for synchronizing adjustment, the condenser-breaker plate, upon which the contact arms are pivoted, is arranged to swivel slightly, permitting as an adjustment feature one arm to advance before the other in their relation to the cam. This adjustment is secured by means of a clamping nut on the left side of the plate as shown in the illustration of the breaker mechanism. In adjusting the main contacts for simultaneous action, it is necessary that they are on the lobes of the cam at the same instant, and that the gaps between the contact points should be approximately the same. These contact points should be set so they separate not less than 0.010 in. nor more than 0.015 in. The average opening is 0.012 in.

An ingenious maintenance arrangement has been worked out to check the accuracy of synchronism by means of two 8-10 volt electric lamps, each in series with one of the main contact arms. The cam should be turned one complete revolution and the lamp should indicate the best average of synchronism. The firing order is illustrated in the diagram herewith, the cylin-



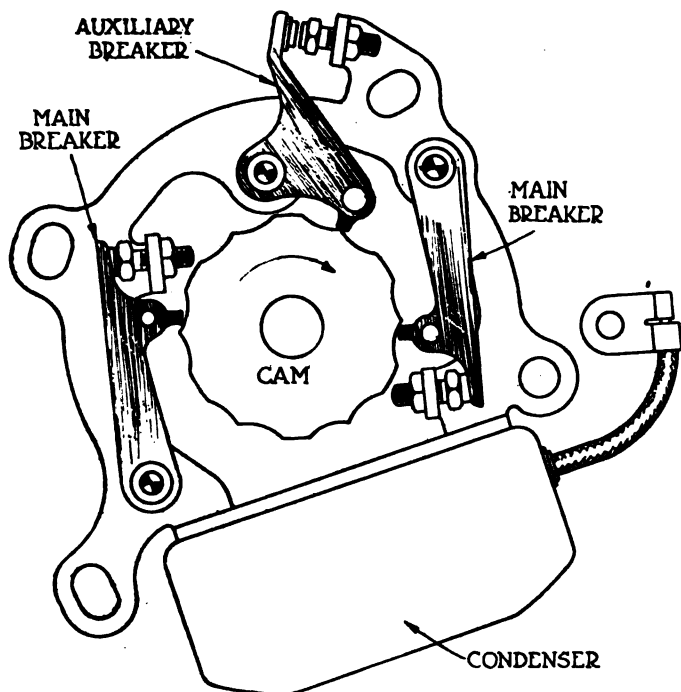
Sectional view of ignition unit

ders on the distributor end being referred to as 1L and 1R respectively, and those at the propeller end as 6L and 6R.

The firing order is as follows:

1 2 3 4 5 6 7 8 9 10 11 12  
1L 6R 5L 2R 3L 4R 6L 1R 2L 5R 4L 3R

To take care of airplane requirements, a special light-weight battery was developed for the Liberty engine. These batteries are supplied by the Willard and Exide companies. They contain but very little elec-



Arrangement of the three arms of the circuit breaker. The main breaker points are diametrically opposite and open simultaneously. The auxiliary breaker has a slight lead in normal running

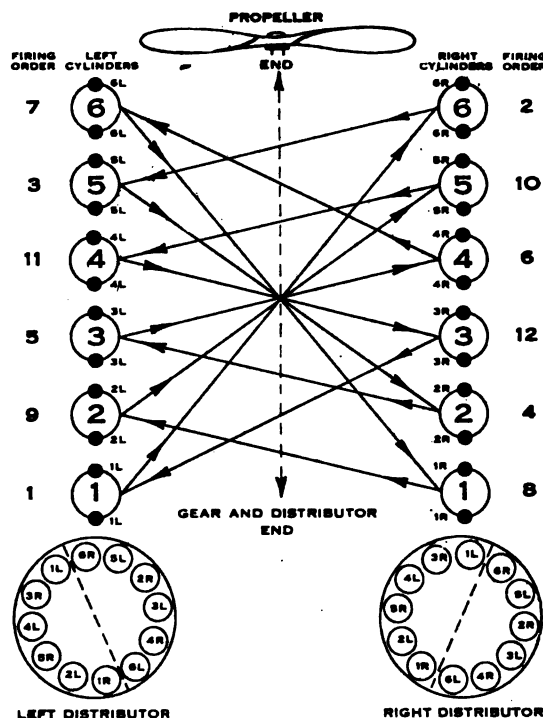


Diagram of firing order

trollyte and may be turned upside down without harm. The battery is a four-cell type. The two types of battery vary slightly in detail, but in general principle they are quite similar. The battery is built within a double compartment, with the cells held in the lower part. The upper part of the receptacle forms an expansion chamber and at the same time helps to seal the battery. By means of this chamber the battery can be operated at various angles and positions without spilling the acid.

Not the least of the problems connected with the development of the Liberty aviation engine was the design

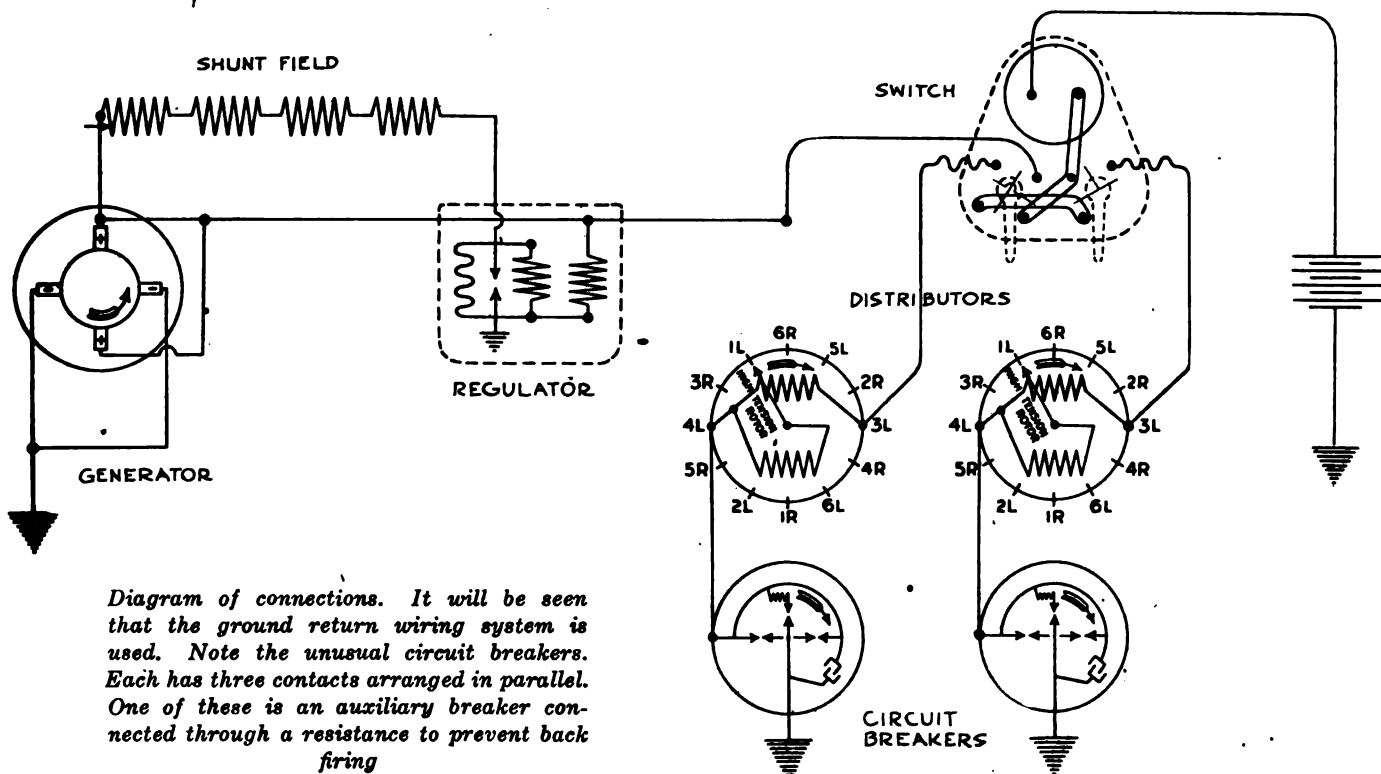
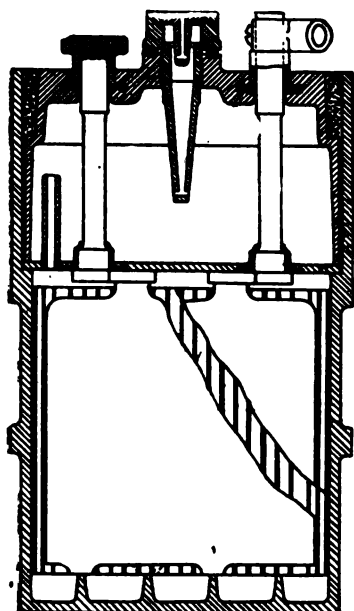
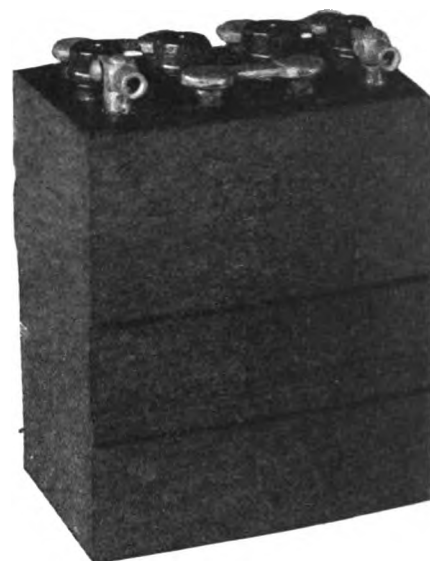
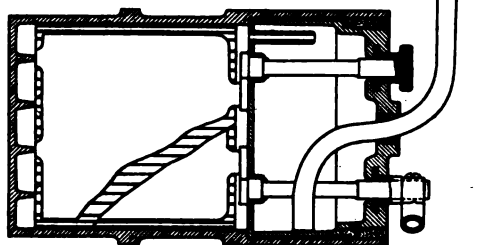


Diagram of connections. It will be seen that the ground return wiring system is used. Note the unusual circuit breakers. Each has three contacts arranged in parallel. One of these is an auxiliary breaker connected through a resistance to prevent back firing





To prevent spilling of the electrolyte in upside down flying the battery on the Liberty engine is provided with an upper closed chamber connected to the battery proper through a stand pipe. One of the sectional views shows the bent nozzle type of hydrometer used to take readings. The battery weighs 10 lb. 3 oz.



of a special type of storage battery for the ignition. This battery had to be as light as possible and made so that the acid could not be spilt during the various maneuvers of the airplane. The photograph herewith shows the Willard battery that was developed for this purpose. It weighs only 10 lb. 3 oz.

The batteries were supplied by the Willard Storage Co. and the Electric Storage Battery Co. of Philadelphia and are assembled in a single unit container made of hard rubber. No individual jars are used in the manufacture of the battery. The plates are about 3 in. sq. and 3/32 in. in thickness. Threaded rubber insulation is used between the plates, the ends of these insulators having thick ribs of hard rubber extending beyond the edges of the plates.

Referring to the cross section through a cell of the battery, a thin, hard rubber baffle plate separates the part of the cell containing the plates from the large compartment into which the electrolyte is free to flow through small holes in the baffle when the battery is in an inverted position. This compartment is of sufficient size to hold all the acid without any leakage out of the vent

hole, either when the battery is laid on its side or when it is in an inverted position. A deep, hard rubber cover and a specially designed vent plug complete the cell. Long, cylindrical posts of lead, burned to a lead insert in the top cover, serve to connect the plates with the top connectors and terminals of the battery.

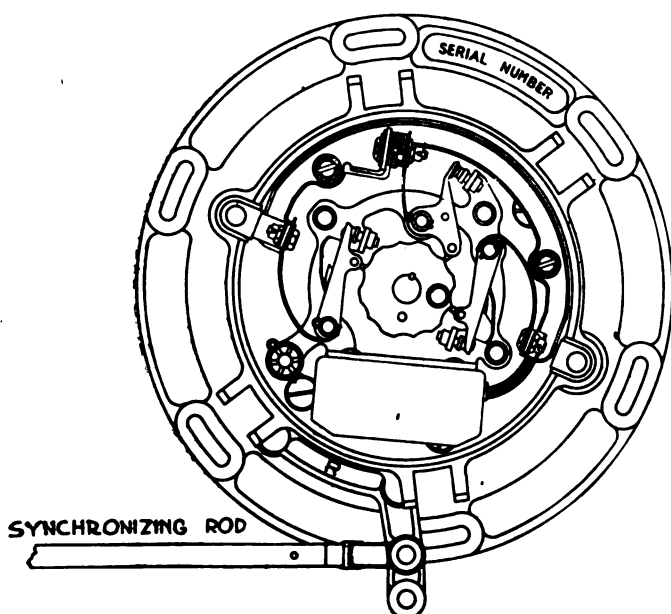
The specific gravity of the electrolyte of this type of battery is read by tipping the battery on its side and taking the gravity by means of a hydrometer provided with a bent hard rubber tube, as shown in one of the illustrations. In flushing this battery each cell is filled with distilled water to a depth of 1 in. above the baffle plate. After several minutes the surplus water above the plate is removed with a hydrometer syringe. Charging is effected at a rate of one ampere. A discharge rate of 3 amp. can be maintained for 3 hr. at normal temperatures.

One of the features of this battery is the possibility of preparing it for overseas shipment in a "bone dry" condition. A battery prepared in this manner has never had any acid in the cells and can be kept in this condition for an indefinite period. When it is wanted for service the battery is filled with acid of a certain gravity and charged at a low rate until the specific gravity of the electrolyte and the battery voltage remain constant.

## New Hall-Scott Engine

**B**LOCK tests recently made showed that the new six-cylinder Hall-Scott L-6 aircraft engine is capable of developing 212.6 hp. at 1666 r.p.m. A comparison of the results with those obtained from earlier Hall-Scott models, the A-5a and the A-5, shows a considerable improvement. The output figures above given are the average for a six-hour non-stop run which was conducted under the supervision of George R. Ross, a Government inspector. The cylinder dimensions are 5 x 7 in.

One of the chief improvements in this new engine as compared with earlier models is that now all of the oil is retained within the engine, with the result that the oil consumption is only 0.01 lb. per b.-hp.-h. as compared with 0.35 lb. per b.-hp.-h. in the former models. The new engine weighs only 502 lb. as compared with 595 lb. for the type A-5a, which developed less horsepower. Most of the reduction in weight was made possible by the use of steel cylinders, which are similar to those of the Liberty engine, where cast-iron cylinders were formerly used. The greater strength of the steel cylinders permitted the use of higher compression. The test showed the fuel consumption to be at the rate of 0.55 lb. per brake hp. hr.



Showing one of the breaker mechanisms complete and the method of connecting with the other by a synchronizing rod

# Organization of the French Army Automobile Service

Equipment Included 90,000 Trucks and 150,000 Men — Subsidy Plan Made Vehicles Quickly Available—How Repairs Were Handled

By W. F. Bradley

OFFICIAL figures released by the French Government show that the automobile service of the French army comprised 150,000 men and 2500 officers, with 90,000 trucks and cars when the war ended. The value of the automobiles, together with the stocks of spare parts, is estimated at \$800,000,000. The budget for the maintenance only of this material is \$40,000,000 per month, while if the purchase of new vehicles is included the total expenditure is \$600,000,000 per month.

The French have always maintained a bigger army automobile service than that of any of the Allies or of the enemy powers. This was both a matter of policy and of necessity. Whereas the German army specialized more on railroads, the French authorities believed that the best results could be obtained from motor trucks. The great length of line held by the French army compared with the length of the other Allies necessitated the big number of trucks. Also the fact that for a long time the French were on the outside of the circle, with few convenient railroads for moving troops and supplies, had its influence on the number of trucks required.

On the outbreak of war the French army did not possess more than 7000 subsidized trucks. These were vehicles of an approved type in the hands of private owners, but which could be and were claimed by the army at a moment's notice. In addition to these trucks there were between 70,000 and 80,000 privately owned touring cars of a suitable size and power for military service, which the army also had the right to requisition.

## Sound System of Organization

A very sound system of military automobile organization had been drawn up before the war, and by means of subsidies manufacturers had been directed toward the production of a type of truck very suitable for service in the field. But although the system was good the quantity of vehicles available was altogether insufficient.

It was under this military subsidy system that the French army took over at a moment's notice the whole of the 900 motor buses in service in the streets of Paris. Some of these buses carried the 75th Infantry Regiment

into Belgium, allowing these troops to keep pace with the cavalry. Other buses had their seats ripped out and were transformed in a few hours into meat trucks. By reason of these advance arrangements the French army was able to have deliveries of fresh meat by automobile from the very beginning of the war, this work being done in a very efficient manner.

The system adopted before the war, and which has been in operation until the present date with practically no changes, was to form sections of 20 trucks, with 2 drivers to each truck, simple repair facilities, and a rolling kitchen. Such a section was in charge of a lieutenant, who had the use of either a motorcycle or a light car. Three such sections were united from an administrative standpoint (although not always working together) into a group, and the groups were united into a groupment, each with a carrying capacity of 6 battalions or 1 brigade or 1000 to 12,000 tons of material.

These automobile groups got into actual work on Aug. 10, 1914, and by the end of the month had carried 14,000 men and transported 18,000 tons of supplies.

It was immediately after the Battle of the Marne, when Gallieni requisitioned all the taxicabs and many of the private automobiles of Paris to carry a

fresh division to Meaux, that the automobile service began to extend. As an example of the increase, the tonnage transported by automobile during the Verdun battle and also during the first Somme battle averaged 766,000 a month. In June, 1918, when the Germans were making their last supreme effort to crush the Allied armies and gain possession of Paris the automobile tonnage for the month attained the record figure of 1,100,000. It has to be remembered also that the distance covered in June, 1918, was very much greater than during the Verdun battle.

## Duties of the Service

Summarized, the duty of the automobile service is to keep the army adequately supplied with men, with food, with munitions and materials, to fill the gaps in the railroad system and permit of the greatest flexibility of movement of the army and its material.

The French system is to have one automobile service for the entire army, and to adopt non-specialization of

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*The tonnage transported by automobile during the Verdun battle and during the first Somme battle averaged 766,000 a month.*

vehicles as far as possible. The exceptions are for the Air Service and the Artillery. The automobile service of the army purchases and delivers automobile chassis to the Air Service, but is not responsible from that point on.

The Air Service purchases or builds its own bodies and maintains and operates its own vehicles. It also purchases or builds its own trailers and special vehicles. A somewhat similar state of affairs exists with regard to the artillery; the automobile service has to supply the artillery with shells, food, etc., in just the same way as it supplies the infantry, the engineers and other corps, but it has no control over the tractors and trucks used permanently by the artillery service.

#### Operated Under Difficulties

The difficulties of the work of the automobile service increased with the length of the war. In 1915 an attack was always preceded by a bombardment of several days. Thus the automobile service was warned that a call was about to be made on it, and all arrangements could be made to so organize the convoys that they could carry supplies and reserve troops to the point where they would be needed.

This was a weakness quickly noticed by the attacking party, and in 1918 long bombardments were no longer indulged in by the German armies. In the big attack on the Aisne, in the spring of 1918, the German bombardment lasted only three hours, and when the Kaiser's troops made their huge Paris drive in July, 1918, the bombardment which preceded the great infantry attack began at midnight and ended at 4.30 o'clock in the morning.

Under such conditions there was no time to concentrate automobile trucks or to bring up reserve supplies by road in time to stem the first fierce rush. This also meant that the automobile men who were in the attacked zone were put to as severe a strain as any of the combatant troops. They had to work until they dropped from sheer exhaustion; whatever food they got was snatched while driving or while waiting for instructions, and all of their work had to be done over a zone which it was in the interests of the enemy to maintain under the most intense artillery fire.

It was not an uncommon thing, under such circumstances, for men to fall asleep at the wheel and to be awakened by the loaded truck running off the road. Cases are not unknown where a tired driver, bringing back war-worn men, has run off the road in the dark, allowing his truck to fall six feet, and both the men in the truck and the driver have continued to sleep until morning.

#### Considerable Economy Effected

Non-specialization of vehicles and the rigid rule that no officer or unit shall claim a car as his or its property have resulted in a considerable economy in automobiles. A French infantry division, for instance, is entitled to six touring cars and one or two light cars for headquarters use, according to whether the division is composed of three or four regiments.

No unit in the division can claim priority in the use of these cars: they are to be used for the general work of the division. By means of this grouping the six cars are sufficient, and are kept constantly in service, covering from 650 to 700 miles a month. Without this system three times the number of cars would be necessary, and the average car mileage would not exceed 250 per month.

Although France possesses a wonderfully fine automobile service it is not above criticism, and its most

merciless critics are the French themselves. The three points which appear to be the weakest are the lack of continuity in general control; the lack of technical knowledge on the part of the higher officials, and, in consequence of this, the faulty system of allowing important repairshops to be established too near the lines.

#### Authority Changed Five Times

The controlling authority of the French automobile service has been changed five times during the war, the fifth system of management being practically the same as the first. At the present time the automobile service is a sub-division of the artillery, the head of the service being an artillery officer, Lieutenant-Colonel Pujo.

There are four different controlling forces in the French automobile service: (1) A sub-director for the artillery personnel; (2) a director for the material supplied by the Ministry of Armament; (3) a director for improvements attached to the Ministry of Armaments; (4) a director at General Headquarters for the automobile service at the front.

These four directors are responsible to three different chiefs: (1) The Minister of War; (2) the Minister of Armaments, and (3) General Headquarters. The Minister of War is responsible for the personnel, the Minister of Armaments for the material, and G. H. Q. for operations at the front.

The reformists claim that as the automobile service of the army is only a huge transportation organization, it should be established on commercial lines, with a single director at the front, where the vehicles are used, and a single director at the rear whose functions would be to supply, maintain and improve material, to recruit and train personnel. This director should be responsible to the Minister of War only, and should not be attached to any particular branch of the army. There is no more reason for him to be attached to the artillery than to the infantry, the cavalry, the engineers, or any other corps.

#### The Plan of Organization

As in the case of the railroads, the General in Chief has charge of all the automobiles operating in the zone of advance. General Headquarters has always maintained that repair parks must be kept in the zone of advance in order to assure proper repair of vehicles in service. Experience has shown that repair work in the zone of advance should be reduced to a minimum and should be nothing more than is essential to keep the vehicles in running order. From simple repairshops there have grown up in the zone of advance very complete overhaul shops employing 600 men, capable of doing elaborate work, and only removable at the cost of considerable time and money.

This system of allowing overhaul shops to be established near the lines has cost the French dear on more than one occasion. This year, when the Germans were making their drive on Paris, they captured one of these repair parks at Noyon practically intact. The officer in command of the organization, feeling nervous at the rapid advance of the enemy, proceeded to G. H. Q. to ask permission to remove. In the meantime the German army advanced. Before the officer had returned with his instructions, and while the German forces were only 2000 yards away, the entire personnel decided that the only thing left to do was to bolt, which they did, leaving the entire repair park, valued at \$1,600,000, to be captured by the enemy.

During this German drive there was a similar case at Vierzy. On the approach of the enemy it was impossible to remove the whole park, and material to the



value of \$500,000 had to be abandoned. When the Germans began their offensive of March 21 the automobile repair park at La Motte Breuil was considered to be in danger and was ordered to be removed. It went back a few miles to La Ferté sous Jouarre, and had only just begun to get into working order again when the German offensive of May 21 was launched and a further removal had to be made to Montereau. During these removals a complete month was lost.

If the zone of advance had been limited to simple, mobile repairshops, with the overhaul shops entirely in the zone of the rear, better service would have been obtained, and losses which are declared to run as high as \$3,000,000 would have been avoided.

Some critics maintain that in addition to this direct loss there was an additional loss of \$6,000,000, representing 1000 trucks at \$6,000 each, these having to be purchased to replace losses to the enemy or to meet the shortage by reason of the impossibility of carrying out repairs.

This expenditure of \$9,000,000 would have been avoided by the adoption of the general rule that all automobile overhauling should be carried out in permanent shops in the zone of the rear. It is stated that the overhaul shops at the front employ 1000 men per day to repair 3.4 trucks per day. At the permanent shops at Orleans 150 men overhaul 11 trucks per day.

Before the end of the war it was fully recognized that the overhaul work, equipped to carry out any kind of mechanical work, also to repair and build bodies, should not be under the control of the G. H. Q. and established in the zone of advance, but should be placed in the interior zone and operated on commercial lines. It was owing to the difficulty of making this change while the war was in progress that these overhaul parks were allowed to remain under the control of G. H. Q.

Very severe criticism has been leveled in France against the system which allowed non-technical men to occupy important positions in the automobile service. This defect is not limited to France, for in all the Allied armies there appears to have been a general idea that

any officer, no matter what his previous training, was capable of serving in the automobile service.

The system of judging results by numbers only, inaugurated by non-technical chiefs, has tended to develop abuses. In some parks it was the rule that only the work for which a car was brought in should be carried out.

Thus if an automobile was brought in with a broken spring, the workman would repair the springs; but if he noticed that the steering gear was also defective he would pay no attention to this.

A few days later the car would be brought back to have its steering gear attended to, and the shop would receive credit for two automobiles repaired instead of one.

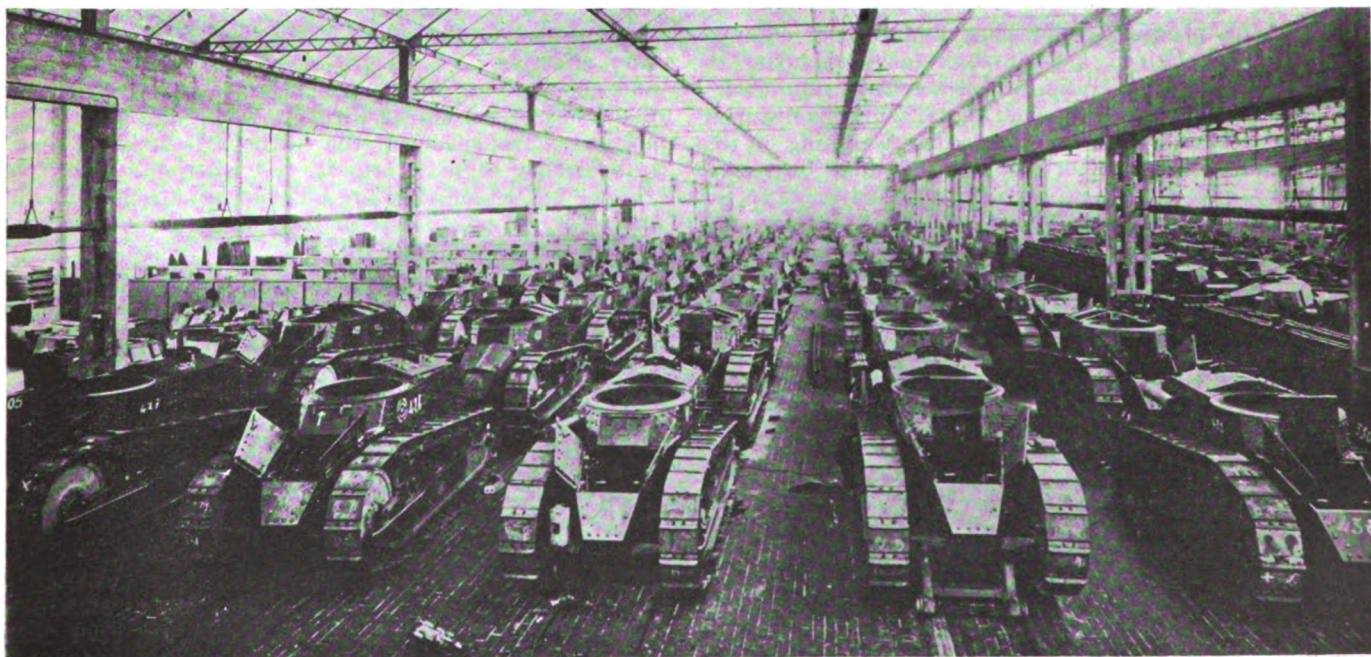
As an extreme case it is stated that on one occasion an officer drove into a repair park in order to pay a visit to the commanding officer. On leaving an obliging mechanic cranked the motor, and then reported this as one car having gone through the shops for repairs.

#### Repairs at Front Not Satisfactory

The installation of the repair parks at the front has not always been satisfactory. If the officer had had technical training he did good work; if his only idea was to respect military regulations the result was bad. An officer instructed to establish a repair park in a certain locality reported that no suitable building existed there. He was told that he had received his orders and had no right to search elsewhere.

A chief of a repairshop wishing to secure better protection during the winter proposed to build woodsheds covered with tarred paper, the cost of which was 40 cents a yard. The reply of his chief was that the cost was much too high and that in consequence he should use corrugated iron. The officer pointed out that corrugated iron cost much more than wood. "No it does not," replied the chief; "the engineers supply us with corrugated iron, but we have to buy wood."

There was not sufficient technical control over the officers in charge of repair parks.



*Assembly building at the Renault plant where small "tanks" were built at the rate of 650 per month for the French and American armies. Seventy are seen in course of assembly. In the same building caterpillar gun platforms and 6-in. cannon were also assembled. This plant employed 26,000 men and is completely equipped with American machine tools*

# Artillery Tractor Production Well Started When the War Ended

3527 Completed to Nov. 1 and 1174 Shipped to France—Program  
Included All Sizes from 2-Ton Ford to 35-Ton  
Mark VIII Machines

WASHINGTON, Dec. 20—At the time the armistice was signed the War Department was preparing to place under General Pershing the finest motorized artillery equipment that has ever been devised.

Tractors and tanks were being shipped abroad in quantities and were entering quantity production in the American factories. A complete program arranged by the Ordnance Department had been designed and put into action.

It included tractors ranging from 2½ to 20 tons, and tanks of various sizes from the 2-Ford to the Mark VIII.

The work of designing and getting these tanks and tractors into operation is chiefly that of two automobile men—Lieut. Col. H. W. Alden, who designed the tanks, and Lieut. Col. W. G. Wall, in charge of tractors and gun mount designs.

The program included the 2½-ton tractor equipped with a Cadillac 8-cylinder engine, capable of hauling the French 75 mm. at 18 m. p. h., the 5-ton tractor equipped with a modified Liberty truck engine capable of hauling a 4.7 howitzer at better than 7 m. p. h., and the 10-ton tractor with a special engine designed by the Ordnance Department, and the 20-ton tractor which is a machine produced by the Holt company of Peoria, Ill.

## Mark VIII the Largest Type

The tank program included a 2-man tank equipped with 2 Ford engines, a 6-ton tank fashioned after the French Renault and equipped with a Buda engine, and the Mark VIII tank, capable of carrying twelve men, four machine guns and two 6-pounders weighing 35 tons and equipped with a Liberty engine. In addition a cargo carrier was designed with a truck body and crawl treads.

Production on November 11 of these tractors and tanks had reached a point where the 2½-ton machines were just coming through, and 1858 of the 5-ton, 1541 of the 10-ton and 128 of the 20-ton types had been produced. Of these, 450 5-ton, 643 10-ton and 81 20-ton types had been delivered in France.

The production on the Ford tanks would have totalled 1250 for the month of December and the Ford plants would have had a production of 2500 a month for January 1.

The 20-ton tank, one of the engineering marvels of the war, was exhibited yesterday at the Aberdine Proving Grounds. Assistant Secretary of War Benedict Crowell drove it over bushes and trees up to 17 in. in diameter and across the stumps.

This particular tank exhibited carried an 8-in. howitzer gun. It weighed 55,000 lb. It had made a journey overland from Peoria to Detroit and from Detroit to the Aberdine Proving Grounds at Maryland, and included among its feats the climb of a 45-degree grade and traveling through 4 ft. of water.

In its journeys overland, whenever a bridge was reached which was considered dangerous, the tank was forded across the river at some shallow point.

A demonstration was made which included the firing of a gun with the engine running. The shooting did not disturb the engine, in fact did not even cause a miss, and as quickly as the shell was discharged the tractor was gotten under way.

## 2½-Ton Machine Wins Race

The cargo carrier with a truck body and a tractor tread was designed for hauling heavy tonnage. It has all the qualities of the other tractors and is able to climb grades, but of course has not the ability to push down trees. The Mark VIII tank, which is equipped with a wireless outfit, was produced by the Ordnance Department on a joint production schedule with England, parts being made here and shipped abroad for assembly.

The 2½-ton, 5-ton and 10-ton tractors were manufactured at various automobile plants. A race between these tractors and including the Ford tank, resulted in a victory for the 2½-ton machine, which easily outdistanced the others at its speed of 18 m. p. h., but the 5-ton job, which includes the modified Liberty truck engine and which has been described before in these columns, was said by the officials to undoubtedly be the best artillery tractor that has been produced.

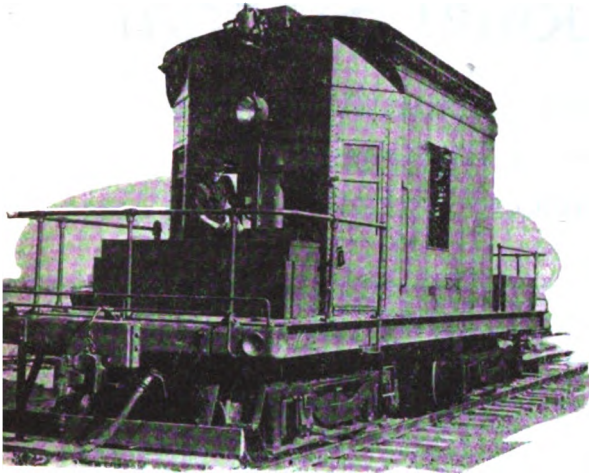
The Ford job is more or less freakish, but nevertheless very effective. The entire tank is less than 6 ft. high and about 10 ft. long. Entrance is made by lifting up the front metal shield through which the gun muzzle appears. The space for the two men is so small that it is necessary to back into it, and when the driver and gunner are seated they are huddled in so compactly that there is not even room to sway with the turning and jarring of the tank.

The gunner has his only view by peering through the muzzle of the gun. The driver sees only through the slits in the tower of the machine, and between severe jolts received over the ground and the spasmodic jerks resulting with every turn of the tank, the occupants have a difficult time. The tank operates at 15 m. p. h. and when turning, instead of describing an arc makes an abrupt right about or left about, which makes riding in the tank very difficult and uncomfortable.

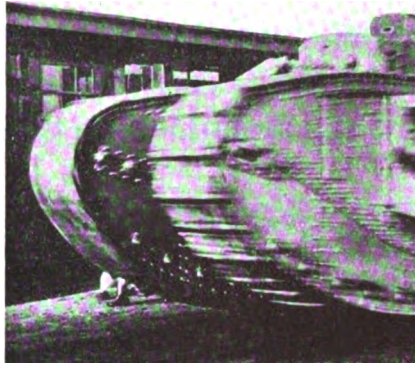
A FRENCH report on new anti-friction metals includes trials of alloys consisting chiefly of aluminum, cadmium, magnesium and especially of zinc. Such alloys were designed to reduce as far as possible the use of copper, tin, lead and antimony, and the most satisfactory results are stated to have been given by a compound of 63.3 per cent of zinc, 21.3 per cent of tin, 12 per cent of lead, and 3.3 per cent of copper.



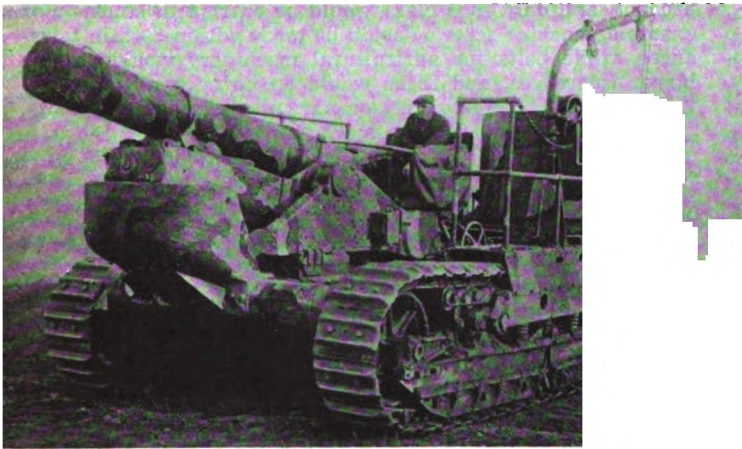
# Some of America's Land Battleships



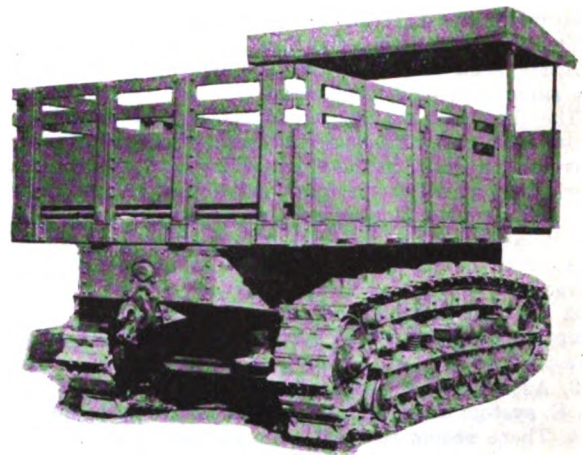
*Type of gasoline-propelled railroad engine which has been developed for use in and around cantonments*



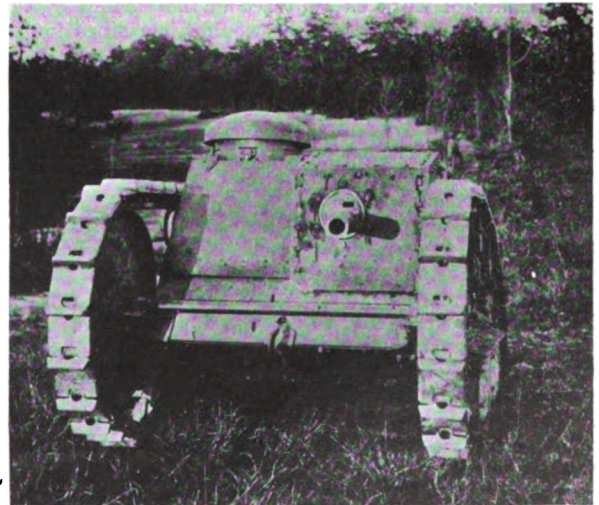
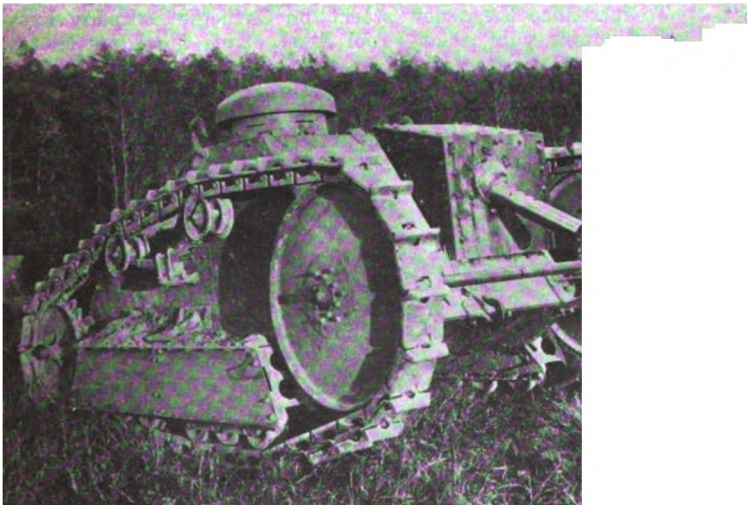
*The Mark VIII Tank, produced by the Ordnance Department on a joint production schedule with England, carries twelve men, four machine guns and two six-pounders. A twelve-cylinder Liberty engine, the same as used in airplanes, furnishes the power for this 35-ton dreadnought. A wireless outfit by which communication is always had with headquarters is a part of its equipment*



*Crawler type of heavy howitzer conveyor which is capable of going practically anywhere, even through heavy brush and forest*



*Another use of the crawler type of transmission, this time on a stake-body vehicle for carrying ammunition and supplies*



*Machine gun cavalry is the name that should properly have been assigned for these American "Baby" or 3-ton tanks, developed by the Engineering Division of the Ordnance Department. Capable of a speed double that of a horse and with one man firing at a rate in excess of the firing of ten men with rifles, this type of tank saves the work and lives of many thousand soldiers. It advances against machine gun fire, and can pull guns as well as carry fighters*



# Screw Thread International Standards

## Commission Appointed by Congress Beginning Active Work—Results of Questionnaire on U. S. Standard, S. A. E. Standard and A. S. M. E. Machine Screw Standard Threads

ON Sept. 21 last Secretary of Commerce Redfield appointed a Commission for the Standardization of Screw Threads in accordance with an act of Congress known as House Bill No. 10852. This committee was later divided into four branches, to deal respectively with (1) pitches, systems, forms of thread; (2) tolerances, classification; (3) nomenclature and terminology; (4) gages and methods of test.

The bill referred to prescribes the duties of the Commission, which, it says, shall ascertain and establish standards for screw threads, which shall be submitted to the Secretary of War, the Secretary of the Navy and the Secretary of Commerce for their approval. These standards, when approved, shall be adopted and used in the manufacturing plants under the control of the War and Navy departments and so far as practicable in all specifications for screw threads in proposals for manufactured articles, parts or materials to be used under the direction of these departments. It is also intended by the bill that the Secretary of Commerce shall promulgate such standards for use by the public and publish the same as a public document.

The first hearing for the purpose of obtaining data and views from manufacturers and users of screw-thread products was held on Oct. 7 in the Engineering Societies Building, New York City, at which the following topics were discussed:

1. As a national standard, is there any objection to the continuation of the U. S. Standard system of thread diameters and pitches for general use in practically its present shape?

2. As a national standard, is there any objection to the adoption of the S. A. E. system of diameters and pitches of fine threads?

3. As a national standard, to what extent could the A. S. M. E. system of standard machine screws be adopted?

4. There seems to be a general feeling that in standardization we should make it possible to cover several classes of work, and there has been suggested a minimum of four classes of fits to provide for different grades of work ranging from reasonably wrench-tight fits to very loose fits. Would such a classification, including at least four classes, be sufficient for all grades of work encountered in the various systems of threads previously mentioned or would a classification including more than four classes be required?

5. Is there any objection to adopting the "standard hole" practice for screw threads—that is, the practice of making all the taps for any particular thread of one basic size and securing the required fit by changing the diameter of the screw on male threaded work which is to assemble with the nut cut by the basic tap?

The consensus of opinion of those present was as follows:

1. The U. S. system should be continued practically in its present form for the ordinary threaded work, to which it is well adapted.

Objections were raised to its use for diameters less than  $\frac{1}{8}$  in. on the ground that for small work the U. S. pitches are too coarse and the threaded work too much weakened by excessive depth of thread.

2. The S. A. E. system is satisfactory for use where finer threads are necessary, as, for example, in automobile and aeroplane work.

3. The A. S. M. E. machine-screw system should be used to supplement the U. S. system for diameters less than  $\frac{1}{8}$  in., and all sizes from 14 to 30 should be discontinued in order that there may be no overlapping of the two systems. A minority thought that all A. S. M. E. sizes should be retained.

4. Classification of Fits. The general opinion was that four classes of fits would be ample to provide for all ordinary threaded work, and that very probably three classes would be sufficient, since it was felt that wrench fits, stud fits, etc., which could not be covered by general specifications should be classed as "special" and no attempt made to include them in the regular classification.

5. Standard Hole Practice. There was a sharp difference of opinion on the question of whether the nut or the screw should be made basic, with the majority favoring the former.

A part of the objection to making the hole basic arose from a misapprehension. It was suggested that if the tap or the tapped hole were made basic it would be necessary to carry in stock several sizes of bolts in order to provide for different classes of fits. Such, however, is not the case, since in general only a single class of fit will apply to each threaded product, and only that class would be carried in stock. For example, machine screws should be made within certain tolerances, while bolts for agricultural machinery would require larger tolerances, and there would be no necessity for providing for machine-screw fits on agricultural-machinery bolts, or for "agricultural fits" on machine screws.

## Carbon Tool Steels

A NEW line of carbon tool steels is being manufactured by the Carnegie Steel Co. in its electric furnace at the Duquesne Steel Works, in five grades. These five grades contain different proportions of carbon, are suitable for different uses and in manufacture and shipment are designated by appropriate labels of different colors.

Although alloy steels have been generally used for cutting tools of late, the Carnegie Steel Co. reports that in its own machine shops and in actual work in its various plants it has found that there are many purposes where a well-made carbon tool steel can be utilized in the manufacture of tools. It has been possible by the use of carbon steels to reduce the cost of machine and other tools without material loss either in endurance or in speed of operation.

To introduce these new steels the Carnegie company has issued a new publication—Tool Steel. This is addressed to users of tool steels and only essential practical information is given, while extended theoretical discussion of heat treatment and related subjects is avoided. No use is made of the terms "critical temperature" and "critical range," but instead the shop terms "line of hardening" and "minimum grain size" are used.

In standard works of reference on metallography and heat treatment may be found figures illustrating the changes which take place in various kinds of steel under heat treatment. These, however, are, as a rule, steels of different carbon content, alloy steels, etc., so that a direct comparison is not possible. In Tool Steels are given illustrations of Metcalf test pieces and full-size test piece fractures made from specimens treated and tested at the Carnegie shops.

There is also a chart of heat colors, with its corresponding heat treating temperatures, based on carbon steels. Names of colors have been selected to conform to most general uses and are checked by indication of temperature in degrees Centigrade and Fahrenheit.

A chart of temper colors is likewise entirely new as regards the form in which it is presented. It is a direct reproduction by color photography from test pieces heat treated to the temperature shown.

# The Allen Self-Locking Differential

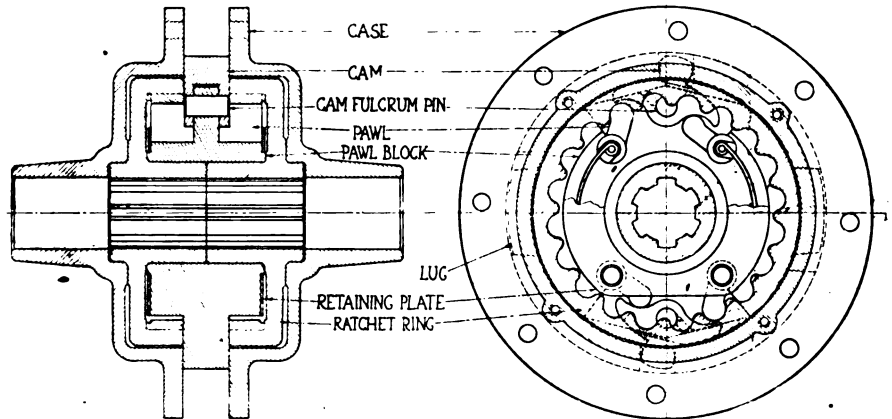
**A Simple Device Embodying the Reversible Ratchet Principle—Drive on Curves Is Entirely Through Inner Wheel—Loss of Traction of One Wheel Cannot Stall Car**

A DIFFERENTIAL of the type which drives on the inner wheel only when the vehicle is turning a corner, and which gives positive traction on one wheel, irrespective of the condition of the ground on which the other wheel may be standing, is manufactured by the East Iron & Machine Co., Lima, Ohio, and is to be marketed under the name of the Allen differential.

It comprises a pawl and internal ratchet mechanism, the ratchet device being automatically controlled. Each of the two ratchet wheels is provided with a splined hub which is fitted to one of the axle shafts, and in addition to the wheels there is a spider ring carrying the driving pawls. The pawls are set in the spider ring with limited movement, and the whole is secured to the casing to which the main gear wheel is either bolted or riveted. The driving mechanism, consisting of the ratchet wheels, spider and pawls, is assembled and secured in the casing. The spider ring arms are secured in slots in the casing with a limited movement, 3/16-in., which movement automatically changes the pawls from the position of forward to that of reverse drive. Hence, the backlash of the differential is only 3/16 in., and in operation the device is said to be absolutely noiseless and without shocks.

When the mechanism is pulling both wheels, in driving straight ahead, all parts move together as a unit. When one part moves faster, as in rounding corners, there is no load on that member. In rounding corners, the outer wheel overruns the driving pawl, making it a free wheel. The inner wheel then takes care of the entire load. Should the driving wheel encounter slippery surface and lose its traction, the outer wheel will pick up the load until such time as the inner wheel again secures sufficient traction.

When the driving clutch is disengaged, and the engine thereby disconnected from the driving mechanism, the differential automatically reverses and its reverse pawls control the wheels on the momentum drive. A light application of

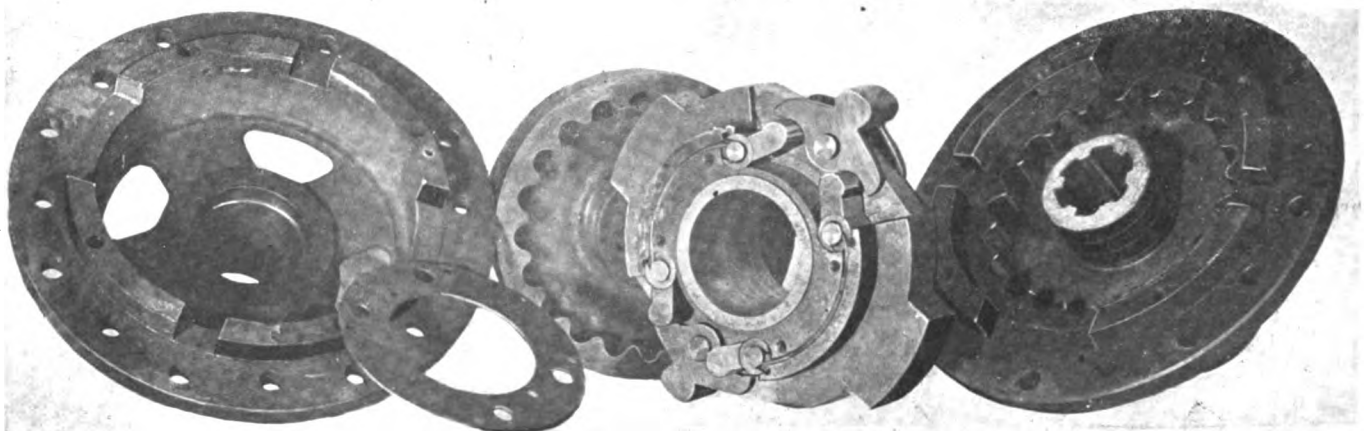


*Longitudinal and cross section through differential*

the brakes will then stop the car. When the power is again applied, the differential automatically changes to the position for forward drive. The chief advantage claimed for the Allen differential is that it makes a vehicle practically un-stallable.

We understand that this differential has been given extensive tests, both on passenger cars and on 3½-ton trucks.

THE predominant contributor to the world's supply of petroleum is the United States, which furnished no less than 64.74 per cent of the estimated total for 1917, the others in order of importance being: Russia, with 13.26 per cent; Mexico, with 11.37 per cent; the Dutch East Indies, with 2.74 per cent; Rumania, with 2.08 per cent; India (Burma and Assam), with 1.61 per cent; Persia, with 1.32 per cent; Galicia, with 0.947 per cent; Japan, with 0.615 per cent; Peru, with 0.511 per cent; Trinidad, with 0.303 per cent; Germany, with 0.189 per cent; the Argentine, with 0.170 per cent; Egypt, with 0.094 per cent; Canada, with 0.037 per cent; Italy, with 0.002 per cent, and other countries, with 0.006 per cent.



*Parts of the Allen self-locking differential*

# Development of the Aircraft Spruce Industry

Douglas Fir Used as Substitute in Less Exacting Work—Figures of Monthly Cut—Woodworking Plants Put to Making Finished Airplane Parts—Byproducts Disposal a Serious Problem

## PART II

By Lawrence K. Hodges

**O**WING to the relatively limited stand of spruce, to the difficulty and expense of increasing production and to the urgent necessity of rapidly expanding supply of airplane lumber, resort has been had to Douglas fir, which now constitutes about half of the cut. Spruce is reserved more particularly for combat and bombing planes, because of its combination of strength with lightness and resiliency and because a bullet cuts a clean hole instead of shattering it. These qualities enable a plane in which it is used to fly higher and carry more weight than one framed of other wood, and to remain in the air after its beams have been punctured with bullets which would have sent other planes to earth with broken wings.

Fir is strong but heavier and is more apt to shatter, but is well adapted for training and reconnaissance planes. Port Orford cedar is also used, being superior to fir, but there is only a small stand in the extreme southwestern corner of Oregon, and the entire output is shipped to the Allies.

The results accomplished in the course of the year that General Disque has been in control are told in some eloquent figures. In August, 1917, shipments totalled 202,264 ft. and in response to the pleas of the Allies an increase to 2,683,329 ft. was accomplished, all of this being spruce. In October, 1917, when cutting of fir stock began, the total was 3,443,667 ft.

Output increased steadily from month to month and showed a spurt after the Vancouver mill began cutting, until in August, 1918, the total was nearly 18,500,000 ft. and in October almost reached 20,000,000 ft., about equally divided

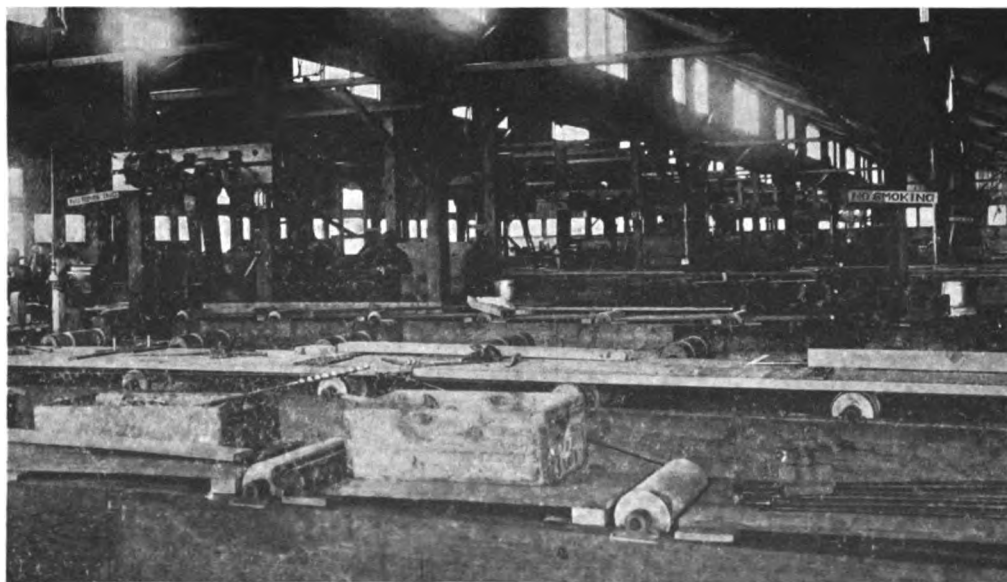
between spruce and fir. In fact, the shipment of good stock increased far more rapidly, for before the cut-up plant was put to work in February the totals were subject to a discount of 90 per cent for rejections, while since that time all stock shipped has been as nearly perfect as it can be made when cut and trimmed to wing-beam size.

Last November the Spruce Division aimed to reach a monthly output of 10,000,000 ft., and this mark was passed in March, but in April, in consequence of the great German offensive, it was raised to 30,000,000 ft. There is good promise that this point will soon be attained as the new mills come to full production. Growing efficiency of the men as they gain skill and experience aids powerfully in swelling output. In August the output at Vancouver was more than double that which was originally planned, and it steadily grows without addition of new units, though with improvements in machinery.

### Three Plants for Making Finished Parts

The Government has begun carrying production of airplane lumber on the Pacific Coast still farther by employing three woodworking plants to make finished parts to a tolerance of one thirty-second of an inch, ready for fitting and assembling in the airplane factory. The plants and skilled labor on the Pacific Coast are ample to furnish all the stock produced for the United States, and the depression in building has left them practically unoccupied except in finishing work for ships.

The stock turned out by the cut-up mill is further trimmed,



Interior view of airplane lumber mill erected by the Government at Vancouver, Wash. This huge building was put up in the record time of 45 working days



H. S. MITCHELL  
Designer and Manager of Government airplane lumber mill at Vancouver, Wash.





*To reach the heart of the timber the Government has built 166 miles of spur track. From these lines plank or corduroy roads branch into small canyons and over them motor trucks haul logs to railroads*

and that process reveals defects which cause rejection of 30 to 40 per cent. If this work were done on the Coast, a further reduction of 75 per cent in the tonnage shipped might be effected.

Planing mill men suggest that much material might be saved if wing-beams were built up of thin laminations rather than composed of solid pieces. A single knot or other defect may cause rejection of a beam 20 ft. long, though it may be otherwise sound. By laminations all the sound part of that beam could be used. Also a solid beam may be perfect to all outward appearances, but may have internal defects which would be discovered and eliminated if it were cut into thin laminations.

The layers of wood could be overlapped to give the same strength as is obtained in a solid stick, and added strength would be gained by elimination of defects which would otherwise be hidden. Much lumber which is now rejected would also become available for airplanes.

When it is considered that the present accessible stand of spruce in Oregon and Washington is estimated to yield at the most 700,000,000 ft. of airplane stock and that consumption will soon reach 15,000,000 ft. a month, economy dictates that the proportion made available for aircraft be greatly increased. Aviation in commerce and travel may soon be as general as it now is in war, and without such economy the best airplane lumber may reach an impossible price.

#### Problem of Side-Cut Lumber

The tremendous impetus given by the war to production of spruce for aircraft has created a serious problem for the lumbermen; that is, how to dispose of the side-cut lumber, meaning the product unsuited for aircraft which must be cut in process of cutting airplane stock. At the Government mills this amounts to 44 per cent of the output, but in commercial mills it is 80 per cent. The sudden increase in production of this class of lumber is indicated by the fact that there are now 52 spruce mills and that 25 of these cut spruce exclusively, as against a total of 25 four years ago which cut one-fourth spruce to three-fourths fir and cedar.

Formerly a market was found for the smaller output in building, boxes and food containers. With an output several times as large, the demand for building is at its lowest ebb, and a tremendous expansion of the market for other uses will be necessary to absorb the growing stock.

Side-cut in immense quantities is piling up at the mills, and it constitutes a financial burden to the manufacturers

and to the Spruce Division, as well as an obstruction to their operations.

To cope with this problem, General Disque has established a sales department and has placed in charge Lieutenant Thor W. Sanborn of Kansas City, who has been selling West Coast lumber for sixteen years and has made spruce his specialty.

He has divided all the country east of the Missouri River into districts, each of which is in charge of a trained salesman and is supplied with a stock at its commercial center, from which prompt delivery can be made.

A planing mill has been added to the Vancouver plant to finish side-cut. A Spruce Bureau has also been established by the West Coast Lumbermen's Association with Ralph C.

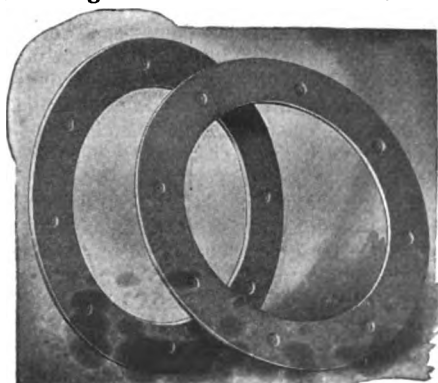
Angell as manager, and he works in co-operation with Lieutenant Sanborn. They are urging the Government to use spruce in some of the vast number of packing cases which it uses for supplies, and the suggestion has been made that boxes and crates for airplanes alone would consume 300,000,000 ft. a year as long as the war lasted.

#### Raybestos Molded Disc Clutch Facing

THE Raybestos Co., Bridgeport, Conn., has recently announced a new type of facing for disc clutches, known as the Raybestos molded disc clutch facing. It is composed of pure asbestos with a suitable binder, molded under great pressure. This process of manufacture is said to insure a homogeneity and an accuracy impossible with the woven type of facing, which was composed of asbestos spun around a composition wire (the wire to give the required tensile strength), this in turn being woven into tape, which was subsequently formed into a ring.

Discs of this molded facing can be made endless, which was impracticable with the woven facings. Owing to the homogeneity of the facing its frictional properties do not change as it wears away.

Among the claims made for the new facing are the following: It presents approximately 20 per cent more surface to the steel disc, consequently it increases the capacity of a clutch of given dimensions. It permits of a clutch easy in action, positive in release and free from sticking. The friction coefficient is given as between 0.35 and 0.40.



*Raybestos molded disc clutch facings*

# Pickling with Nitre Cake

Permits of an Appreciable Economy in Steel Cleaning and Reduces Demand for Technical Sulphuric Acid

**A**N investigation has been made by the Bureau of Mines regarding the availability of nitre cake for pickling steel. At the present time sulphuric acid is used for the purpose but the acid present in the thousands of tons of nitre cake produced in the manufacture of nitric acid for explosives might be utilized to the extent of releasing an equivalent amount of technical acid from industries which might find it economically practicable to adapt their processes to the use of a substitute. The nitre cake which is left to weather in the open, soaking into the land and polluting the streams, is a source of manufacturing nuisance, as well as an economic waste, the correction of which would partially relieve the strain on sulphur and acid production.

## Nature of Nitre Cake

Nitre cake is, popularly, a mixture of neutral sodium sulphate with a varying proportion of sulphuric acid; more properly, it is an impure acid sulphate or bisulphate of soda carrying a variable excess of sodium sulphate or, infrequently, of sulphuric acid, from kettles improperly charged or prematurely drawn. Sodium bisulphate contains, chemically, 40.6 per cent sulphuric acid combined with 59.4 per cent sodium sulphate in the double salt of the formula  $\text{NaHSO}_4$ . Nitre cake may occasionally have the same approximate composition, but its acidity usually ranges between 28 per cent and 44 per cent sulphuric acid, depending on the working conditions surrounding its production. In addition to the substances already mentioned, the cake contains small percentages of iron, aluminum and silica as regular impurities, with traces of arsenic, sodium nitrate or nitric acid as accidental impurities. The following analysis is fairly typical of its composition:

Silica .....	0.10 per cent
Oxides of Iron and Aluminum .....	.45 " "
Free Acidity, $\text{H}_2\text{SO}_4$ .....	34.55 " "
Sodium nitrate .....	.05 " "
Sodium sulphate .....	64.75 " "
Sulphates of Calcium and Magnesium	Trace

Nitre cake is, then, an indefinite chemical compound which, like sodium bisulphate, or acid sulphate, breaks up in solution into sodium sulphate and free sulphuric acid, entirely available as such for metal cleaning. Thus the pickling capacity of one pound of the nitre cake whose analysis is cited above is equivalent to 0.37 lb. 66 deg. Be. (93.2 per cent) sulphuric acid, or to 0.44 lb. 60 deg. Be. (78.04 per cent) sulphuric acid.

## Method of Use

Cleaning with nitre cake solution does not differ essentially from pickling with acid, but it introduces certain necessary manipulative changes due to the presence of sodium sulphate in large proportion as a diluent. Sodium sulphate in hot concentrated solution tends to reduce the activity of the acid; as a result, pickling with nitre cake alone of approximately 33.3 per cent acidity, requires from  $1\frac{1}{2}$  to  $2\frac{1}{4}$  times the period demanded by acid under similar conditions. The reaction velocity of the solution of nitre cake of acidity 41 per cent is at least twice as great as the solution of a cake of 32 per cent acidity at the same temperature and concentration. Hence, a mixture of three parts of nitre cake with one part of 60 deg. acid, or four parts of nitre cake with one part of 66 deg. acid should serve to maintain normal production and at the same time effect a saving of acid. In some processes it has been found practicable after a few experimental runs to substitute acid entirely with nitre cake; the time

element involved in experiment and operation, however, forbids entire substitution in most work.

In most works operating with nitre cake solution the bath is made up with nitre cake and acid sufficient to give the desired strength for pickling (2-10 per cent free  $\text{H}_2\text{SO}_4$ , reckoning the acidity as  $\text{H}_2\text{SO}_4$  vs. water, rather than  $\text{H}_2\text{SO}_4$  vs. weight of solution); successive additions of nitre cake and acid are made during the day as deterioration of strength demands until the density of the hot solution approaches specific gravity 1.26-1.28. "Killing down" is then begun; the temperature of the solution is raised to 200-205 deg. Fahr. and maintained until analysis shows an acidity of 0.002-0.004 gm.  $\text{H}_2\text{SO}_4$  per c.c.

Occasionally it is found practicable, through normal interruptions of operation, to let settle the particles of scale and other extraneous matter suspended in the bath, to draw off five or six inches of "sludge" from the bottom of the tank and replace with an equal volume of water and nitre cake.

## Supplementary Tank System

By the installation of a supplementary system for continuous operation in conjunction with the pickling the settling may be even more comprehensively effected. Such a system involves the use of two extra tanks separate from the actual pickling vats. The initial cost of installation is moderate, the cost of maintenance small.

The first of the supplementary tanks serves partly as a pass tank, into which the partially spent pickle solution may be dropped by gravity prior to being raised by steam-injector, air-lift, or compressed air to the main settling tank. The latter, in turn, is placed on a higher level than the main pickle tank, to permit again of gravity flow from the upper levels, gage-controlled, back to the working tank.

The first, or pass-tank, may, by the introduction of the necessary steam coils and proper ventilation, be used as a dissolving or fortifying tank. Here the acid or nitre cake is run in and dissolved to the necessary amount, and the solution then raised to the main settling tank, in which dirt and suspended rust and scale are deposited and at intervals drawn off at the bottom with such sulphate crystals as may separate as the liquor cools. In this way scale and crystals may be recovered, the solution cleaned, and its gravity and consequent viscosity reduced, while the acidity may be maintained at a practically constant value.

A system of this general type is by far the most economical for handling pickle liquors. Reasonable care in its operation tends to eliminate losses of small percentages of acid which are ordinarily run to the sewer; to minimize the spotting of material resulting from the red oxide deposits carried out of dirty solutions and which are often with difficulty rinsed off in the wash tanks; and to give a mobile cleaning solution at all times of uniform acidity and free from suspended undissolved salts.

The process necessitates no interruptions; it provides a continuous cycle of operations in which the dissolving of pickling agent, cooling, crystallizing and settling are permitted a sufficiently long interval in which to keep up with pickling, provided a fair reserve of solution is kept in circulation in the liquor storage. Solutions may be rejected and renewed without interfering with the cycle.

The system is applicable to both hand and machine, as well as plunger, pickling—especially to those processes of pickling heavy stock in which it is not uncommon practice to run the solution to the sewer as soon as the material is cleaned without making a determination of spent acid and regardless of

the waste which is entailed in such summary starting of the tank plugs.

With proper chemical supervision the crystallization in the settling tank may be so controlled as to yield, from the stronger solutions, a good technical grade of ferrous sulphate.

#### Modifying Agents

The pickling solution of nitre cake and acid may be still further modified by the addition of other substances in small quantities to produce specific effects. Thus, a fraction of a per cent of an organic body, such as spent tan-bark, quebracho fibre, waste sulphite liquor from the extraction of pulp-wood chips, or of one of the various non-fumes or no-gas compounds on the market, serves to blanket such acid fumes as may be carried out by the steam, and at the same time assists in removing oil or grease deposits from the metal. Again, calcium fluoride helps to slough off particles of furnace bottom which sulphuric acid only with difficulty affects. Finally, sodium chloride added to the cleaning solution accelerates attack on alloy scales, particularly those containing nickel and tungsten; while nitrate of soda is apparently without beneficial action; the presence of free nitric acid causes pitting of low carbon steels, notably in the case of metal for wire and tubes.

#### Summary and Extension

1. From ten to twenty per cent economy may be effected in steel cleaning by (a) suitable temperature regulation designed to check fume loss as well as steam and fuel waste; (b) the use of polarizers or inhibitors adequate to minimize dissolving of sound metal and to blanket entrainment of acid in vapors rising from the surface of the bath; (c) methodical chemical and mechanical control maintained to prevent live steam losses at worn fittings and acid waste in splashing, leaky equipment, and in spent solutions rejected before the acidity has dropped to a specified limit of 0.3-0.5 per cent or less.

2. Except in the cases of a few special processes, nitre cake may be substituted for 50 per cent of the acid now used for steel pickling. In those industries where time is not the controlling consideration the substitution may after trial be made even entire. The maintenance of production and the lining up of co-ordinate operations demand with present equipment, however, the use of acid to accelerate the action of the nitre cake solution; otherwise total substitution requires a 30-50 per cent increase of tank equipment.

The exceptional instances in which the adoption of nitre

cake pickling tends to introduce disproportionate hardship include (a) highly polished hard steel wire and drill rod; (b) butt-welded tubing for enameled conduit, the interior of which must be energetically pickled with a readily mobile, rapidly circulating acid solution for the removal of siliceous furnace bottom without undue reduction of the exterior wall; (c) the finer grades of tin-plate; and (d) those processes and plants in which the spent pickle liquor is concentrated for copperas recovery.

Sand-castings should be cleaned with a mixture of sulphuric and hydrofluoric acids. High nickel-chrome and tungsten-vanadium-chrome alloy rod and wire are best pickled in mixed hydrochloric-sulphuric acid, or with sulphuric acid in conjunction with common salt.

3. The chief objection to the use of nitre cake in the cleaning of tin plate and sheet stock appears to rest on a physical or mechanical problem. The cake is ordinarily added to the machine tanks in lumps, which, dissolving irregularly, lead to momentary irregularities of acid concentration and consequent burning of the sheet; or, added as a powder or ground cake at the surface of the bath, it deposits on the sheet and causes local pitting or smudging which appears on the finished material as pinholes or blisters. The preparation of clear solutions would seem to be the proper corrective of these faults.

4. The shipping and handling of nitre cake demands special cars and storage and an increase of transportation tonnage over that required for the equivalent acid. The increase of labor for handling is an essential item, though not a serious one except where extreme labor shortage obtains. Control of operation at the pickle tanks requires certain alterations of process of handling which the majority of plants are prepared to make.

5. The exploitation of nitre cake as a commercial material has been only too frequently accompanied by enthusiastic but extravagant assertion of its effectiveness as cure for all the ills incident to pickling. Unquestionably it produces in most work a better metal surface than does acid alone; it reduces the fume nuisance; effects a saving of metal and acid; and aids in the utilization of a valuable technical product whose rejection at the point of production is a vast economic waste. But it can be regarded as a total substitute for sulphuric acid only under exceptional circumstances; its action is substantially slower than commercial acid solutions, and the labor required to handle it is necessarily greater. Its use as a beneficial substitute demands intelligent experiment until the conditions governing its behavior are understood.

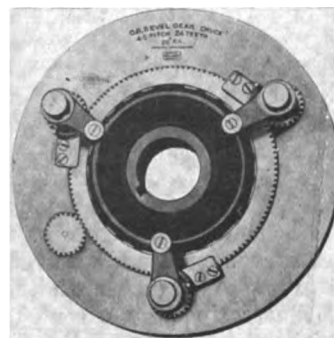
## New Lathe Chucks for Spur and Bevel Gears

**L**ATHE or grinding machine chucks designed to permit of chucking spur, bevel and other gears quickly and accurately are being manufactured by the Garrison Machine Works, Dayton, Ohio. The chuck for spur and internal gears and sprocket wheels is known as the Johnson chuck. It is designed for use when it is desired to remachine or regrind the holes in the gears concentric with the pitch diameter. It is claimed that use of these chucks obviates the loss of expensive parts due to questionable chucking methods, lack of judgment or carelessness on the part of the operator. With the Johnson chuck a spur gear can be chucked accurately in four to six seconds. The work is entirely automatic and does not depend upon the skill of the operator. Adjustment of the chuck for a different size of gear requires only two minutes. With one set of chuck members the Johnson chuck holds all gears of a given pitch, and it has no loose parts. The bearings of the chuck are protected against emery or grinding solution. The chuck can be applied to any grinder, the same as an ordinary chuck, and it serves also as a gage for the pitch diameter, indicating over a range of 0.030 in. the amount the pitch diameter is out either plus or minus. These chucks are of an outside diameter equal to the pitch diameter of the largest gear to be chucked plus the outside diameter of a 24-tooth gear of the same pitch.

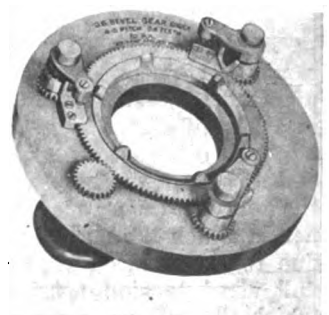
For chucking bevel gears the same company manufactures the O. G. bevel gear chuck. With this bevel gears can be

chucked accurately concentric with the pitch diameter, and the operation for a gear of 6 in. pitch diameter requires only 5 sec.

In chucking the gear the clamps are all turned simultaneously into radial positions over the gear and clamped by turning a knob back of the chuck to the right. To unchuck the gear this knob is turned to the left, which automatically loosens all clamps, turns them out of the way of the gear and raises and holds them until another gear is inserted.



Gear in place



Ready to receive gear



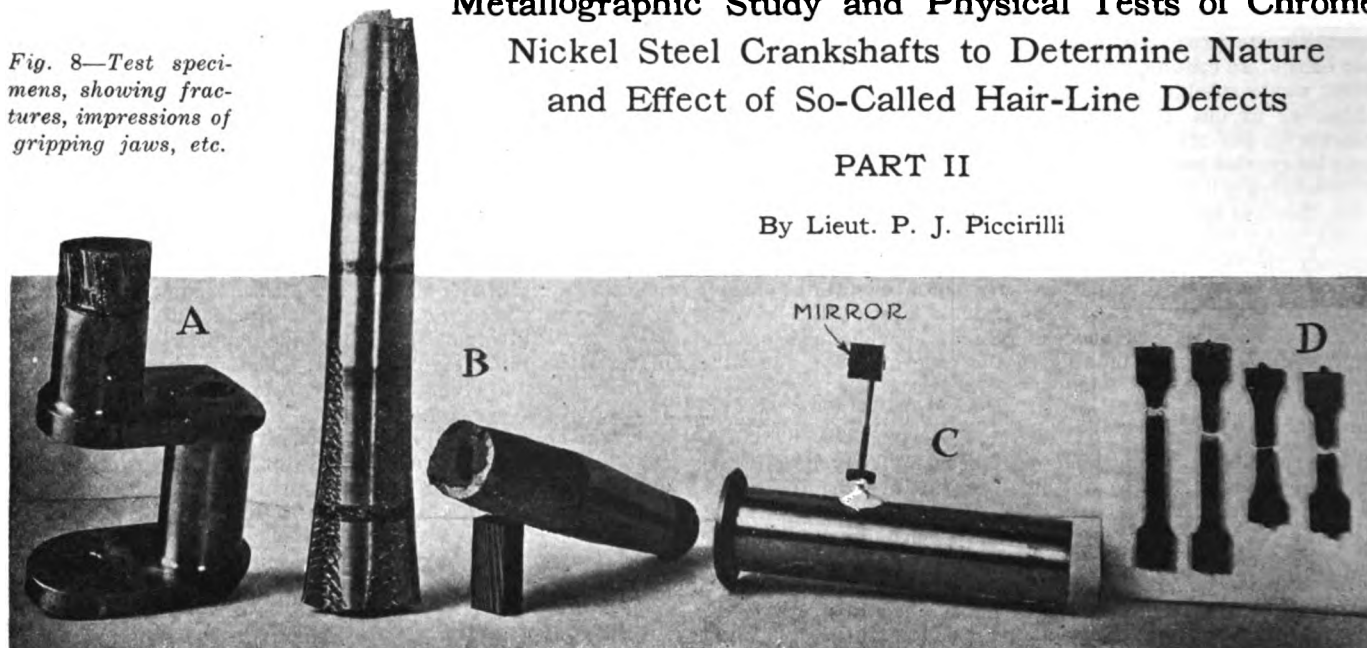
# Hair-Line Defects in Crankshafts

## Metallographic Study and Physical Tests of Chrome Nickel Steel Crankshafts to Determine Nature and Effect of So-Called Hair-Line Defects

### PART II

By Lieut. P. J. Piccirilli

Fig. 8—Test specimens, showing fractures, impressions of gripping jaws, etc.



FOUR tension tests were also made upon small flat specimens of reduced sections, cut from shaft B. Two of these were cut from the cranks, so as to obtain test pieces at right angles to the direction of the fibrous structure of the material, to permit of determining the strength of the material across the grain, with its resultant fracture. These pieces were necessarily short, so that it was possible to obtain only the yield point and not the true elastic limit. The result of the two tests made give average values of elongation of  $14\frac{1}{2}$  per cent; reduction of area, 30.4 per cent; yield point, 109,900 lb. per sq. in., and ultimate strength, 129,050 lb. per sq. in. The fractures appeared laminated at right angles to the axis of the piece, as was expected from the nature of the material as brought out by the fractures obtained in the compression tests. Two flat test specimens were cut from one of the pins, longitudinally, so that the tensile stresses produced would coincide with the direction of the fibers. These pieces were of sufficient length to permit of using the 2-in. strain gage, so that strain readings could be taken for increasing loads. The results of this test were plotted as shown in Fig. 15. The tension tests as above described indicated that the elastic limit of the material of the shafts, both with and across the grain, was approximately 80,000 lb. per sq. in. Also that the ultimate tensile strength ranges from 120,000 to 130,000 lb. per sq. in., possessing a fair degree of ductility, the average elongation amounting to 15 per cent and the reduction of area to 38 per cent, and although the structure of the metal is different in the two directions tested there is no material difference in strength. Fig. 8 shows at A the end of the original shaft A which failed in the grips of the torsion testing machine. It clearly shows the manner in which the end of the shaft collapsed and sheared, due to the reduced sectional area. At B is shown the full sized tension specimen, illustrating the extent to which the end was compressed by the gripping action of the jaws of the testing machine, and also showing the

character of the fracture produced. C illustrates the manner in which the mirror was attached to the shaft, during the torsional experiments. The four small tension specimens are mounted as shown at D, Fig. 8.

After completing the various tests described which were to determine the effects upon the physical properties of the material, due to the existence of so-called "hair-line" defects, a series of metallographic tests were made. These tests were to supplement the physical tests in order to reconcile the results of the same and to determine the exact nature of the "hair-lines."

The chemical analysis of the shaft was as follows:

Carbon	.....0.36	to 0.48
Manganese	.....0.70"	to 0.84
Phosphorus	.....0.01"	to 0.034
Sulphur	.....0.018"	to 0.042
Chrome	.....0.85	to 1.14
Nickel	.....1.20	to 1.43

A piece of the defective bearing was cut along A-A, Fig. 9. After polishing the sample for non-metallic inclusion, it was treated with picric acid in alcohol to

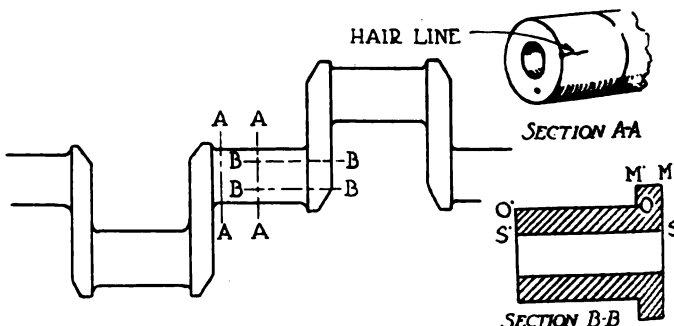
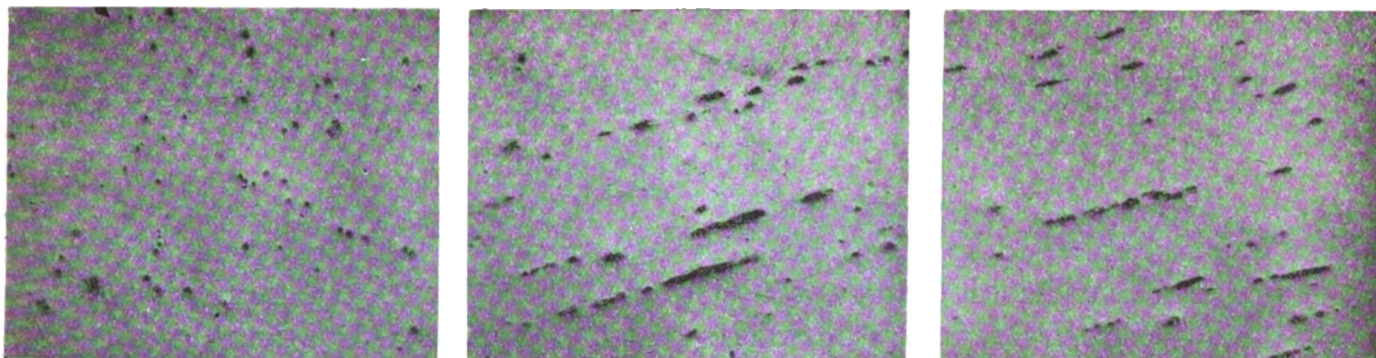


Fig. 9—Showing how sections were cut, from which metallographic studies were made



Figs. 10, 11 and 12—Metallographic sections, showing dots of manganese sulphide and oxide of iron

develop the structure and careful metallographic observations were made. It was noted that the material was full of dots of manganese sulphide and oxide of iron. It was plainly seen that below the "hair-lines" there was no evidence of any flaws, the metal appearing more or less normal. This was an indication that the "hair-line" was entirely a superficial defect. The dots of manganese sulphide can be plainly discerned in Fig. 10. By referring to Fig. 10 it will also be noted that the metal appears streaky, as if segregated areas had been laminated by forging. These streaks were more definitely developed by etching. It was also noted upon etching the metal that the structure was prominently martensitic, being coarser on the inside of the section which was cut than on the side nearer the finished surface, or outside. The streaks referred to are plainly seen in Fig. 10 to run diagonally. These streaks in their particular arrangement are not considered an uncommon occurrence in chrome nickel steel forgings, and their existence is believed to be due to the segregation of the chromium.

Another sample was cut from the shaft, as indicated by the lines B-B, and upon metallographic observations of the same it was noted that the manganese sulphide and oxide of iron lines appeared drawn out into fine strands. The direction of these fine strands was parallel to the forging or length of the shaft. These parallel lines of manganese sulphide continue for some distance, then bend over, become shorter and finally appear as dots, as can be seen in Figs. 11 and 12. In other words, referring to Fig. 9, Section BB, the manganese sulphide lines appear drawn out into lines parallel to the forging or length of the shaft, along the surface O'O and cross sections at M'M of section BB. This confirms the supposition that the "hair-lines" are threads of manganese sulphide and iron oxide, drawn out by forging operations so they would naturally appear in longitudinal sections at O'O and cross sections at M'M. On etching, the struc-

ture was martensitic, as before, and decidedly streaky along O'O (Figs. 11 and 12).

In order to determine whether the streakiness referred to was due to segregation or not, a longitudinal section at 90 deg. to the section BB was taken and heated to 840 deg. C., held at this temperature for 30 minutes and slowly cooled in the furnace. Upon etching the metal was found to be strongly laminated, and the ferrite strung out parallel to the direction of the forging. Fig. 13 shows the structure at O'S, Section BB, Fig. 9. Fig. 14 shows the structure of the cross-hatched area of Section BB, with the ferrite bands broader and slightly inclined. Hence it is reasonable to assume that the streakiness is due to the segregation of chromium.

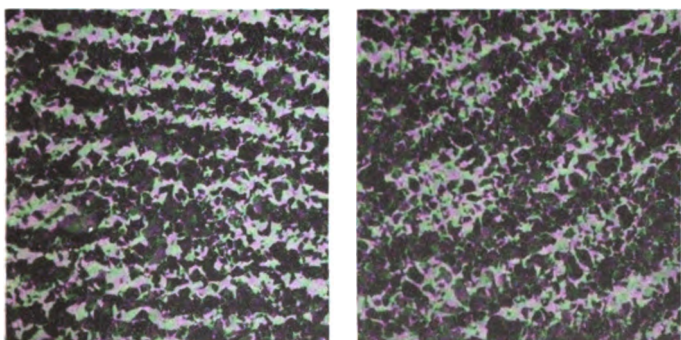
### Summary

As a result of the physical and metallographic tests carried out the following conclusions were derived:

(1) The torsion test indicates the elastic limit of the central portion of the shaft to lie between 60,000 and 70,000 inch-pounds, corresponding to a shearing stress of 49,400 pounds and 67,600 pounds per square inch.

(2) Compression tests indicated that the surface defects, three of which had been previously strained in torsion beyond the elastic limit of the material, did not develop any signs of local weakness until considerable deformation was produced.

(3) Tensile tests were made, three with the fibre and two across the fibre. These tests showed that there is no material difference in strength parallel with or across the fiber. The elastic limit of the material in tension is  
(Continued on page 1122)



Figs. 13 and 14—Metallographic sections, showing streakiness supposed to be due to segregation of chromium

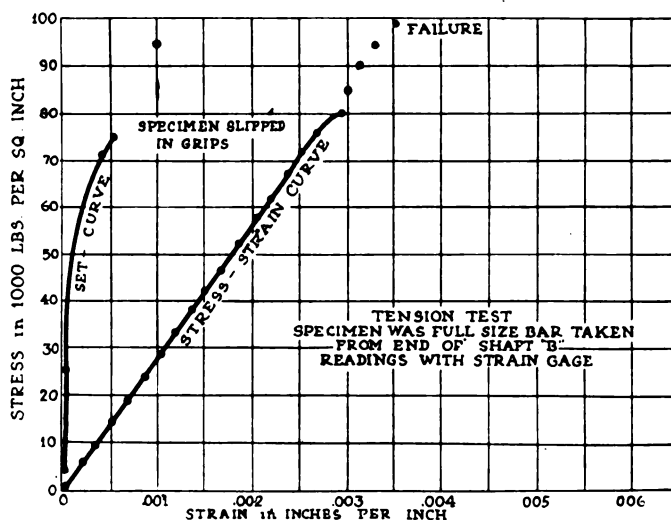


Fig. 15—Stress-strain and set curves of crankshaft specimen

# Cultivating the Chinese Automotive Field

There Is a Great Need for Cars, But the Absence of Good Roads Has Retarded Automotive Development—Majority of Cars in Use Are American—High-Priced Cars of Striking Color Have Been Popular

By Tom O. Jones\*

**C**HINA'S future as a market for motor vehicles depends absolutely on the construction of roads throughout the country. While the population of the Republic is said to be over 400,000,000, there are many millions of Chinese of the coolie class who never in their lifetime can hope to do more than make the barest kind of a living and countless numbers of the lower middle class who are far away from car ownership. Even if the buying power of the people were many times greater, the market for motor vehicles would be extremely small because of lack of highways. No matter how wealthy a resident of any district may be or how great his desire to own a motor vehicle, he will not purchase if there is no place in which the car can be used.

It may be said that China has no roads outside of those found in the foreign concessions of the treaty ports, but this statement is not strictly true, because in Peking there are nearly 150 miles of streets, including those of the legation quarter, that are suitable for motor cars, and there are short stretches of roads scattered throughout the Republic that might be used.

This report does not cover all China, but only the central and northern parts. Central China is taken to designate the Yangtze Valley, while North China the territory of which Tientsin is the chief treaty port and distributing center.

In these districts there are, at the present time, approximately 2000 motor vehicles in operation, practically all of them passenger cars and the majority of American manufacture. It is the territory destined to furnish the best market for motor cars, largely because the topog-

raphy of the country is more favorable to road building.

The principal buyers of motor vehicles in China have been the foreign residents in the treaty ports, but it is evident that the market in this field is limited, although the foreigners in China must be considered as offering better prospects for motor-car sales than the same number of citizens in an American city. The future of the motor car in China lies with the Chinese themselves, and it is this field that the wise motor dealer in that territory is now cultivating.

Generally it may be said that the Chinese are favorable to the motor car, especially the younger generation. At present their choice is a high-priced distinctive car of striking color, fitted with as many accessories as possible, but men who know China are convinced that the small and medium-priced car will be the popular car of the future.

## Customs and Habits Change Slowly

The Chinese are slow in changing customs and habits which have been followed for centuries. Until comparatively a few years ago the sedan chair and the native wheelbarrow, with its large wheel in the center, were practically the only means of passenger travel in all parts of the Republic, even among the wealthy, and they are to-day in many sections. With the advent of the European came the coolie-drawn jinrickshas, now found in hundreds of thousands all over China, and with them the use of horse-drawn carriages, two vehicles now generally used by both the Chinese and the Europeans.

Practically all the motor-car selling in China is in the hands of the Europeans or Americans in treaty ports.

*Camels, donkeys, jinrickshas, Peking carts and rambling pedestrians do not add to the pleasure of motor car driving in China*

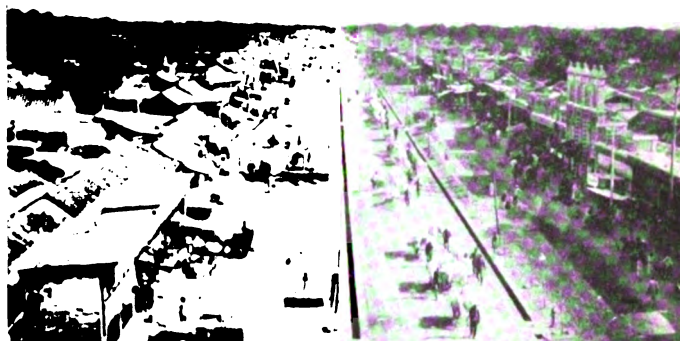
\*EDITOR'S NOTE—Mr. Jones was formerly with the J. B. Crockett Co., New York, and was given a special appointment by the Bureau of Foreign and Domestic Commerce to investigate automotive conditions in Japan, China, the Philippines and Hawaii. This story is taken from the advance proof sheets of Mr. Jones' report to his department.





*In North China camels solve transportation problems*

*Ideal Chinese road, the center macadam and the sides dirt*



*Narrow city street in China with a good road surface but too crowded for vehicular traffic*

*One of the reasons why there is no motoring outside cities in North China. This was probably a good road in the Ming dynasty, several hundred years before the advent of the motor car*

Most companies make contracts directly with the motor-car dealers, although some are held by importing houses, either independent concerns or branches, which are given territorial rights for certain sections. For the American manufacturer the most satisfactory connection should be an American firm, a policy that we would do well to follow to a greater extent in our general export business. This is said not in disparagement of any of the European houses, but simply as an American business principle, and one that is applicable in all countries.

The established dealers in China are in position to pay cash against shipping documents, either through their own resources or by arrangement with their banks at an interest charge of about 7 per cent. It should be borne in mind that the treaty ports have been one of the best fields in China for European cars of all types, and here, as in other parts of the world, the American manufacturer may be forced to make some financial concessions to meet this European competition after the war.

When selling to Europeans, the dealer, of course, deals directly with his customer, and the same is true in many sales to Chinese buyers. But often the salesman has to work through several intermediaries and pass out "presents" to each. One representative in Peking, before sending a salesman out, usually lets him know just how much can be given as presents. He told of one case in

which this had been done, and the buyer had ordered a car, but before it could be delivered and payment received, there was one intermediary who had been overlooked and who had to be taken care of to the extent of \$70 before the deal could be consummated.

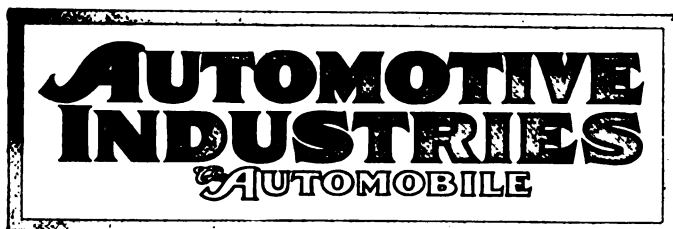
Prices of cars are rather generally known through their advertising, although there may be changes in prices between different shipments, so that it is not well for the dealer to allow his prices to vary too greatly.

#### Types of Cars for China

It is impossible to point to any one car and say that this is the type that will meet with the greatest favor in the general market in China. Open or closed body, long or short wheel base, high or low price, influence sales in about the same proportion as in America. There is a field for all types and all prices. The population of China, at least the motor-buying portion of it, is probably the most cosmopolitan in the world. In the treaty ports, the European colonies and Peking are thousands of foreigners from every country in the world. Manifestly, the buying power and choice of this foreign population is varied.

As a whole, the foreign population in China would probably show a greater buying power than any other

*(Continued on page 1122)*



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## The Inventor's Opportunity

**I**N all the history of industrial development there probably have never been such opportunities to get manufacturing concerns to take up new articles as there are at the present time.

Thousands of manufacturing plants have been engaged on war work, and a great majority of these suddenly had their contracts canceled while working on them to full capacity. Of course, many of these previous to the war were engaged in well established lines of manufacture to which they will return. Others, however, were specially organized for munitions or other lines of work directly connected with the war; their products have been of a nature for which there is little or no call in peace times, and they are confronted with the difficult task of quickly shifting to other lines for which there is an established peace-time market unless they want to see their organizations disintegrate.

Under ordinary conditions the inventor or industrial pioneer has a most difficult time getting manufacturers interested in his inventions. Conservatism

is a common quality of human nature, and as long as there is a fair demand for his product a manufacturer is apt to be disinclined to make radical improvements or take on entirely new lines. Under such conditions it is the task of the inventor to overcome the obstacle of conservatism, and that often proves beyond his powers.

At the present time, in the case of concerns which have been suddenly left without a line of marketable products, there is absolutely no such obstacle to overcome. The inventor of a practical device for which a ready sale can be found not only has no difficulty in getting a hearing but is actually being sought after.

The average inventor does not make a good manufacturer. He is too much wrapped up with the glamour of invention—too much bent on improving things—to be content to settle down and produce a standardized article. Of course, if we go back three or four decades it is not difficult to mention a considerable number of inventors who became successful manufacturers; but, in the first place, there are exceptions to every rule, and, secondly, manufacturing in those days was not conducted on the same lines as it is now.

To-day, with numerous firms having excellent manufacturing equipment and splendid organizations looking for new products to take up, the inventor who has an article of merit certainly stands an unprecedented chance of reaping his due reward.

## Cast Connecting Rods

**A**LTHOUGH every engineer familiar with high speed combustion engines knows that, owing to the inertia of the reciprocating parts, the maximum upward or tensional force on the connecting rod is about equal to the maximum downward force or pressure, very few keep this fact constantly in mind. It is of great importance in determining the suitability of certain metals for connecting rods. For instance, some of the cast metals have as high a compressive strength as wrought steel and, therefore, if compression stresses had to be withstood only they might be quite as serviceable as steel. However, the stresses on the material of a connecting rod are of an alternating character, and the tensile strength of a metal intended for connecting rods is as important as its compressive strength. This is undoubtedly one of the reasons why cast steel for connecting rods has been discarded. Of course, there is the further objection to it that defects in the castings, such as blowholes, are likely to cause much trouble. For any work where the stresses alternate and where it is desirable to keep down the weight to a minimum a metal of low tensility is not likely to prove satisfactory even though it may be of low specific gravity.

No comparison with the piston is possible, as the conditions of operation are quite different. The mechanical stresses in the piston can be kept down, but there must be provision for rapidly transmitting heat from the piston head to the skirt, which is easier to accomplish with aluminum than with steel.

# Shortening the Power Plant

**I**T is practically universally recognized that engine length, when considered relatively to horsepower output or torque, is decreasing. This is a more important factor than appears on the surface. In the first place, length of engine vitally affects the length of wheelbase required. Given a chassis of a definite wheelbase and a definite weight, which requires a definite horsepower or torque to give satisfactory performance, the shorter the engine the easier it will be for the body designer to provide adequate comfort for the passengers.

The whole development of the powerplant for automobiles has been along lines of greater compactness and at the same time greater output for a given bore and stroke. The adoption of block cast cylinders was one step in this direction which even the increase in sizes did not exactly offset. One of the chief talking points in connection with the V-engine always has been the fact that it requires a minimum length of hood for the displacement and output.

## Present Engines Are Shorter

Taken as a group, the engines employed in 1918 cars are remarkably short as compared with engines of 5 years and more ago. The compactness of design has been secured, of course, through the use of block castings, through compact waterjacket space, through shorter and stiffer crankshafts, V-shaped fan belts instead of flat belts, and in some cases by the utilization of the V-type of radiator, which allows the fan to project inside from 1 to 2 inches.

It is easy to see that with the L-head type of engine, in which the valves are all strung along in a single line, one of the determining factors of engine length is valve size. With the three-bearing type of crankshaft on the four-cylinder engine and the four-bearing type on the six-cylinder engine, the matter of crankshaft design is also a deciding factor. In fact, it is the belief of some engineers that, though shortening of the powerplant saves wheelbase and makes it possible to have a long, roomy body, it is a mistake to skimp on crankshaft bearings. In other words, it is useless to design crankshafts with large pins and large bearings unless there is length enough to make the cheeks of the cranks so that they are in keeping with the large diameter of the pins and bearings. These arguments are, of course, incontrovertible, except for the fact that in a large number of instances engine length is not determined by the crankshaft but by other factors, such as too great a distance between cylinder centers, necessitated by large valve diameters and sometimes even by the mountings of accessories and auxiliaries, such as the generator, fan, water pump, ignition drive, starting motor, etc.

The fact that an engine of the design of the Liberty aircraft type can run under full load for 150 hours and more shows that careful workmanship, coupled with good design, permits of extreme

shortening, while at the same time crankshaft bearing failures are kept down to a minimum. The Liberty engine, from the tip of the propeller hub to the center line of the water heater, measures 69 5/64 in., with a power output of approximately 400 hp. This is remarkably short and sufficiently indicative of the fact that shortening need not be accompanied by structural weakness.

## Overhead Camshaft Improvements

There is little doubt that we will see some marked improvements along the lines of overhead camshaft engines within the next 2 or 3 years. Fully 75 per cent of the engines now down on the drawing boards in designing rooms are of the overhead type. While this type of engine is higher than the L-head, one of its distinct advantages is the possibility for making it appreciably shorter than an L-head type of the same output. The valves are arranged on opposite sides of the cylinders, thus eliminating valve dimensions as a factor in the length of the engine. The camshaft bearings take up no more space than if they were within the crankcase. The valve drive need not take up any more space, and although the height of the engine is greater, this conforms very nicely with modern practice which favors a high, narrow radiator and elimination of the sharp break at the cowl.

With side-by-side valves it is practically impossible to get much shorter engines than we now have. This is evidenced by the fact that in a few instances when it was decided to increase the valve size on certain engines, it was necessary to lengthen the cylinder block slightly to take care of the valve increase. With this condition and with the certainty that the demand for lighter cars with equal passenger space and better performance is going to increase, it is almost sure that some designers will be driven to the overhead camshaft with valves on each side of the engine. The good performance of airplane engines, which require the most refined engineering to produce the greatest torque for a given weight, has certainly vindicated the overhead camshaft type of engine where manufacturers can afford the high class workmanship necessary with this type. It is quite probable that improved design will eliminate the necessity of working to such close limits as are required in aircraft practice. On the other hand, the war has been a great educator, teaching workmen to do their work rapidly and at the same time accurately. This will enable us to build better engines for use in automobiles.

If engines of the old type cannot be redesigned to accommodate them to less hood length, we should start on another tack and design engines of an inherently shorter type. There is no excuse for the production of heavy-weight cars to take four and five passengers when cars of shorter design and improved workmanship can be built which in performance will be far superior.



# □ Latest News of the

## Advocate Government Assistance for Development of Commercial Aviation

Annual Report of National Advisory Committee for Aeronautics Suggests Adoption of Comprehensive Policy—  
Great Amount of Investigation Work Started—  
Diesel Aircraft Engine Possibilities Considered

WASHINGTON, Dec. 23—A comprehensive Government policy calculated to develop aircraft construction for both civil and military purposes and to assure the existence of a nucleus of an aircraft industry is advocated in the annual report of the National Advisory Committee for Aeronautics made public here to-day.

Other recommendations resulting from the past year's experiences include a plan of co-operation of military and naval air service to insure continued training in long distance flying and to assist the development of the Aerial Mail Service. Legislation, it is suggested, should be enacted to regulate civil aerial navigation, the issuance of licenses to pilots, inspection of airplanes, uses of landing fields, etc., and such legislation should be drawn to encourage the development of commercial aeronautics. The estimates, states the report, submitted by the War, Navy and Post Office Departments should be given full consideration with a view to placing the United States foremost in the development of aviation for all purposes.

### Investigate 38 Subjects

The report, which deals with the organization and functions of the committee, co-ordination of scientific and research work, technical reports, aeronautic problems and specifications for aeronautic materials, announces that 38 technical discussions will shortly be issued for the general public dealing with general aeronautic problems, including the structure of airplane fabrics, construction of propellers, engine difficulties, sparking, voltage, power characteristics and altitude experiments.

During the past year the committee and its sub-committees have made investigations which will result in the reports mentioned above, and which included inquiries into aircraft designs, studies of types of propellers, combinations of supporting surfaces, available materials of engine construction and special requirements of aircraft structures. A sub-committee on Navigation of Aircraft, Aeronautic Instruments and Accessories was formed, which co-operated with the War and Navy Depart-

ments to improve existing instruments and devise new ones.

New types of aviation engines were made a special study, and a sub-committee is at present investigating the possibilities of developing an aircraft engine embodying features of the Diesel oil engine. Experiments in scavenging two-cycle engines were made which will be continued in the near future. In addition there have been studies in supercharging to maintain power at altitude, improvement of engine details, radiation, carburetor, ignition and fuels and combustion improvements.

### Two New Carburetors

Two types of automatic carburetor control have been developed to such a point, it is stated, that their operation is superior to any available hand adjustment. A third method is now under development and promises excellent results. An engine has been equipped with a new form of apparatus which determines absolute value of the rate of flame propagation in the study of fuels and combustion, and which it is expected will also measure the rate of combustion. Three special gas engine indicators have been under development. A greatly improved and simplified form of optical indicator of the polar type has been designed which it is expected will aid to obtain pressure diagrams of great accuracy.

An altitude laboratory has been constructed and has been in continuous operation throughout the year. Observations have been made on the effect of fuel composition on engine performance, changes of horsepower with altitude, changes of horsepower with speed at different altitudes, performance of carburetors at varying altitudes, heat distribution in engines, effect of supercharging and the effect of compression ratio on horsepower at different altitudes.

The sub-committee on Standardization and Investigation of Materials for Aircraft has conducted experiments on airplane wing beams, wing ribs and wing coverings, impact tests, variable chamber wing, steel construction for aircraft, etc. The results of these tests will be made public in the technical reports to

be issued later. The substitution of steel or other metal for spruce in airplane wings resulted in construction of two complete sets of metal wings made of steel ribs and aluminum alloy beams, the ailerons being entirely of steel. These were tested at McCook Field, Dayton, and proved satisfactory.

Instruments are now being developed for recording in the air the torque and revolutions per minute of the engine, the thrust of the propeller, air speed, angle of attack and the inclination of the wing chord to the true horizon, and it is proposed to use such instruments to determine power plant performance and the relations in the air between the lift drag, air speed and angle of attack.

The work already started by the Weather Bureau in the study of aeronautic atmospheric conditions and the daily reports on them is being furthered by a sub-committee on the Relation of the Atmosphere to Aeronautics. Papers on meteorology and aeronautics, mean values of free air barometric and vapor pressures, temperatures and densities over the United States, and the turning of winds with altitude have been prepared and distributed to the Aviation and Artillery Services. Special experimental tests and kite flights have been made at the various flying fields. Pilot balloon observations are made daily at military stations.

### New Wind Tunnel Constructed

A description of the wind tunnel built for experimental purposes by the committee is included in the report. The tunnel building is brick and steel 43 ft. wide, 90 ft. long and 30 ft. high. It will house a 5 ft. modified Eiffel type of wind tunnel which has been designed to provide for lessening the diameter of the wind stream to 30 in. for high velocity investigations.

When operating with the 5-ft. section the air stream is left open across the operating room, and when operating with the 30 in. section the stream is enclosed as in the National Physical Laboratory type of tunnel. The wind tunnel proper will be equipped with a thrust torque dynamometer for propeller investigations and for determining the effect of the fuselage form upon propeller efficiency; also an aerodynamic balance for making accurate measurements on aerofoils.

(Continued on page 1119)

### S. A. E. Victory Dinner Feb. 6

NEW YORK, Dec. 23—The Society of Automotive Engineers has set the date of Thursday, Feb. 6, for its Victory dinner. It will be held at the Hotel Astor, New York.

# Automotive Industries □

## May Make and Sell "B" Parts

### Producers Given This Permission, But Must Maintain Government Standards

WASHINGTON, Dec. 23—The Motors and Vehicles Division of the Quartermaster Corps has notified manufacturers of parts for the Class B standardized truck that they may make and sell the parts in the open market and may also make and sell completely assembled vehicles.

However, there are certain strings tied to the proposition and in view of these, various interpretations are placed on the action of the Government. For example, it is stated that the drawings, workmanship and material must be up to government standards; that gages must be maintained accurately and that the Government must be given the right to purchase such parts if an emergency arises.

It is believed that the action has been taken primarily to forestall the possibility of makers putting in claims for excessive amounts through the Court of Adjustment. Another angle is that the Government may perhaps be making a move toward obtaining the benefits of a subsidy plan without putting such a plan actually into effect. Following is the letter which outlines the plan; it was signed by Major A. B. Browne, Chief Truck Section, S. C., U. S. A.:

You are authorized to manufacture and sell parts of the United States Government "B" truck or the complete assembly of the "B" truck chassis commercially, provided that you adhere rigidly to the following:

(a) Firms manufacturing and selling the "B" truck as such for commercial trade must conform rigidly to the drawings, workmanship and materials specified by the Government. Any alterations or variations must be distinctly stated in all commercial literature and publicity.

(b) Gauges used in manufacture of such vehicles, in order to be authentic, must be checked and approved by the Bureau of Standards in Washington, by comparison with the master gauges there on file. Gauges must be maintained at this standard of accuracy.

(c) The Government reserves the right of free access at all stages of manufacture to its accredited inspectors, to see that the provisions of "a" are complied with.

(d) The Motor Transport Corps shall control the designs specifications of the "B" truck and these issued each year shall be authority during that year.

(e) Firms granted permission to manufacture and sell the Class "B" truck or parts must give the Government the right, upon immediate notice, to purchase all or such parts as the Government may desire, or its available and future Class "B" type vehicles, should emergency arise.

(f) The right of export and sales in foreign countries shall be restricted to American manufacturers.

(g) In all the above, where the term Class "B" truck is used, this shall apply—not only to the truck as a whole—but to any assembly unit or part thereof, such as engine,

transmission, electrical equipment, or spare parts, and that as future Government models develop, wherein designs are initiated and controlled by the Government, this policy shall apply likewise to them.

(h) In granting this permission the Government assumes no responsibility and gives no authority under existing or future patent rights.

### Future Air Service

WASHINGTON, Dec. 24—Reports and rumors are numerous here with regard to the future Air Service of the Army. While nothing definite can be said at this time, as the plans of the War Department are kept secret until they will be presented to Congress, current statements are to the effect that the future Army Air Service will be composed of approximately 500 officers and 5000 enlisted men. This would mean about 350 fliers and at the most the maintenance of a fleet of 1000 airplanes. It is said that present plans are for an Army of 400,000 men and if the Air Service in the future is to be proportionate to that maintained with our Army of 2,000,000 men which was 20 per cent, the figure stated above would be slightly below the requirements.

It appears that although the War Department is making its plans for presentation to Congress, these plans hinge on the outcome of the peace conference and the League of Nations, for it is expected that armament may be regulated in size to conform with the requirements of the platform which will be formed as a result of the League of Nations, if one is organized.

### M.A.M.A. Sanctions Boston and Chicago Shows

NEW YORK, Dec. 23—The Motor and Accessory Manufacturers' Association has formally placed its stamp of approval on two automotive expositions. It has sanctioned both the show which will be put on by the Boston Automobile Dealers' Association and the one to be staged by the Chicago Automobile Trade Association. Nothing has been done as yet in the way of issuing any sanction for the show to be staged in Madison Square Garden and the 69th Regiment Armory by the New York dealers. The annual meeting of the M.A.M.A. will be held at the Congress Hotel, Chicago, Jan. 29.

### Ford Publishing Co. Incorporates

LANSING, MICH., Dec. 23—The Dearborn Publishing Company, which is to publish Henry's Ford's newspaper, has been incorporated with a capital stock of \$100,000, all common, and all subscribed and paid for in cash. The shares are \$100 each, and of them Clara J. Ford has 334 and Henry Ford and his son, Edsel B., 333 shares each.

## 5% Motor Truck Tax Eliminated

### Levy on Sale Price of Commercial Vehicles, Trailers and Tractors Cut Out

WASHINGTON, Dec. 24—There probably will be no tax on the price of motor trucks, motor truck trailers or tractors. The Senate Finance Committee has passed the new war revenue bill with this 5 per cent tax eliminated.

The 5 per cent tax on the sale price of passenger cars, motorcycles, parts and accessories remains in the bill, however. But the bill has not been finally passed as yet and it is expected that when it comes up before the general conference of the House and the Senate, a strong recommendation will be made that these taxes, too, be eliminated as being discriminatory against the automobile industry.

The removal of the tax on the sale price of trucks does not free such vehicles from all proposed taxation. There still remains a tax of 5 per cent levied on the amount of business done by the owner of a truck who operates over a fixed route in competition with the rail carriers.

Following the presentation of the bill before the conference of the House and the Senate, it will again be presented to the House and the Senate separately for final action.

### Wright-Martin Buys Simplex

NEW YORK, Dec. 23—As was forecast in AUTOMOTIVE INDUSTRIES last week, the Simplex Automobile Co., New Brunswick, N. J., was bought in by the Wright-Martin Aircraft Corp., which already controlled the company. The move was made merely to simplify the accounting methods of the Wright-Martin company and presages no changes in the Simplex company or its product.

### Mexico Shipped 5,505,834 Bbl. of Oil in November

TAMPICO, MEXICO, Dec. 21—Practically complete figures for the oil shipments from Mexico for the month of November are now available. They show a total of 5,505,834.02 bbl. as compared with 5,834,952.50 for the month of October. Of the November shipments, all were export except 283,589 bbl. by the Aguila Oil Company, which were coastwise.

## October Exports to Latin America

### Month's Figures Show Big Drop—Probably Caused by Transfer of Shipping

NEW YORK, Dec. 21—Although there has been a serious falling off in exports from this port to the various Latin American republics during the month of October, in comparison with the figures for September, the drop loses much of its significance when the fact that all available tonnage during the former month was devoted to transatlantic service. Since then, altered circumstances have relieved the tension in a measure and it is expected that in the near future our shipping facilities to Latin American ports will be more nearly equal to the demands made upon them.

In September the total value of cars, trucks and parts shipped from New York to Latin America was \$1,205,359. In October the total dropped to \$483,923, a falling off of nearly 60 per cent. Cars dropped from 651 to 119, trucks from 70 to 37, and the value of parts from \$306,432 to \$214,100.

A table showing the total exports from New York for the ten months of 1918, ending October, is also published. This shows a total value of exports of \$10,281,871; an average of well over \$1,000,

000 per month. This average further indicates that October exports have been abnormally low.

#### Reclassifying Trade Statistics

WASHINGTON, Dec. 21—A reclassification of import and export statistics is being made by the Bureau of Foreign and Domestic Commerce in co-operation with other Government departments in order to provide a more logical arrangement, to facilitate tabulations and to increase the use of the statistics. The new classification will be on a decimal basis. All commodities are divided into ten main groups. For the purpose of export statistics the subdivision will be carried to four places. For imports the classification will be carried to five places. Rubber will be listed under plant products other than foods and woods. Essential oils will come under the same heading. Iron, steel, copper and lead will come under the group of ores, metals and metal manufactures. Passenger cars, trucks and farm implements, including tractors, will be entered under the heading of machinery, tools and vehicles.

#### Garford Has Highway Department

LIMA, Dec. 21—The Garford Motor Truck Co. has instituted a Department of Highway Development under the management of S. M. Williams, who has been for the last 4 years sales manager for the company.

## Bureau of Mines' Annual Report

### Many Investigations Undertaken and Experiments Planned and Completed

WASHINGTON, Dec. 21—The Bureau of Mines has issued its eighth annual report, which deals briefly with its many activities. The report was written prior to the armistice, and refrains from detail. It is also largely a compilation of work planned in conjunction with the prosecution of the war. Numerous investigations and experiments with ores, gases, petroleum and fuels were planned, and some completed.

An inquiry into manganese conditions developed that in event of shortage a large part of the country's requirements could be met by using low manganese alloys, as there are considerable quantities of low-grade domestic ores available. Investigation also showed that the Cuban output would increase to about 140,000 tons for 1918.

Investigations of possible domestic production of tin pointed to no prospect of any considerable output. An investigation is planned for the near future of the possible use of domestic graphite formed in crucibles.

A petroleum station costing \$50,000 has been erected at Bartlesville, Okla., and will be used for experiments and inquiries into the formation of oil and water emulsions in wells, characteristics of oil sands, and methods of recovering maximum quantities of oil from sand.

Experiments conducted by the Bureau at the plant of the Michigan Smelting & Refining Co., Detroit, on electric brass melting by use of a 1300-pound capacity rocking furnace, showed good metallurgical results, the metal losses being markedly below those obtained by melting in coke-fired crucibles. The power consumption was low and, says the report, if the metal saving be considered, the over-all cost of melting brass and bronze in a rocking furnace is not more than one-third as compared with the coke-fire system under present crucible, fuel and metal prices. Following the experiments, the Michigan Smelting & Refining Co. has put in four 1-ton furnaces and two other Detroit firms have ordered similar equipment.

Experiments are being conducted with the Ordnance Department for preparation of a series of uranium steels, besides tungsten and molybdenum steels for gun liners. Special furnaces are being used, and so far an indirect-arc furnace has been found most suitable.

Volatilization of lead ores has proved successful, and the Bureau is now starting to apply the process to copper ores. The work done thus far is said to be successful.

The Bureau station at Salt Lake City has discovered and perfected methods of treating complex and oxidized ores of zinc. The precipitation of the zinc from

EXPORTS OF AUTOMOBILES, TRUCKS AND PARTS FROM NEW YORK TO LATIN AMERICAN COUNTRIES FOR OCTOBER, 1918

	Cars		Trucks		Parts Value
	No.	Value	No.	Value	
Argentina	2	\$14,345	..	.....	\$52,247
Bolivia	..	.....	..	.....	350
Brazil	19	22,764	..	.....	9,649
Chile	9	16,341	5	\$19,000	40,876
Colombia	4	8,601	..	.....	483
Costa Rica	..	.....	..	.....	527
Cuba	17	38,404	16	40,077	76,866
Ecuador	..	.....	..	.....	592
Guatemala	..	.....	..	.....	..
Haiti	1	1,800	..	.....	501
Honduras	..	.....	..	.....	168
Mexico	13	15,490	..	.....	4,854
Nicaragua	1	1,488	..	.....	41
Panama	2	2,550	14	18,512	3,133
Paraguay	..	.....	..	.....	..
Peru	17	26,269	..	.....	6,810
Salvador	..	.....	..	.....	..
Santo Domingo	5	8,862	1	2,297	2,390
Uruguay	27	39,730	..	.....	8,998
Venezuela	2	2,518	1	1,000	6,115
	119	\$188,957	37	\$80,866	\$214,100

EXPORTS OF AUTOMOBILES, TRUCKS AND PARTS FROM NEW YORK TO LATIN AMERICA DURING TEN MONTHS ENDING OCTOBER, 1918

	Cars		Trucks		Parts Value
	No.	Value	No.	Value	
Argentina	993	\$1,080,168	33	\$32,921	\$1,187,391
Bolivia	11	15,191	2	9,000	5,200
Brazil	1,052	789,042	35	37,114	197,382
Chile	1,486	1,871,023	86	117,097	399,746
Colombia	103	73,312	1	600	20,680
Costa Rica	41	20,100	..	.....	1,561
Cuba	529	625,023	243	563,742	639,653
Ecuador	58	61,177	..	.....	6,835
Guatemala	5	8,089	..	.....	2,704
Haiti	79	44,790	9	8,789	18,627
Honduras	20	19,927	..	.....	5,382
Mexico	192	192,892	34	74,110	61,361
Nicaragua	30	22,219	..	.....	1,191
Panama	50	41,593	42	38,135	33,116
Paraguay	1	2,500	1	875	768
Peru	467	575,570	57	126,535	76,220
Salvador	57	32,971	..	.....	3,731
Santo Domingo	198	152,884	13	12,397	33,805
Uruguay	1,134	659,085	11	11,000	126,154
Venezuela	97	76,965	6	16,900	46,296
	6,603	\$6,364,531	574	\$1,049,537	\$2,867,803



hydrometallurgical solutions, it is said, has been found most simple by the use of zinc sulphate, because a solution is the easiest to produce in practice and offers the least difficulty in successful precipitation. Enough limestone is added to the zinc sulphate to precipitate all of the sulphate as calcium sulphate.

After the limestone an excess of sulphur dioxide is added; this reacts with the zinc sulphate to form soluble acid zinc sulphite and sulphuric acid, the latter being precipitated as calcium sulphate by the limestone. The calcium sulphate is removed by filtration, and the clear filtrate is heated to remove the excess SO<sub>2</sub>, and at the same time form the insoluble normal zinc sulphite. This zinc sulphite is then filtered from the treated solution.

It has been found possible to recover 85 per cent or more of the zinc from the solutions in a zinc product carrying 38 to 43 per cent zinc and less than 2 per cent harmful impurities. On calcination at a low temperature the zinc sulphite breaks up to form SO<sub>2</sub> and nearly pure zinc oxide.

The work on the problem now consists of determining the various factors that affect operation and also any other data that would be of value in the commercial application of the process or make possible an easier estimation of its cost.

As air rapidly oxidized the zinc sulphite to sulphate and hence interfered with precipitation, a laboratory apparatus was developed in which all of the operations necessary will be performed out of contact with the air and in an SO<sub>2</sub> atmosphere.

The work of the Petroleum Division has included examination of 275 samples of fuel oil, representing deliveries amounting to nearly 20,000,000 gal., worth \$800,000. Some 60 samples of lubricating oil, 135 samples of gasoline for trucks and airplanes, and 95 products, including products of special cracking processes, alleged gasoline improvers, etc., were analyzed. This work included tests of German gasoline and other fuels for airplanes both in flying and dynamometer experiments.

#### Airplane Mail Increases 600 Per Cent

WASHINGTON, Dec. 19—Airplane mail has increased 600 per cent during the past month, post office officials announced yesterday. This is attributed to the mailing of Christmas cards by this medium, and also to the rate reduction on 1 oz. of first-class matter from 16 to 6 cents. This is the first Christmas that it has been possible to send a Christmas greeting in this way.

More than 600 pieces of first-class mail were sent by airplane to New York yesterday. Approximately 100 were sent on the corresponding day of last month.

#### Hide Restrictions Off

WASHINGTON, Dec. 21—All restrictions on the importation of hides and skins have been removed by the War Trade Board.

## Aircraft Department Annual Report

### Records Enormous Progress Made in Training Aviation Specialists

WASHINGTON, Dec. 21—An appeal, by Premier Clemenceau of France, for 2000 planes a month, 5000 pilots and 50,000 mechanics, was the cause of the appropriation of \$640,000,000, according to a statement in the annual report, Department of Military Aeronautics, made public here recently. The appeal of the French premier was received May 24, 1917, and within 60 days Congress passed the appropriation measures.

American army aviators in the United States flew over 30,000,000 miles in a single June week, or 1223 times the distance around the equator, according to the report. Flights were 407,999 hours in the fiscal year as against 745 hours in 1914.

"This country never had trained an aviator sufficiently to meet the demands of overseas aerial warfare," states the report, and "it had not the slightest knowledge of the instruction necessary for radio, photography or the enlisted personnel. Consequently, the first men largely trained themselves before teaching others, and experience led from one course to the next." Despite these handicaps, 4980 men had graduated as reserve military aviators by June 30, 1918, and 110 bombers, 85 bombing pilots, 464 observers, 389 observer pilots and 131 pursuit pilots had been graduated on that date from the advanced training schools.

Fatalities for the year ended June 30, 1918, totaled 152 in training, an average of 1 death for each 2684 training hours or 201,000 miles flown. Stalled engines, usually due to errors by pilots, caused 86 deaths; collisions 30 and side slips 10. The number of fatalities, says the report, averaged less than one-half of those of the larger allied countries.

The first American cadets were sent overseas for training within 6 weeks after the declaration of war, and by the end of 1917, says the report, more than 2500 men had been sent to France, England, Canada and Italy.

"The collapse of Russia and Italy's serious defeat made it impossible," says the report, "unfortunately, for the Allies to meet the training schedules, so that many of these cadets were in idleness for months. Nevertheless, what facilities were available greatly advanced America's aerial preparation and helped relieve the shortage of equipment here.

"It was early in May, 1918, that the first German plane fell a victim to an aviator in the American service. About the same time 468 fully trained American aviators, organized into 13 complete American squadrons with British and French squadrons, were actually on the front taking increasing toll of the enemy."

There were also 440 balloon officers graduated, according to the report, of whom 155 were fully qualified observers, during the fiscal year.

In conclusion, General Kenly states that while at the outset of the war there were but 65 officers in the air service, there were, on June 30, 14,320 and the enlisted strength increased in the same time from 1120 to 124,767, the men in training or waiting training as fliers, from less than 100 to more than 18,000. There were 4,872 officers and 46,667 enlisted men overseas.

Attention is also called in the report to the fact that within two years this country developed its aviation rapidly, installing radio outfits, manufacturing regular bombing planes and developing the Liberty engine.

#### Appropriations for Aircraft Production and Operation

WASHINGTON, Dec. 21—In the appropriations asked of Congress for Air Service, \$164,877,253.18 for the Army and \$225,000,000 for the Navy, provision is made allowing \$19,933,738.47 for Army aeronautics operations and \$144,943,514.71 for Army aeronautics production.

#### Government to Sell Airplanes

WASHINGTON, Dec. 21—The Department of Military Aeronautics plans to sell several hundred airplanes and engines on the open market. These are planes that have served their purpose as training ships, and it is believed there will be ready purchasers for them. It is expected that the sale to private owners will do much to popularize flying in the United States. Another possible market for more of these planes includes the nations of South America and other countries favorable to the Allies. The Czecho-Slav Government has already purchased 25 L. W. F. airplanes.

#### Deeds Presented with Testimonial

WASHINGTON, Dec. 21—Col. Edward A. Deeds was presented with an engrossed testimonial by Col. Sidney D. Waldon on behalf of the original Equipment Division of the Signal Corps at a banquet in his honor at the Army and Navy Club last night. More than 100 high ranking officers, Government officials and aircraft manufacturers were present. The testimonial, bearing the insignia of the Air Service and the Signal Corps, expressed the confidence and esteem of the officers who were associated with Col. Deeds in determining the aircraft policies on which the Air Service was built. Major General George O. Squier, originally head of the Army Air Service, briefly described how it had been formed, and the class of men that made up its personnel. Brig. Gen. J. D. Cormack praised the Equipment Division and told of the difficulties it had to encounter. Seated at the speaker's table with Col. Deeds were Assistant Secretary of War Benedict Crowell, General Cormack, General Squier, Admiral D. W. Taylor, Orville Wright, Lt. Col. L. S. Horner and W. C. Potter.

## Bill Would Legalize Contracts

Congressman Dent's Measure Provides Payment for Contracts "Illegally" Made

WASHINGTON, Dec. 23—A new bill has been drawn up by Congressman Dent authorizing the Treasury Department to pay manufacturers who hold Government war contracts which were not "legally" executed and which have been held up by a decision of the Controller of the Treasury. The bill restricts the authority of the Secretary of War considerably as compared with the first bill which was drawn up.

It provides that on June 30, 1919, a detailed statement must be presented to Congress by the Secretary of War showing the terms and nature of the contracts which will be paid under the authorization of the bill. It eliminates payments for contracts made during the war and not "legally" executed to June 30, 1919. It does not relieve any officer or agent of the Government from criminal prosecution and provides that the Government may prosecute regardless of provisions if fraud is found.

The names of all contractors and the amounts of the payments to them must be filed with the Clerk of the House and printed in the Congressional Record or Official Bulletin 10 days before the payment is authorized. It was expected that Congress would take action on the bill to-day, but other business prevented this, and it may come up for action to-morrow or be held over the holidays. Following is the complete bill:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

"That the Secretary of War be, and he is hereby, authorized to adjust, pay, or discharge any agreement, express or implied, upon the basis of reasonable value but in no case greater than the agreed price that has been entered into, in good faith during the present emergency and prior to November 12, 1918, by an officer or agent acting under his authority, direction, or instruction, with any person, firm, or corporation for the acquisition of lands, or the use thereof, or for any supplies, material, or equipment to be used in the prosecution of the war, when such agreement has been executed in whole or in part, or expenditures have been made or obligations incurred upon the faith of the same by any such person, firm, or corporation prior to November 12, 1918, and such agreement has not been executed in the manner prescribed by law:

"Provided, that payment under such agreement shall not exceed the fair value of the property transferred or delivered and accepted by the United States, as determined by the Secretary of War, and where no property has been transferred or delivered, or accepted payment shall not be in excess of the actual cost incurred in preparation for performance, as such cost is determined by said Secretary:

"Provided further, That this Act shall not authorize payment to be made of any claim under such agreements after June 30, 1919:

"And provided further, That the Secretary of War shall report to Congress at the beginning of its next session following June 30, 1919, a detailed statement showing the nature, terms, and conditions of every such agreement and the payment or adjustment thereof:

"And provided further, That nothing in this Act shall be construed to confer jurisdiction upon any court to entertain a suit against the United States upon any agreement of the character herein provided for:

"And provided further, That no settlement of any claim arising under any such agreement shall bar the United States Government through any of its duly authorized agencies, or any committee of Congress hereafter duly appointed, from the right of review of such settlement, nor the right of recovery of any money paid by the Government to any party under any settlement entered into, or payment made under the provisions of this Act, if the Government has been defrauded, and the right of recovery in all such cases shall extend to the executors, administrators, heirs, and assigns, or any party or parties:

"And provided further, That nothing in this Act shall be construed to relieve any officer or agent of the United States from criminal prosecution under the provisions of any statutes of the United States for any fraud or criminal conduct:

"And provided further, That this Act shall in no way relieve or excuse any officer or his agent from such criminal prosecution because of any irregularity or illegality in the manner of the execution of such agreement:

"And provided further, That the names of such contractors and the amounts of such partial or final settlements shall be filed with the Clerk of the House for the information of Congress and printed in the Congressional Record, or in the Official Bulletin, or as a public document, 10 days before confirmation and payment is authorized upon such contracts."

### Menohar Made Aircraft Head

WASHINGTON, Dec. 23—Major General C. T. Menohar, who has been in command of the Rainbow Division in France, is returning to the United States to become Director of the Bureau of Aircraft Production. Col. James A. Mars, who is at present Director of Aircraft Production, as was announced last week, succeeding W. C. Potter in this position, will probably be made the Assistant Director under General Menohar.

The appointment of General Menohar probably means that the Bureau of Aircraft Production will be made a part of the regular military organization, and probably General Menohar will be assigned to the General Staff to effect this co-ordination. This would mean a continuation of two separate air divisions—one for production and one for operation, with the latter under Major General Kenly. Heretofore the Bureau of Aircraft Production has been chiefly a civilian department. It was operated originally as the Aircraft Production Board in conjunction with the Equipment Division of the Signal Corps, and at that time was headed by civilians, including Howard E. Coffin and W. C. Potter. With the reorganization last spring, when the Bureau of Aircraft Production was formed, John D. Ryan was appointed to head it with W. C. Potter as Assistant Chief, both civilians.

### War Industries Board Withdraws All Pledges

WASHINGTON, Dec. 20—All restrictions and orders of the War Industries Board and all pledges given to the War Industries Board by industries are canceled, effective Jan. 1, 1919, according to formal announcement made to-day by the board. This means that all restrictions in the purchase of steel and other commodities and in the manufacture of passenger cars, motor trucks and other automotive products and accessories are completely removed and normal peacetime business can resume with the New Year.

## 39 Aero Squadrons in Service

United States Had This Many on the Front When the Armistice Was Signed

WASHINGTON, Dec. 23—On Nov. 11, when the armistice was signed, there were 39 American aero squadrons distributed on the front, including 20 pursuit, one night bombardment, six day bombardment, five Army observation, 12 corps observation and one night observation squadron.

American fliers brought down 491 confirmed and 354 non-confirmed enemy planes up to that day, a total of 845. During the same period the American forces lost 271 planes. Eighty-two enemy balloons were destroyed as against 45 American balloons.

The American air service in the front zone included 2161 officers and 22,351 soldiers, a total of 24,512. During the period between Sept. 12, 1917, and Nov. 16, 1918, the A. E. F. received from all sources 3337 service planes and 90 school planes for pursuit, 421 service planes and 85 school planes for day bombing, 3421 service planes and 664 school planes for observation and 31 planes for night reconnaissance in addition to 2385 training planes, 30 experimental planes and 108 miscellaneous.

Eight different schools under American control were established in France and designed for training 3800 officers and 11,700 men, as follows:

Tours—Observers:	916 officers
	2121 soldiers
Issoudun—General Flying:	2175 officers
	6100 soldiers
Clermont—Ferrand—Bombardment:	120 officers
	660 soldiers
St. Jean-De-Monte—Aerial Gunners:	92 officers
	1500 soldiers
Meucon—Artillery Firing Point:	20 officers
	110 soldiers
Chatillon-sur-Seine—Observers:	204 officers
	383 soldiers
Souge—Artillery Firing Point:	259 officers
	750 soldiers
Coetquidan—Artillery Firing Point:	25 officers
	120 soldiers

### England Lightens Driving Restrictions

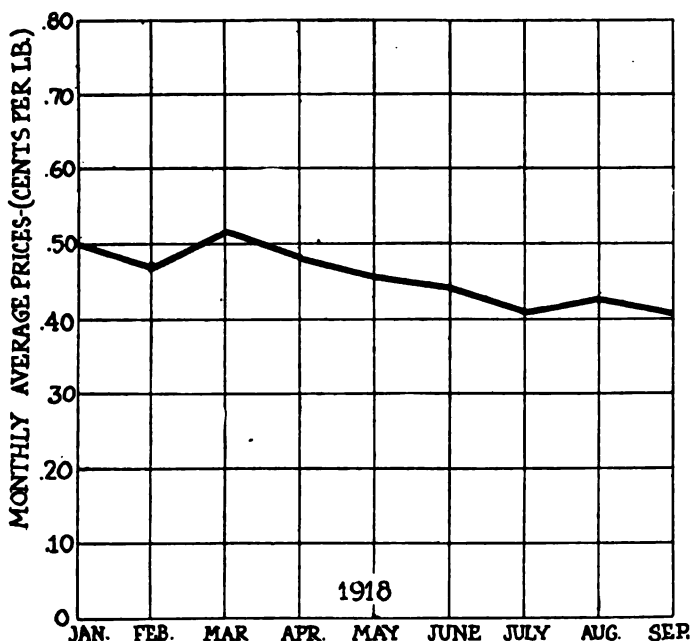
LONDON, ENGLAND, Dec. 1—By mail—England has partly removed the restriction on the use of motor cars and trucks by private owners. Effective to-day owners are permitted to drive free of restraint to the limit of the gasoline allowance and within a thirty mile radius of London. It is still necessary for those who buy gasoline to have permits from the Petrol Control Department. It is expected however that the necessity for such permits will soon cease to exist owing to the fact that military use of gasoline is very rapidly decreasing and imports are increasing.

## AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

<b>Acids:</b>		<b>Fabric, Tire (17½ oz.):</b>	
Muriatic, lb. ....	.02 -.03	Sea Is., combed, lb.1.65-1.70	
Phosphoric (85%)..	.35 -.39	Egypt, combed, lb.1.25-1.35	
Sulphuric (60), lb..	.006	Egypt, carded, lb.1.20-1.30	
<b>Aluminum:</b>		Peelers, combed, lb.1.05-1.20	
Ingot, lb. ....	.33	Peelers, carded, lb. .95-1.05	
Sheets (18 gage or		<b>Fibre (½ in. sheet</b>	
more), lb. ....	.42	base), lb. ....	.50
<b>Antimony, lb. ....</b>	<b>.13½-.13½</b>	<b>Graphite:</b>	
<b>Burlap:</b>		Ceylon, lb. ....	.09 -.22
8 oz., yd.....	.17½-.17½	Madagascar, lb. ..	.10 -.15
10½ oz., yd.....	.21½-.22	Mexico, lb. ....	.03½
<b>Copper:</b>		Lead, lb. ....	.06½-.07½
Elec., lb. ....	.26	<b>Leather:</b>	
Lake, lb. ....	.26	Hides, lb. ....	.18 -.35½

<b>Nickel, lb. ....</b>	<b>.40</b>	<b>Smoked, ribbed</b>	
<b>Oil:</b>		sheets, lb. ....	.52
<b>Gasoline:</b>		<b>Para:</b>	
Auto, gal. ....	.24½	Up River, fine, lb. .62½	
68 to 70 gal.....	.30½	Up River, coarse,	
<b>Lard:</b>		lb. ....	.36½
Prime City, gal..	2.30-2.35	Island, fine, lb..	.53
Ex. No. 1, gal....	1.62	<b>Shellac (orange), lb..</b>	<b>.70-.72</b>
Linseed, gal. ....	1.63-1.65	<b>Spelter .....</b>	<b>.08½-.08½</b>
Menhaden (Brown),		<b>Steel:</b>	
gal. ....	1.35-1.36	Angle beams and	
<b>Petroleum (crude),</b>		channels, lb. ....	.03
Kansas, bbl. ....	2.25	Automobile sheet	
Pennsylv'a. bbl....	4.00	(see sp. table).	
<b>Rubber:</b>		Cold rolled, lb.....	.06½
Ceylon:		Hot rolled, lb.....	.03½
First latex pale		<b>Tin .....</b>	<b>.71-.72</b>
crepe, lb. ....	.54	<b>Tungsten, lb. ....</b>	<b>2.00-2.50</b>
Brown, crepe, thin,		<b>Waste (cotton), lb..</b>	<b>.12½-.17</b>
clear, lb. ....	.50		



The average import price per pound for crude rubber for each month from January to September, 1918. The tendency to lower prices seems at variance with the reduced quantity of crude rubber available

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only per 100 lbs.	Primes when seconds up to 15 per cent are taken per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping .....	6.45	6.35
Hood, flat, fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, extra deep stamping .....	6.55	6.45
Crown fender, cowl and radiator casing, deep stamping .....	6.30	6.20
<b>Automobile Sheet Extras for Extreme Widths:</b>		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 80c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
<b>Black Sheet Extras to Apply to Narrow Widths:</b>		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Automobile Securities on the Chicago Exchange at Close Dec. 21

	Bid	Asked	Net Ch'ge		Bid	Asked	Net Ch'ge		Bid	Asked	Net Ch'ge
Auto Body Company.....	5	8	..	Motor Products Corp.....	40	..	..	<b>Rubber Stocks</b>			
Briscoe Motor Car, com.....	11	..	..	Nash Motors Co., com.....	175	200	..	Ajax Rubber Co.....	65	68	..
Briscoe Motor Car, pf.....	40	55	..	Nash Motors Co., pf.....	90	95	+3	Firestone T. & R., com.....	125	130	..
*Chandler Motor Car.....	105	107	-3½	National Motor Co.....	9	12½	..	Firestone T. & R., pf.....	99	101	..
Chevrolet Motor Car.....	149	151	-4	Packard Motor Car, com.....	108	116	+3	Fisk Rubber Co., com.....	60	65	..
Cole Motor Car Co.....	90	105	..	Packard Motor Car, pf.....	97½	..	..	Fisk Rubber, 1st pf.....	97	103	..
Continental Motors, com.....	8	8½	-¼	Paige-Detroit Motor, com.....	23	24	..	Fisk Rubber, 2nd pf.....	80	84	..
Continental Motors, pf.....	92	96	..	Paige-Detroit Motor, pf.....	8½	9½	..	Fisk Rubber, 1st pf. conv.....	90	97	..
Edmunds & Jones, com.....	20	22	..	Peerless Motor Truck.....	18	21	+1	Goodrich, B. F., com.....	56	57	..
Edmunds & Jones, pf.....	75	90	..	Pierce-Arrow Mot. Car, com.....	41½	42½	-2	Goodrich, B. F., pf.....	..	..	..
Electric Storage Bat.....	49	57	-1	Pierce-Arrow Mot. Car, pf.....	103	104	-½	Goodyear T. & R., com.....	212	220	+2
Federal Motor Truck.....	32	35	+2	Premier Motor Corp., com.....	5	..	+1	*Goodyear T. & R., 1st pf.....	..	..	..
Fisher Body Co., com.....	35½	38	..	Premier Motor Corp., pf.....	75	..	..	Goodyear T. & R., 2nd pf.....	100	102	..
Fisher Body Co., pf.....	92	94	..	Prudden Wheel Company.....	15½	17½	..	Kelly-Springfield, com.....	68½	..	+½
Ford Motor of Canada.....	235	245	+10	*Reo Motor Car Co.....	20½	21	-1½	Kelly-Springfield, pf.....	80	91	..
General Motors, com.....	130½	131½	+5	Republic M. Truck, com.....	35½	38	..	Lee Tire & Rubber Co.....	23	24½	+1
General Motors, pf.....	81	83	+½	*Republic M. Truck, pf.....	87	90	-2	Marathon Tire & Rubber.....	..	55	..
Hupp Motor Car, com.....	4½	5	..	Saxon Motor Car, com.....	7½	9½	-½	Miller Rubber Co., com.....	142	148	..
*Hupp Motor Car, pf.....	84	88	+3	Scripps-Booth Corp.....	21	25	..	Miller Rubber Co., pf.....	95	98	+1
Kelsey Wheel Co., com.....	26	30	+2	Stewart Warner Speed. Corp.	78	80	+1	Rubber Products Co.....	..	101	..
Kelsey Wheel Co., pf.....	85	90	..	Stromberg Carburetor Co.....	33	38	+2	Portage Rubber Co., com.....	145	149	..
Manhattan Electric S., com.	..	48	..	Studebaker Corp., com.....	51½	52½	+½	Swinhart T. & R. Co.....	50	60	..
Maxwell Motor, com.....	29	30	+½	Studebaker Corp., pf.....	90	92	-3	U. S. Rubber Co., com.....	77	78	+3
Maxwell Motor, 1st pf.....	52½	53½	+½	Stutz Motor Car Co.....	49½	51½	-2½	*U. S. Rubber Co., pf.....	109	110	+1
Maxwell Motor, 2nd pf.....	21	22	+½	United Motors Corp.....	33½	35½	..				
McCord Mfg., com.....	30	35	..	*White Motor Co.....	43½	44½	-3½				
McCord Mfg., pf.....	90	95	..	Willys-Overland, com.....	24½	25½	..				
Mitchell Motor Co.....	25	35	..	Willys-Overland, pf.....	88	89	..				

\*Ex Dividend.





*French army trucks being overhauled preparatory to being sold. In this lot of war-worn vehicles are a number of captured German Mercedes*

## French War - Worn Vehicles Sold

**Government Has Realized \$6,000,000 for 2789 Trucks, 2884 Cars and 1826 Motorcycles**

By W. F. Bradley

PARIS, Nov. 20—A year before the war came to a close the French Army inaugurated a system for placing its surplus automobiles and trucks at the disposal of the public. Up to the present date these sales of war-worn automobiles have enriched the State treasury to the extent of more than \$6,000,000. The sales cover 1134 trucks, 1655 light trucks, 2884 touring cars, 1826 motorcycles and 2145 units such as motors, transmissions, etc. Thus 7499 automobiles have been placed at the disposal of civilian users at a time when transportation is most urgently needed.

A big exhibition ground has been established on the Champ de Mars, immediately behind the Eiffel Tower, and on this ground every kind of gasoline propelled vehicle from a single-cylinder motorcycle to a 10-ton artillery tractor can be purchased. All the automobiles offered for sale are unfit for further service with the armies in the field. While they are defective in some way, they are far from being totally disabled. The French plan is not to sell junk, but to put at the disposal of the public old vehicles which can be patched up so as to give very satisfactory service in civilian life.

These automobiles are picked out of the huge reception park in which the cast-off material from the army is received. A small group of experts decides which of these vehicles shall be turned over for sale, and which shall be disassembled for parts or repaired to go into use with the army service of supply.

In picking out the vehicles to be sold

the experts first of all take the odd cars or the odd models—cars or types which are not used to any great extent in the service. All the old type powerful touring cars, of 1910, 1911 and 1912 vintage, are eliminated. Most of the captured German automobiles are turned over for sale; cars and trucks which have not given very great satisfaction in war work are got rid of; finally the more modern vehicles are sold when there is a plentiful supply to be obtained from the factory.

As proof that the cars are not all junk, Louis Wagner's Mercedes, which won second place in the last French Grand Prix, is now in the exhibition ground for sale, and it is known when it passes into private service it will change hands at not less than \$12,000, which is a higher price than some of the racing Peugeots were sold for in 1913 and 1914.

When cars and trucks are sent to the

exhibition ground they are cleaned up and painted by army mechanics and made to present as good an appearance as possible. Usually once a week there is a public sale, and for about ten days before this sale every automobile can be examined in detail.

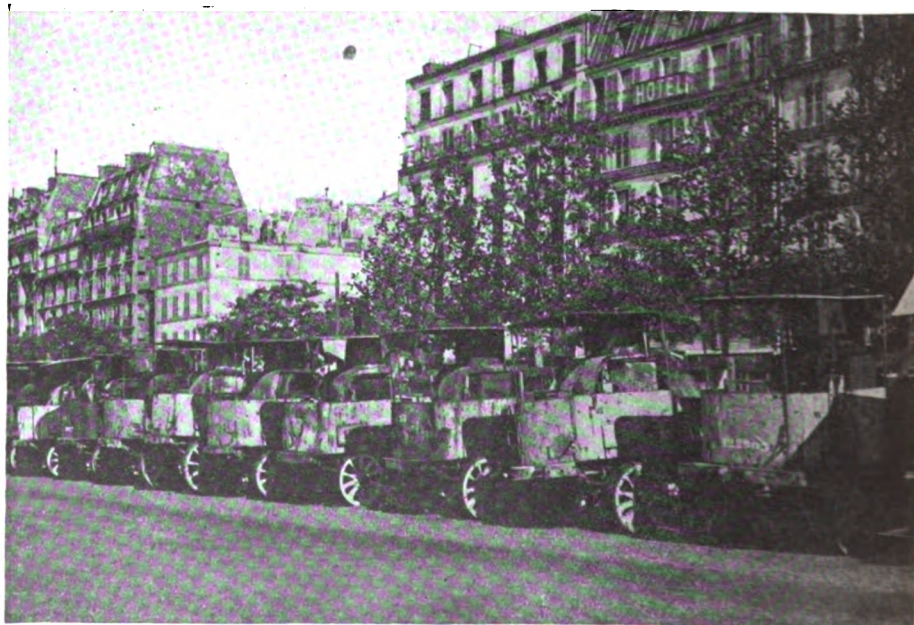
The entire sales organization is in the hands of Lieutenant Paris, a French automobile officer, who fixes a limit price for each truck or car. The public is invited to make bids in sealed envelopes, the highest bid received being the one accepted. Not more than 2 per cent of the automobiles are unsold.

Certain bodies, including municipal councils, government departments, charitable organizations, are allowed preferential bids. These are opened before the bids made by the general public, and, provided the minimum is offered, are sold to these bodies. There is no guarantee that the cars and trucks are in good running condition. Generally they have to be towed home. But provision is made to supply spare parts by stripping down certain chassis and letting the purchasers of trucks and cars have a prior right on these parts.

Many of these trucks are bought up by mechanics as a mere matter of speculation. In other cases the prospective purchaser gets in touch with a small mechanic and arranges with him to carry out the necessary work if purchase is concluded. Horses are so scarce in France and the automobile factories are so busy on war orders that these war-worn trucks are sold for almost as much as when they were new.

### Tractors in Scotland

WASHINGTON, Dec. 19—More than 17,000 acres have been plowed, 2500 acres cultivated, 5000 acres grubbed and 4300 acres harrowed in Scotland as a result of the use of farm tractors during the last season, according to a Commerce report.



*Steam trucks used before the war by a sugar refinery, employed behind the lines since 1914 and now offered for sale*

# Petroleum Demand Will Increase

## Mining Engineers Told of Necessity for Extensive Investigation and Development

WASHINGTON, Dec. 21—The demand for petroleum, increased during the war times, will continue and grow in the future, and to meet the requirements and maintain its place as a petroleum producer, the United States must carry on extensive work in the improvement of producing, storing and shipping and refining of petroleum, and must develop every possible resource.

These were the most important messages given to the American Institute of Mining Engineers at its first annual meeting held here this week, by Chester Naramore, Chief of the Petroleum Division, Bureau of Mines, Department of the Interior. Mr. Naramore, who has just returned from a visit of several months to Europe, where he aided the Allies to secure sufficient petroleum, stated that for the past several years the United States has produced 65 per cent of the world's crude petroleum, reaching 335,000,000 bbl. in 1917, an amount equal to 60 per cent of the total world's yield. In 1917 Russia was our nearest competitor with a production of 14 per cent, while Mexico, considered the bonanza of the oil world, produced but 11 per cent.

### Should Invest in Foreign Fields

Tanker tonnage, said Mr. Naramore, gained 50 per cent since the first months of 1917 with a total dead weight of 1,360,000 tons on Nov. 15, 1918. And this, he stated, is fortunate because there will be an increased demand for gasoline and lubricants for internal combustion engines both at home and abroad.

American producers and American capitalists, said Mr. Naramore, must invest capital in other sections of the globe, must develop oil wells wherever they exist, and in that way only, he stated, can they hope to meet the huge demand that will come in the future and, further, in that way only can they hope to maintain and increase the tractor, truck, passenger car, airplane and oil burning boat industries of the United States.

He holds out but little hope of securing oil from oil shale, principally because of the high cost of extraction, and insists that "this country must in the future depend upon foreign fields to meet a considerable part of the demand that will be made."

"As a source of power," stated Mr. Naramore, "petroleum functioned in all the important mechanical contrivances that stand out as factors of the war, on land, water or in the air. Eliminate petroleum and you eliminate the submarine, the fast destroyers, the best battleships, the automobile, the tractor, the motor ambulance, the motor truck and the aircraft. The airplane, the submarine and the tank each stands forth clearly in the average man's picture of recent great events, but to those whose duty it was to supply the fuel it is clearly evident that the humble motor truck functioned to an extent not measurable in any but superlative terms.

"Trucks, trucks, and more trucks, ever

present from the channel ports to the Adriatic, constituting a main artery that carried the life blood of the army, whether in men, munitions or supplies.

"But how does that apply in a paper on petroleum and reconstruction problems? Tremendously—because it means when the troops return the greatly increased use of the motor truck for every conceivable future transport problem both in Europe and America; yes, and in South Africa and Australia.

"This leads directly to the third point under discussion, that is, the probable future requirements of petroleum products, as well as the possibilities of meeting them.

"Previous to the war, apparently the only limit to the number of motor cars absorbed by the public was the number which the automobile industry could build. The motor truck, on the other hand, had proved its worth most conspicuously in our commercial centers; the millions of men across the sea who represent the best blood of each nation have become accustomed to depending upon the long trains of motor lorries for their every want. Accordingly, when they return home they will automatically think of transport problems in terms of truck loads as well as tons.

### Truck Demands Good Roads

"Consider this universal use of trucks with the unrestricted manufacture of automobiles, and the problem from an engineer's point of view becomes one of unlimited road building. Good roads, with permanent bridges and new regulations as to road maintenance and repair, must materialize. In fact, it means a complete revolution in the attitude of many communities toward expenditures for roads that will stand the traffic wear of fast moving 4 and 5-ton (and even larger) trucks. Many of the so-called permanent highways, of which certain states are so justly proud, are permanent only in a relative sense, and even though they represent expenditure of millions they will not be found serviceable for severe freight transport. I will let your fancy picture the further problems immediately ahead in the fields of engineering, financing and maintenance.

"Tractors are merely another branch of the one great field of automotive endeavor and their more extensive use is an assured fact. Their successful adaptation to farm use will spread with increasing rapidity as the knowledge of the internal combustion motor becomes more and more general.

"To guarantee the perpetuation of the several tremendous industries in which the internal combustion motor functions, including automobile trucks, tractors, motor boats and aircraft, an unlimited supply of petroleum is a basic necessity, and to further guarantee the life of the above industries a campaign for the conservation of petroleum products should be continued and needless losses should be prevented.

"The popular conception that there will be a permanent decrease in the demands of petroleum after the signing of peace is erroneous. Bear in mind for a moment that in France and England for the past year every gallon of gasoline used has been for war purposes, and every day was a gasolineless day. With the lifting of this ban undoubtedly any surplus of gasoline will be readily consumed by the civilian population. We are at once confronted with the problem, How will the industry meet the future demands for petroleum? A great many men have predicted in the past that each year the maximum production would be reached, and it seems very obvious to those who are close students of the game that we cannot expect any material increase in production over that of the present year, 1918. To our best knowledge, outside of northern Texas, certain parts of Oklahoma and Wyoming, the oil fields of the United States have been explored to a very large extent. Optimistically assumed that the production will remain constant for the next several years, and assume that consumption will not increase for the next few years. How then will we make up the deficit of 52,000,000 bbl. as of 1917, 21,000,000 bbl. of which were drawn from storage and 31,000,000 bbl. imported from foreign fields, chiefly Mexico?

### Extensive Research Work Essential

"With such a shortage and no probable increase in home production, it is very evident that to meet the shortage we must first of all obtain from petroleum a maximum recovery and a minimum loss. Extensive research work should be carried on in order to improve the art of producing, storing, shipping and refining of petroleum and to develop possible unknown and better uses of this wonderful natural resource that it might still further serve mankind.

It has been suggested by a great many writers that oil shale will solve the problem of the world's demands, but we should bear

in mind that this industry is in a decidedly experimental stage with need for extensive research work. The solution is not a simple one when we consider that on a basis of a barrel of oil to a ton of shale, 1000 bbl. of crude oil output per day requires on the roughest kind of an estimate an initial investment of approximately \$1,000,000. It is primarily a moneyed man's undertaking and with such heavy initial expense its development will be very slow. Hence we cannot look upon the oil shale industry as a solution of our nation's needs within the next few years. This industry has its place, of course, in the American problems and I do not intend to minimize in any way the attention that should be given to development of oil shale.

"In spite of our very best efforts for conservation and a maximum recovery from the oil produced, it is very evident that this country must in the future depend upon foreign fields to meet a considerable part of the demand that will be made.

"Moreover, because of the universally recognized importance of petroleum as a prime factor of national defense, we must expect every first-class nation to endeavor to control as much crude production as possible, in order that they may be less dependent upon the United States. In view of this, I would consider it little less than a national calamity if American capital should fail to develop the potential petroleum resources contiguous to the Gulf of Mexico, the Caribbean Sea and those of South America.

"The control of the crude oil production of the world is often thought of as a battle between giant corporations, one in America and the other a Dutch-British unit, but the control means more than division of profits between rival business concerns. It means fuel, and fuel is power, and national security as well as prosperity.

"It is true that our domestic production has been able to supply two-thirds of the world's consumption, but petroleum is a wasting resource, and in this country because of its accessibility and proximity to industrial centers we have already drawn heavily upon our total supply as we approach the dawn of a tremendous era of petroleum expenditure.

"With the facts as outlined in my earlier remarks thoroughly known and appreciated by the powers of Europe, it will indeed be surprising if every encouragement is not furnished the different representatives of the petroleum industry by their respective governments to extend their holdings the world over. This assistance may even assume the form of active government investment in petroleum reserves.

"Accordingly, with American interest thoroughly entrenched in the prolific fields of Mexico, it is to be earnestly hoped that they will not find it necessary to sell to foreign capital, but will be able to further increase their holdings in these fields, which are so accessible to the states.

"Furthermore, if the tremendous effort of this country to establish a merchant marine is to bear its maximum rewards, the ships must be provided with oil from nearby sources to reduce the long haul cost. To this end it would be well if American capital did not limit its activity to this hemisphere, but participated in exploration and development work even to more distant parts of the globe.

"Nationally speaking, it is a question to ponder over, when one considers that American geologists are locating prospective fields and American drillers are developing petroleum reserves the world over FOR FOREIGN CAPITAL. May I leave that one thought with you as of first importance?"

### Detroit Show March 1-8

DETROIT, Dec. 21—Detroit's eighteenth annual automobile show will be held from March 1 to March 8. It will be given in the Crosstown Garage building, which is a new garage completed during the year and which offers the greatest amount of space yet provided for a Detroit Automobile Show. The show is staged by the Detroit Automobile Dealers' Association and owing to the fact that a better show building is now available, it is expected that the show will far exceed anything ever held in this city. The Detroit Dealers' Association has established show headquarters in the Hotel Statler with H. H. Shuart, who has managed Detroit shows for the last years, in charge of the exhibition.



**Transport Truck in Production**

MT. PLEASANT, MICH., Dec. 23—The Transport Motor Truck Co. has entered into active production and has completed arrangements for distribution in most of the large trade centers. The company, which is headed by Milton A. Holmes, is to market a 2½-ton internal-gear drive truck equipped with a Continental engine, Eisemann magneto, Stromberg carburetor, Fuller clutch and gear-set, Columbia front axle, Jacox steering gear and Prudden wheels. The wheel-base will be 150 in. and equipment is to include a Motometer and a Hub-odometer.

**Receiver for Nilson Tractor**

MINNEAPOLIS, Dec. 21—The Nilson Tractor Co. has been placed in the hands of a friendly receiver at the request of its own stockholders and directors. The court has appointed M. J. Osborn, who has been general manager of the company. The receivership is a temporary matter and is the first step in a re-financing and reorganization plan from which the company hopes to emerge bigger and stronger.

**Chicago Office for Lancaster**

CHICAGO, Dec. 21—The Lancaster Steel Products Co. has opened a western office in the United Motors Building at 2715 South Michigan Avenue. Frank N. Adgate, who has been connected with the mills at Lancaster, Pa., has been placed in charge of this office.

**Willard Opens Boston Branch**

BOSTON, Dec. 22—The Willard Storage Battery Co., Cleveland, has opened a branch at Boston to cover the New England territory. It has leased a portion of the large Garford building on Commonwealth Avenue, and has sent J. J. Kennealy, one of the factory officials, on to take charge of the plant.

**Turner Tractors for Italy**

MILWAUKEE, Dec. 23—The Turner Mfg. Co., Port Washington, Wis., manufacturer of the Turner-Simplicity tractor, has booked an order for several hundred machines for exportation to Italy. It will require 100 flat cars to ship the order from the factory to the seaboard. The plant is now working on the contract, which will require several months to fill.

**La Crosse May Ad**

LA CROSSE, WIS., Dec. 23—It is reported that the La Crosse Tractor Co., La Crosse, Wis., manufacturer of the Happy Farmer tractor, is contemplating an important plant enlargement project, involving about \$100,000 in buildings and machinery.

**Perfex Radiator to Build**

RACINE, WIS., Dec. 23—The Perfex Radiator Co., Racine, Wis., manufacturing motor car, truck and tractor radiators and cooling systems, intends to start work shortly on its new \$100,000 plant

**Current News of  
Factories***Notes of New Plants—Old  
Ones Enlarged*

in Racine, which project has been delayed by war conditions. The company has been cramped for room for a long time and its present orders largely exceed the capacity.

**Maibohm Will Rebuild**

RACINE, WIS., Dec. 23—The Maibohm Motors Co., which suffered a heavy loss by fire in its plant recently, is making arrangements to build a new factory costing about \$100,000 without equipment. The main building will be 80 x 600 one story high, of steel and brick construction, with steel sash. The contract probably will be awarded to the Austin Co., Cleveland.

**Gehl Increases Facilities**

MILWAUKEE, WIS., Dec. 23—The Gehl Bros. Mfg. Co., West Bend, Wis., manufacturing gas engines, tractors and agricultural machinery, is increasing its manufacturing facilities about 25 per cent. A second floor has been added to the erecting shop for office purposes. The former office and storehouse have been converted into a machine shop addition.

**Can Export Rubber Goods**

WASHINGTON, Dec. 23—Restrictions upon the exportation of manufactured rubber goods have been removed and licenses will now be issued freely.

**Embargo on Importation Into India  
Withdrawn**

WASHINGTON, Dec. 20—The embargo on the importation into India of automobiles, motorcycles and accessories has been withdrawn. The Government of India has given official notification of this withdrawal.

**Triple Tread To Start**

MILWAUKEE, WIS., Dec. 2—The Triple Tread Tire Co., Chicago, an Illinois corporation, with a capital stock of \$362,236, has filed articles and a statement to do business in Wisconsin. The local headquarters are in Platteville, Wis., and the Wisconsin interest is given as \$25,000.

**Dividends Declared**

Ajax Rubber Co., quarterly, \$1.50.  
Packard Motor Car Co., quarterly, 1% per cent preferred stock.  
Pierce-Arrow Motor Car Co., quarterly, 2 per cent preferred stock.

**Newman to Bring Out Truck Line**

ST. LOUIS, Dec. 23—Harry Newman, Inc., a truck and trailer distributor here, will on Jan. 15 begin production of a standard truck in five sizes, ranging from 1 to 5 tons. He has contracted for such parts as Timken-Detroit worm drive rear axle, Continental Red Seal motor, Stromberg carburetor, A. O. Smith frame, Borg & Beck clutch, and Gemmer steering apparatus. He has obtained factory space necessary for a large output. The trucks will sell from \$1,590 to \$4,190.

**Fansteel Moves New York Office**

NEW YORK, Dec. 21—The Fansteel Products Co., North Chicago, has relocated its New York headquarters in the Park Row Building, 15 Park Row.

**Philadelphia Office for Hess**

BALTIMORE, Dec. 21—The Hess Steel Corp. has established a branch office at 517 Widener Building, Philadelphia. Charles O. Rowe, district representative, will be in charge.

**Northern Foundry Increases Capital**

MARINETTE, WIS., Dec. 23—The Northern Foundry Co., Marinette, Wis., organized a year ago to specialize in gray iron castings for the automotive industry, has increased its capital stock from \$25,000 to \$95,000. The company is completing enlargements which will double the capacity. Besides erecting an addition, it has taken over the plant of the Landover Motor Truck Co., Marinette, and this concern has taken new quarters at Stephenson and Liberty streets. At the annual meeting of stockholders, the Northern company re-elected these officers: President and general manager, J. M. Fitzpatrick; vice-president, Patrick McManus, Milwaukee; secretary, Edward J. Vanderboom, Milwaukee; treasurer, Louis E. Best, Milwaukee.

**Open New Brass Foundry**

SUPERIOR, WIS., Dec. 23—A new brass foundry has been opened at Superior, Wis., by G. W. Nelson, formerly engaged in this business at Cumming Avenue and Second Street in this city. Nelson has leased the plant until recently occupied by the Acme Foundry Co., which is now located in its new shops.

**Air Mail Service in New Zealand**

WASHINGTON, Dec. 23—An aerial mail service will be established shortly in New Zealand from Auckland to Dunedin, a distance of 700 miles, according to a Commerce Report. It is expected that a saving of 14 hours will be effected.

**Export Conservation List Modified**

WASHINGTON, Dec. 23—The War Trade Board has modified its export conservation list, removing among other commodities, airplane duck cotton and rubberized silk for use in aircraft manufacture.



### Williams Again Heads Highways Industries Association

CHICAGO, Dec. 21—S. M. Williams of the Garford Motor Truck Co., was re-elected president of the Highways Industries Association at the annual meeting held here last Friday. Other officers elected were: First vice-president, G. P. Coleman, chief engineer, Highways Department, West Virginia; second vice-president, E. J. Mehren, editor, Engineering News-Record; third vice-president, Charles J. Lang; secretary and treasurer, H. G. Shirley; directors (Class A membership), W. P. Blair, National Paving Brick Association; A. T. Rhode, Granite Pavement Block Manufacturers' Association; E. J. Mehren, National Association Asphalt Block Manufacturers; W. T. White, N. A. C. C.; directors (two years), W. E. Metzger, E. J. Sutton, A. P. Sandles, Philip Koehring; directors (three years), H. J. Love, W. O. Rutherford, A. N. Johnson, S. F. Beatty. David S. Ludlum, president of the Autocar Co., Ardmore, Pa., was elected to Class B membership. The following national associations have made application for Class A membership: National Vitrified Pipe Manufacturers' Association, the Lime Association.

M. Frankel, manager of the Chicago office of the Roller-Smith Co., maker of electrical instruments, has been promoted to assistant sales manager of the company, with headquarters at Chicago.

G. W. Werden has been appointed export manager of the Denby Motor Truck Co., Detroit. He has established headquarters in New York City.

H. W. Clark has been appointed manager of advertising for the Chicago Pneumatic Tool Co., Chicago. He was formerly in the advertising service department of the McGraw-Hill Publishing Co. in Chicago.

### Government Help For Aviation

(Continued from page 1110)

Both the balance and the dynamometer will be suspended from an overhead platform into the wind stream. In each case the observer will work above the platform. Power will be supplied to the wind tunnel propeller by a 250 hp. motor, which will be operated by a 250 kw. synchronous motor generator set with special arrangements for speed control and regulations.

The wind tunnel is designed for air velocities up to 130 m.p.h. with the 5 ft. section and 200 or more miles per hour when using the 30 in. section.

During the past year the committee has served the War and Navy Departments as an impartial agency for the settlement of disputes between contractors and the departments. Among the more prominent cases handled were:

A dispute between the War and Navy Departments on one hand and the Kessler Motor Co. relative to compliance with technical provisions of a contract for de-

## Men of the Industry

### Changes in Personnel and Position

velopment of experimental aircraft engines.

The contract with the Glenn L. Martin Co. for a large bombing plane with a smaller pilot plane fastened to it so as to automatically control the large plane and direct its course after the smaller pilot plane had been released, the larger plane to carry and automatically release a large bomb of the type invented by Lester P. Barlow. A contract had been completed at an expenditure of \$15,000 and a controversy arose over the advisability of expending an additional \$150,000. The committee advised against it.

Sand loading and other tests made by members of the committee's technical staff on an experimental plane built by the Carolina Aircraft Co. revealed the ability of wood veneer in wing construction not only for ribs but also for the actual wing covering. It was found that the internal drift wires may be eliminated and the same weight per square foot of service obtained as in the ordinary wing. This was reported promptly to the Bureau of Aircraft Production.

Engine fuel investigations during the year have included inquiries into:

- 1—Gasoline direct from crude petroleum without stills, cleaned without use of acid or alkali.
- 2—First distillate of crude benzine cleaned and purified without the use of acid or alkali.
- 3—Natural neutral gasoline.
- 4—Increased yield of straight paraffin gasoline from crude oil.
- 5—Separation of gasoline from crude oil by mechanical means.
- 6—Quality samples of pure paraffin gasoline from crude oil were completed and delivered in July, 1918, and were referred to the Bureau of Standards for tests. This work will be described in detail in a later report.

The membership of the committee as elected on Oct. 10, 1918, includes Dr. John R. Freeman, chairman; Dr. W. F. Stratton, secretary; Dr. Charles D. Walcott, chairman executive committee; Dr. Joseph S. Anes, Dr. William F. Durand, Dr. John F. Hayford, Major General William L. Kenly, Prof. Charles F. Marvin, Dr. Michael I. Pupin, Dr. Wallace C. Sabine, Rear Admiral David W. Taylor, U. S. N.; Commander John H. Towers, U. S. N. The committee is divided into an Executive Committee and sub and special committees. The subcommittees include those for:

- Aircraft Design and Associated Engineering Problems.
- Steel Construction for Aircraft.
- Fireproof Coverings.
- Navigation of Aircraft, Aeronautic Instruments and Accessories.
- Power Plants for Aircraft.
- Fuel Injection Engines.

### Stewart-Warner Engineer Dies

CHICAGO, Dec. 21—John E. Genn, chief engineer of the Stewart-Warner Speedometer Corp., died Dec. 15. He had been connected with the company since its infancy; in fact, was one of its first ten members. He has been successively engineer, assistant chief engineer, chief inspector and chief engineer. He was 35 years old.

John F. Reno, chief engineer of the Root & VanDervoort Engineering Co., East Moline, Ill., died Dec. 19 of pneumonia following an attack of Spanish influenza. Mr. Reno first became connected with the Moline Automobile Co. about twelve years ago and when this company was absorbed by the Root and VanDervoort Co. he continued as chief engineer. He was thirty-five years old.

### Standardization and Investigation of Materials for Aircraft.

#### Light Alloys.

Special committees are on aero torpedos, aircraft communication on airplane mapping, aeronautic bibliography, buildings, laboratories and equipment, civil aerial transport, design, construction and navigation, editorial, free-flight tests, Government relations, direct-lift aircraft, aeronautic nomenclature, personnel, relation of atmosphere to aeronautics, engineering problems.

Following is a list of special publications which will be issued in the near future by the committee:

- 24—Air Flow Through Poppet Valves.
- 25—Nomenclature for Aeronautics.
- 26—The Variation of Yawing Moment Due to Rolling.
- 27—Behavior of Airplanes in Gusts, III.
- 28—The Laws of Air Resistance of Aerofoils.
- 29—General Theory of the Blade Screw.
- 30—Experimental Research on Air Propellers, II.
- 31—Accuracy and Efficiency of Pressure Nozzles.
- 32—An Airplane Tensionometer.
- 33—Luminous Materials.
- 34—Aluminum and Its Light Alloys.
- 35—The Strength of One-Piece, Solid, Built-up, and Laminated Wood Airplane Wing Beams.
- 36—The Structure of Airplane Fabrics.
- 37—Fabric Fastenings.
- 38—Airplane Dopes and Doping.
- 39—The Testing of Balloon Fabrics.
- 40—The Ferrosilicon Process for the Generation of Hydrogen.
- 41—Testing the Balloon Gas.
- 42—A New Process for the Production of Aircraft Engine Fuels.
- 43—Properties of Aerofoil Sections.
- 44—Description of Altitude Laboratory.
- 45—Effect of Compression Ratio, Pressure, Temperature, and Humidity on Power.
- 46—Heat Distribution in an Aircraft Engine.
- 47—Power Characteristics of Fuel for Aircraft Engines.
- 48—Carbureting Conditions Characteristic of Aircraft Engines.
- 49—Metering Characteristics of Carburetors.
- 50—The Junkers-Diesel as an Aircraft Engine.
- 51—Spark Plug Defects and Tests.
- 52—Temperatures in Spark Plugs Having Brass and Steel Shells.
- 53—Properties and Preparation of Ceramic Insulators for Spark Plugs.
- 54—Effect of Pressure and Temperature on the Sparking Voltage.
- 55—Oscillograph Tests of Ignition Systems.
- 56—Heat Energy of Various Ignition Sparks.
- 57—The Series Gap as a Means for Improving Ignition.
- 58—Transformation Ratio and Coupling in High Tension Magnets.
- 59—General Analysis of Airplane Radiator Problems.
- 60—General Discussion of Test Methods for Radiators.
- 61—Head Resistance Due to Radiators.
- 62—Effect of Altitude on Radiator Performance.
- 63—Water Flow Through Radiators.

# Mail Trucks Earn Four Times Their Cost

Cost of Operation Between July 1 and Sept. 30 Was \$70,000, as Compared with \$292,000 Revenue—Post Office to Put 2000 Trucks on 600 Routes

WASHINGTON, Dec. 21—Motor truck mail service costs during the year ended June 30, 1918, were from 30 cents per hour to \$1.26 per hour, depending on the truck and the locality, according to a tabulation of motor truck costs filed by the Post Office Department with the Committee on the Post Office and Post Roads.

The costs varied considerably with the different types and capacities of trucks and again with the localities. For example, a Ford operated in Boston cost 40 cents per hour, in New York 81 cents per hour, and in Washington, D. C., 36 cents per hour. A  $\frac{3}{4}$ -ton White in Boston cost 59 cents per hour, in Nashville 36 cents per hour, in Philadelphia 98 cents per hour, and in Washington, D. C., 49 cents per hour.

## 509 Fords Used

Depreciation and interest rates per annum figured on 16-hour days and 365 days a year range from 20 per cent to 33  $\frac{1}{3}$  per cent. More Ford trucks are in the mail service than any others, totaling 509 as compared with 173  $\frac{3}{4}$ -ton White trucks, and, next, 64 Packard  $\frac{1}{2}$ -ton trucks.

Thirty-one through motor truck routes have been established over 5720.61 miles. The cost of operation for 3 months from July 1, 1918, to Sept. 30, 1918, was \$69,625.75 as compared with a total revenue of \$292,024.95. These figures in additional tables were filed with the Committee on the Post Office and Post Roads by Fourth Assistant Postmaster General James I. Blakeslee to prove the need for the \$1,000,000 appropriation for additional motor truck routes.

Blakeslee stated that the net income totaled \$134,791.72 if the 1-cent war tax was deducted, and in addition 33  $\frac{1}{3}$  per cent should be credited to postal operations other than perfected through the motor truck service, leaving an actual net

income in 3 months of \$89,861.15, or \$1,576.51 per route per month, or a net income of \$18,918.12 per route per annum. The plans of the Post Office are to establish 2000 trucks over 600 routes.

In illustration of the service that motor truck routes had given, Blakeslee stated that on Nov. 13, 1918, 795 lb. of milk was hauled from Frisco, Mo., to Warsaw, Mo. "Points you might say," stated Blakeslee, "of nowhere to nowhere—there is no market at Warsaw, it is a town of no size and Frisco is a village. There is no railroad anywhere in the vicinity of either of these villages." He also stated that 1726 lb. of milk were carried into Washington, D. C., daily by motor trucks.

A "B" type standardized army truck turned over by the War Department, he said, is now operating between Philadelphia and Westchester, Pa., carrying 6000 lb. of mushrooms a trip. Motor truck operators are being paid \$4 a day for the first 6 months, \$4.50 a day for the next 18 months, and \$5 daily thereafter. It would require \$8,794,000 to operate 600 routes with 2000 trucks, said Mr. Blakeslee.

Replies received from 88 postmasters showed increases of one-half of 1 per cent to 500 per cent of postal business due to the establishment of motor truck routes.

Following is the table showing the cost of motor service by districts:

## Substitute for Platinum

WASHINGTON, Dec. 19—A substitute for platinum has been found in the manufacture of sulphuric acid, according to announcement made by the War Industries Board here to-day. The discovery was the result of experiments in the Nellen Institute, Pittsburgh. The exact nature of the substitute has not been revealed. The substitute is not

available to take the place of platinum in the arts or in dentistry, but it may be used later, according to the report, for laboratory and jewelry purposes.

## Oil and Lubricants Purchased

WASHINGTON, Dec. 19 — From April 1 to Nov. 1, 1918, the Oil Branch of the Raw Materials Division of the United States Army purchased \$23,809,584.14 worth of oils and lubricants. This included 111,229,400 gal. and 2,016,076 lb. Some of the principal items purchased and the quantities are as follows:

Article	Gallons	Value
Liberty aero oil.....	1,308,540	\$808,183.66
Lubricating oil, light..	141,375	54,699.49
Lubricating oil, medium	826,544	329,860.61
Lubricating oil, heavy..	619,498	271,597.23
Transmission lubricant.	286,570	92,975.63
Aviation gasoline.....	12,066,414	2,060,119.48
Aviation naphtha.....	3,297,500	1,084,666.25
Fighting naphtha.....	4,021,500	1,657,713.75
Motor gasoline.....	52,374,066	11,885,012.84
Mineral oil.....	1,868,931	298,789.55
Axle grease.....	1,034,343	279,505.14
Fuel oil.....	30,984,134	2,195,463.12
Motorcycle oil.....	166,600	87,601.36
Neatsfoot oil.....	56,005	118,611.25
Neatsfoot oil substitutes	252,500	174,720.00
Road oil.....	652,350	47,479.20

## Indian Service Wants $3\frac{1}{2}$ Ton Truck

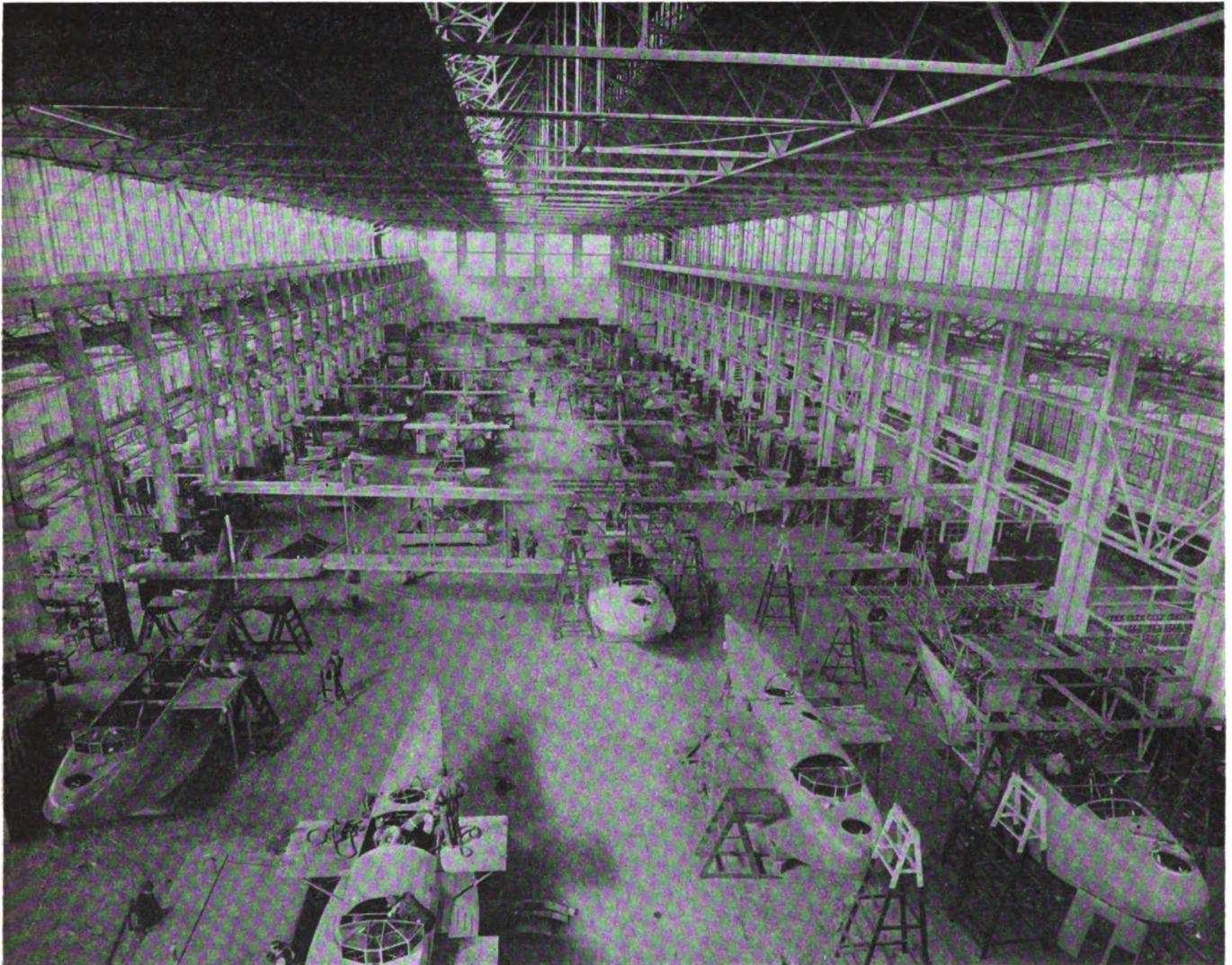
WASHINGTON, Dec. 21—The United States Indian Service, Department of Interior, has asked for bids on 1  $3\frac{1}{2}$ -ton truck, worm drive with a steel dump body and hoist. Capacity 7000 lbs., positive pump circulating oil system in combination with constant level splash system, artillery type wood wheels, Timken roller bearings, 36 by 5 single front tires and 40 by 5 dual rear tires are specified. The truck must be fully equipped with lights and tools and the seat frame should be of wood with well ironed and upholstered back and spring upholstered cushion. All bids should be accompanied by specifications and cut of the truck and should be sent to the Asylum for Insane Indians, Canton, South Dakota, no later than Jan. 4, 1919.

## Revenue and Operating Cost of Postal Trucks, July 1 to Sept. 30, 1918

Termini	July		August		September		Total	
	Revenue	Cost	Revenue	Cost	Revenue	Cost	Revenue	Cost
Portland, Worcester	\$6,807.71	\$1,458.67	\$14,751.44	\$1,502.60	\$16,000.82	\$1,467.01	\$37,595.97	\$4,428.28
Worcester, New York	7,070.20	1,875.47	13,000.00	1,893.89	13,477.22	1,940.47	34,229.47	5,709.83
Kennett Square, Philadelphia, Flemington	4,674.95	2,423.90	4,271.57	1,926.28	3,530.45	1,395.90	12,476.97	5,746.08
Lancaster, New York	3,131.28	1,587.44	2,594.08	1,357.19	2,875.25	1,772.28	8,600.56	4,716.91
Kennett Square, Wilmington	4,123.68	2,397.68	4,055.97	1,095.57	6,282.49	1,038.55	14,462.14	3,533.20
Philadelphia, Washington	13,627.19	2,397.68	13,000.00	2,006.19	14,758.27	2,249.16	42,018.15	6,653.08
Washington, Gettysburg, McConellsburg	3,892.56	1,806.81	3,914.15	972.13	4,335.02	1,145.17	12,141.73	3,424.11
Baltimore, Gettysburg, Lancaster	5,600.25	1,224.36	5,594.80	954.33	5,487.87	841.83	16,682.92	3,020.52
Baltimore, Solomons, Berryville	16,441.67	2,177.59	17,134.82	2,552.16	14,784.37	1,908.37	48,360.86	6,638.12
Washington, Winchester	4,050.49	1,471.66	4,809.89	1,443.04	3,926.32	744.47	12,786.65	3,659.17
Washington, Rock Point, Ridge	6,820.00	1,372.21	7,674.44	1,112.14	7,271.16	1,210.59	21,765.60	3,694.94
Columbia, Orangeburg, Augusta	517.04	514.61	1,158.41	1,202.71	1,323.17	1,063.12	2,998.62	2,750.44
Augusta, Statesboro, Savannah	525.44	558.65	970.08	1,105.23	408.50	580.55	1,904.03	2,244.43
Statesboro, Dublin, Fort Valley	49.08	136.27	738.77	1,289.27	194.27	623.04	982.12	2,018.58
Columbus, Zanesville	1,151.05	544.35	1,102.46	577.63	1,081.02	560.00	3,284.43	1,681.94
Atlanta, Dahlonega	.....	.....	172.31	244.64	551.30	489.89	723.61	734.53
Indianapolis, Bedford, Louisville	.....	.....	3,168.94	1,167.78	6,548.54	1,288.09	9,717.48	2,455.57
Indianapolis, Versailles, Cincinnati	.....	.....	1,599.12	1,069.54	4,304.85	1,325.64	5,903.97	2,395.14
Cincinnati, Hillsboro, Columbus	.....	.....	798.70	649.49	1,147.35	1,173.64	1,946.05	1,828.90
Cincinnati, Lexington	.....	.....	.....	.....	73.13	127.57	73.13	127.57
Louisville, Lexington, Bardstown	.....	.....	.....	.....	545.04	305.19	545.04	305.19
Springfield, Warsaw, Marshall	.....	.....	.....	.....	1,377.86	1,427.02	1,377.86	1,427.02
Nashville, Bardstown	.....	.....	.....	.....	1,486.49	377.79	1,486.49	377.79
Total	\$78,482.54	\$20,448.75	\$101,821.65	\$24,121.76	\$111,720.76	\$25,055.24	\$292,024.95	\$69,625.75
Grand total							\$292,024.95	\$69,625.75



## Progressive Construction in the Naval Aircraft Factory, Philadelphia



*The original manufacturing unit of the Naval Aircraft Factory, Philadelphia, with a ground area of 160,000 sq. ft., is a permanent steel structure of imposing dimensions. It was built and equipped in about 3 months at a cost of \$1,000,000. It has more than 3600 workers, both men and girls, and soon after the factory had produced its first service machine, it began to maintain an output of four a day.*

*Nearly every feasible suggestion has been worked out and im-*

*provements made wherever possible and all this has resulted in the special seaplane model finally developed at League Island—the Model F, deemed the peer of any of the American machines in the war. It has a wingspread of 100 ft., driven at the rate of 100 m.p.h. by two Liberty engines. The propellers are 10½ ft. in diameter. It carries several bombs, a number of machine guns fired from bow and stern, has a wireless and a telephone system and is supplied with carrier pigeons and a crew of four men.*

## Salvage Division Formed

WASHINGTON, Dec. 21—The Salvage Division of the army has been directed by Brig. Gen. R. E. Wood to take charge of all unserviceable or used Government supplies and materials which result from the demobilization of the military forces and are to be sold. This property includes material that cannot be repaired or reclaimed and made serviceable to the army, and second-hand materials which have been used and cannot be sold to better advantage or be repaired. The Salvage Division will determine the method by which sales will be made and the conditions upon which bids will be received. All bids, however, will be accompanied by a guaranty deposit of at least 20 per cent of the amount bid either in cash or certified check. No delivery of property will be made until the full purchase price is paid. A Governing

Sales Board on Unserviceable Property will be appointed to act as a Board of Review with regard to sales of unserviceable property.

## Commerce Department Takes Over War Sections

WASHINGTON, Dec. 21—The Resources and Conversion Section and the Conservation Section, both divisions of the War Industries Board, are to be taken over by the Department of Commerce after Jan. 1, 1919. The Resources and Conversion Section, which has compiled much valuable information about raw materials and plant facilities, will be continued temporarily. The Conservation Section, which was first known as the Commercial Economy Board, will be made a permanent division of the Department. The Conservation Section has

been instrumental in effecting economies in various industries by elimination of unnecessary types, models and styles of commodities. It is the Government division that arranged for the reductions in the sizes and types of passenger car and truck tires and in the types of farm plows.

## Tractor Agency Wanted

WASHINGTON, Dec. 21—The Bureau of Foreign and Domestic Commerce, Department of Commerce, has a request from France for an agency for tractors. Further information can be had by addressing Foreign Trade Opportunity No. 27829. Another inquiry on hand is for an agency for automobile tires in Australia. Further information can be had by addressing Foreign Trade Opportunity No. 27828.



# Calendar

## ENGINEERING

### S. A. E. Meetings 1919

- Jan. 8—Minneapolis Section, S. A. E.—Hotel Radisson. "Governors for Tractors and Truck Engines."
- Feb. 4-6—New York. Winter Meeting. Society of Automotive Engineers, Engineering Societies' Building.
- Feb. 6—Victory Dinner, Hotel Astor, New York.
- Feb. 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Radiator Cooling Fans."
- March 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Tractor Service and Sales."
- April 2—Minneapolis Section, S. A. E.—Hotel Radisson. "Implements Designed for Tractor Belt Power and Their Characteristics."

## MOTOR SHOWS

- Jan. 11-18—Los Angeles, Cal. Automotive Exposition.
- March 1-8—Detroit, Mich. Detroit Automobile Dealers' Assn. H. H. Shuart, Manager.
- Jan. 24-30—Milwaukee, Wis. Eleventh Annual, Milwaukee Automobile Dealers, Inc., Auditorium. Bart J. Ruddle, Manager.
- Jan. 25-Feb. 1—Chicago. Passenger cars, Coliseum.

February—Grand Rapids, Mich. Grand Rapids Automobile Business Assn. E. T. Conlon, Manager.

Feb. 1-15—New York. Automobile Dealers' Assn. Charles A. Stewart, Manager, Hotel Woodward, Broadway and 55th St.

Feb. 2-5—Chicago. Trucks, Coliseum.

Feb. 15-23—Louisville, Ky. Louisville Auto Dealers' Assn.

Feb. 15-23—Newark, N. J. N. J. Auto Exhibition Co. Calude Holgate, Manager.

Feb. 15-22—Minneapolis, Minn. Minneapolis Auto Trade Assn. Walter B. Wilmet, Manager.

Feb. 17-22—Des Moines, Iowa. Tenth Annual, Des Moines Automobile Dealers' Assn. C. G. Van Vliet, Manager.

Feb. 15-22—Albany, N. Y. Albany Automobile Dealers' Assn. State Armory.

Feb. 17-24—Passenger Cars; Feb. 24-27, Trucks—South Bethlehem, Pa. Lehigh Valley Auto Shows Co. J. L. Elliott, Manager.

Feb. 24-March 1—Kansas City, Mo.—Kansas City Motor Dealers' Assn. E. E. Peake, Manager.

March—Great Falls, Mont.—Montana Automobile Distributors' Assn.

March—Philadelphia, Pa. Philadelphia Automobile Trade Assn. Passenger cars.

Mar. 3-8—Columbus, O. Columbus Automobile Show Co. Memorial Building. W. W. Freeman, Manager.

March 3-8—Buffalo, N. Y. Buffalo Automobile Dealers' Assn.

March 1-10—San Francisco, Cal. Motor Car Dealers' Assn. G. A. Wahlgreen, Manager.

March 10-15—Syracuse, N. Y. Syracuse Automobile Dealers' Assn. Harry T. Gardner, Manager.

Second or third week March—St. Louis, Mo. St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Manager.

March 15-23—Boston, Mass. Boston Automobile Dealers' Assn. Chester I. Campbell, Manager.

March 22-29, Passenger Cars; April 1-5, Trucks—Brooklyn, Brooklyn Motor Vehicle Dealers' Assn. I. C. Kirkham, Manager.

Third week March—Trenton, N. J. Trenton Auto Trade Assn. John L. Brock, Manager.

March—Pittsburgh. Automobile Dealers' Assn. of Pittsburgh. John J. Bell, Manager.

March—Utica, N. Y. Utica Motor Dealers' Assn. W. W. Garabrant, Manager.

Feb. 15-22—Cleveland, Ohio. Cleveland Auto Show Co. Fred H. Caley, Manager.

April 5-12—Montreal, Can.—National Motor Show of Eastern Canada, Victoria Rink. T. C. Kirby, Manager.

Not decided—Bridgeport, Conn. Auspices of City Battalion. B. B. Steiber, Manager.

Not decided—Harrisburg, Pa. Harrisburg Motor Dealers' Assn. J. Clyde Myton, Manager.

Not decided—Hartford, Conn. Hartford Automobile Dealers' Assn.

Not decided—Indianapolis, Ind. Indianapolis Auto Trade Assn. John B. Orman, Manager.

Feb. 10-15—Kansas City, Mo. Kansas City Motor Dealers' Assn. E. E. Peake, Manager.

## TRACTOR SHOWS

Feb. 10-15—Kansas City, Mo. Fourth Annual Tractor Show. Sweeney Building. Kansas City Tractor Club. Guy H. Hall, Sec.

Feb. 18-22—Wichita, Kan. Annual Mid-west Tractor and Thresher Show, Wichita Tractor and Thresher Club. Forum.

## CONVENTIONS

Dec. 30-Jan. 1—Chicago, Ill. Twelfth Annual Meeting American Society of Agricultural Engineers. J. W. Dickinson, Secretary, Ohio State University, Columbus.

Feb. 4-6—New York. Meeting. Society Automotive Engineers.

Feb. 25-28—New York. Sixteenth Annual Convention. American Road Builders' Assn.

## Cultivating the Chinese Automotive Field

(Continued from page 1107)

equal number of persons at any other place in the world. Then there are the Chinese, the number of whom able to buy motor cars it would be impossible to estimate. Very often you will find that a Chinese family operating one car will quickly add several more to its fleet.

Naturally in such a market there will be a variety of ideas as to the car which will definitely meet individual needs, and the methods of choosing will, of course, differ. Among the Europeans, for instance, we find that the buyer has a natural inclination to purchase a motor vehicle made in his own country, and he will usually do so, if he can secure a car that comes within his purse. The foreigner, too, before investing will make a close study of the mechanical construction of the machine and buy largely on his personal knowledge of construction, on the word of friends owning cars of the same make, or the service which the dealer can give him. The Chinese buyer, on the other hand, in nine cases out of ten pays absolutely no attention to mechanical construction. He buys because he likes the appearance of the car, its color, and number of accessories. He is not trained in mechanics and shows no interest in them.

The lower-priced American cars have established themselves in every selling center of China and are now taking the bulk of the trade, but that there is a demand for higher-priced cars is borne out

by the fact that a great number of European cars are operated in the larger cities. Manifestly, therefore, there is no reason why any American manufacturer cannot go after business in China with his standard car, but if his domestic product is built with left-side drive, he must furnish his cars for this territory with a steering column on the right, and magneto is preferred to battery ignition.

## Want Detroit-Cleveland Air Mail

WASHINGTON, Dec. 23—The Post Office authorities here have been requested by the Detroit Post Office to establish airplane mail service between Detroit and Cleveland. The request will be acted upon later.

## Fuel Oil Priorities Abolished

WASHINGTON, Dec. 21—All priorities in respect to fuel oil and gas oil were abolished in an order issued to-day by the United States Fuel Administration, in line with its general policy of removing all wartime restrictions as rapidly as conditions warrant.

In to-day's order, Rule 1 of an order issued Sept. 24, 1918, establishing priorities for the entire country in respect to the delivery of fuel oil and gas oil, creating 12 classes, and providing for the serving of the needs of consumers in the order named, is completely set aside. All consumers are now on an equal basis.

## Hair-Line Defects in Crankshafts

(Continued from page 1105)

about 80,000 lb. per sq. in., the ultimate strength about 120,000 lb. per sq. in., the elongation about 15 per cent, and the reduction in area about 38 per cent.

(4) The "hair-line" on the surface has no appreciable depth.

(5) The two steels show long threads of manganese sulphide and iron oxide parallel to the direction of forging.

(6) The structure is martensitic but is streaky or laminated parallel to the forging.

(7) This lamination is due to segregation.

(8) It is the primary cause of the fibrous appearance of the fractures.

(9) The presence of the threads of manganese sulphide and iron oxide tend to make the fibrous fracture more pronounced.

## "Pirate" Part Suit Brought by Connecticut Company Settled

NEW YORK, Dec. 21—The suit in equity instituted by the Connecticut Telephone & Electric Co., Meriden, against Paul G. Niehoff & Co. alleging infringement of certain Connecticut parts through the sale of spare parts not made by Connecticut but sold for Connecticut equipment, has been settled out of court. Niehoff recognizes the validity of the Connecticut patents and has agreed not to sell "pirate" parts.

# Automotive Chronology for 1918

Important Developments in the Industrial and Financial  
Fields Arranged According to Date of Occurrence

## January

- 2—Three samples of Class A standardized war trucks manufactured in White, Denby and Autocar factories arrive in Washington, after drive from factories.
- 2—Secretary McAdoo as Director of Railroads issues order that any consignee who does not promptly unload freight cars and release them for return trips, must be embargoed.
- 2—J. C. Wilson Co. and Dodge Brothers announce that drive-away policy for trucks is satisfactory, and will be followed by them throughout the winter.
- 2—General Motors Corp. announces undivided profits of \$12,900,000 for 4 months ended Nov. 30, 1917.
- 2—Post Office Department plans to establish from 3000-4000 miles of motor truck parcels post routes to be in operation before April 1.
- 5—First War Automotive Show opens at Grand Central Palace, New York.
- 8—Second truck train of 46 Pierce-Arrows ends trip from Buffalo to Governor's Island.
- 8—Exports drop 10 per cent in November.
- 9—S. A. E. announces the addition of 1000 new members in 1917.
- 10—Thirteenth annual session of S. A. E. C. F. Kettering elected president.
- 14—Eighteen Lansing firms allied for war work.
- 14—Overland profits in 1917 \$8,500,000.
- 14—New York Rotary Motor Co. places new 3-wheel delivery car on market.
- 15—Petroleum output for 1917 breaks record. Supply is 341,800,000 bbl., or 14 per cent more than in 1916.
- 16—Proclamation issued by Fuel Administrator ordering shut-down of industry for five days from Jan. 18-22, and 10 Mondays from Jan. 21 to March 25.
- 18—Committee of three receivers named for Bijur Motor Lighting Co.
- 21—Canada registrations for 1917 show 199,301 cars and trucks. Great increase in trade and capital also recorded.
- 22—New altitude record made by Lieut. Brak-Papa in SIA biplane with FIAT engine.
- 22—Rubber Assn. of America appoints a war committee to act as a point of contact between the industry and government. B. G. Work named as chairman.
- 22—Collier Motor Truck Co. starts production on new  $\frac{3}{4}$ -ton model.
- 23—Reports from England show that of 490,000 cars and trucks in Great Britain approximately 80 per cent are out of commission, due to lack of fuel.
- 24—After 5-day shut-down, manufacturers find that the fuel situation is not greatly improved.
- 24—Mexico rated as second largest oil-producing country, replacing Russia.
- 26—National Assn. of Boat and Engine Manufacturers urge adoption of standard motor lifeboat as part of the equipment of the emergency fleet.
- 28—Only 124 Michigan plants, all doing government work, are exempted from the Garfield closing order.
- 28—Goodyear Tire & Rubber Co. inaugurates plan of selling \$25,000,000 second preferred stock to service station dealers and their customers. Dealers to receive \$2 per share for selling stock.
- 29—Fuel Administrator Garfield tells meeting of automobile men that he has no intention of curtailing the industry.
- 29—Federal investigations show that the average cost of producing a gallon of gasoline is only 14.9 cents exclusive of freight and sales charges.
- 30—Massachusetts, Pennsylvania, and New York plan the establishment of central bureaus, at which truck drivers will be assigned loads to deliver on their return.
- 3—Detroit tied up by shortage of gas. Between 8000 and 10,000 men laid off temporarily. Conditions acute.
- 5—Duesenberg buys Fiat Poughkeepsie plant. Fiat to occupy part of buildings and production of Fiat cars to go on much as usual.
- 5—Government orders that all fuel oil manufacturers and distributors need Federal licenses if they have gross sales of more than 100,000 bbl. a year. Priority of deliveries given out. Transportation difficulties, not an oil shortage, the cause of the ruling.
- 5—B. F. Goodrich Co. reports net profits of \$12,675,000 for 1917; 33 per cent gain over 1916.
- 5—Ford Motor Co. receives government order for the manufacture of one submarine chaser a day.
- 5—N. A. C. C. appoints a truck committee to help the government break up the freight congestion. George M. Graham, chairman.
- 9—Twin Cities stage first automotive show. Unprecedented crowds attend. Tractors the best card.
- 9—The keel of the first of the submarine chasers being built by the Ford Motor Co. is laid.
- 11—National Motor Transport Co. plans a motor freight line between Detroit, Cincinnati, Cleveland, Toledo and Chicago to alleviate railroad congestion.
- 12—Ford Motor Co. starts production of complete Liberty engines. Will be largest single producer.
- 12—Post office department asks for bids for an airplane mail service, with a round trip daily between New York and Washington.
- 12—Master Truck Transportation Co. plans operation of a motor freight line on schedule time, between Chicago and New York.
- 12—Edward R. Stettinius given powers to push all war work and maintain an even flow of production. To be surveyor of industrial field and accelerator of war supplies.
- 13—Essex car announced by Hudson.
- 16—President Wilson issues proclamation regulating exports and imports. Special licenses needed for many products.
- 18—Buda Co. exhibits new model tractor engine at Kansas City Show.
- 19—Establishment of Return Load Bureaus in Connecticut of great value.
- 20—Chandler Motor Car Co. reports earnings of \$2,382,403 for 1917.
- 21—First Liberty plane shipped to Europe.
- 23—Chevrolet company assumes status as a division of General Motors Co.
- 23—American delegation, headed by F. G. Diffin, reported safe in England to confer on adoption of international standards for manufacturing materials related to cars, trucks, tractors and machinery.
- 25—Ford shipbuilding plant on River Rouge for the manufacture of submarine destroyers.
- 25—Roads so improved that drive-away can be resumed in Michigan.
- 25—Price of Ford car increased \$90, and chassis to cost \$75 more.
- 26—Bernard Baruch made head of War Industries Board, succeeding Daniel Willard.
- 26—Fisk Rubber Co. announces profits of \$3,578,484 for 1917, double the amount of 1916.
- 26—Announcement made that S. A. E. summer session will be held in Dayton, June 17 and 18.
- 27—Ohio War Industries Commission gives out plan whereby all Ohio factories will be co-ordinated for war work.
- 27—The State of Pennsylvania buys 40 tractors to put at the disposal of farmers.

## March

- 2—Kelly-Springfield Tire Co. reports earnings of \$4,323,955 for 1917, equal to 49 per cent on common.
- 2—Embargo placed on handling of motor cars by the railroads modified. Permits obtainable for shipments in certain areas.

- 2—United States Chamber of Commerce urges adoption of Return Load Bureaus throughout the country.
- 4—Trucks end railroad congestion in Hartford, Conn., by unloading freight cars.
- 4—Highway Transport Committee works out plan for rural express service from farms to cities.
- 5—Third annual Salesmanship Congress called in Detroit for April 24-27.
- 6—Washington statistics show drop of 20 per cent in January exports of cars, trucks and parts from the United States.
- 6—Illuminating Engineers and S. A. E. hold tests for determining headlamp glare, as well as maximum and minimum light.
- 6—General Motors reports earnings of \$26,285,951 for 1917, equal to 34.2 per cent on common.
- 6—N. A. C. C. withdraws from Automobile Industries Committee and Hugh Chalmers resigns.
- 7—N. A. C. C. comes to agreement with Fuel Committee and War Industries Board as to passenger car production for 1918. Manufacturers agree to curtail 30 per cent.
- 7—England revises gas restrictions, allowing cars and trucks to receive certain amounts.
- 8—N. A. C. C. organizes truck division so as to give commercial vehicles more attention.
- 9—A. A. A. resumes control of racing in the United States. Contest board takes hold and status will be same as last November.
- 10—France adds 10 per cent tax to motor cars, putting them in the luxury class.
- 11—Ford announces that he will manufacture light tanks for the government.
- 11—Flint factories work out a scheme for pooling their welfare interests in co-operation with the local Y. M. C. A.
- 11—Curtailed schedule of production serves to clarify industry by allowing factories to make definite distribution plans.
- 11—The State of Michigan buys 1000 tractors for distribution among farmers, under certain restrictions.
- 12—Studebaker profits for 1917 show decrease of 60 per cent.
- 12—Peerless Truck & Motor Corp. profits for 1917 are \$1,065,869, equal to 10.6 per cent on common.
- 14—Motor Products Corp. reports earnings of \$537,527 for first year.
- 14—Committee appointed to investigate airplane situation. H. Snowden Marshall made chairman.
- 15—National Conference of Tractor Manufacturers formed in Chicago.
- 18—Three airplane investigations started.
- 20—J. I. Case Co. announces profits equal to a share on common for 1917—double the 1916 amount.
- 20—Steel trade denies any shortage of steel which may make further curtailment of automobile industry necessary.
- 20—M. A. M. A. Washington office considerably enlarged. Will be distinct from N. A. C. C.
- 20—Stromberg Motor Devices Co. reports net profits for 1917 equal to \$6.37 a share.
- 20—Committee appointed to fix prices of basic materials, under the authority of the War Industries Board.
- 22—List of 82 imports, including cars, asbestos, graphite, acids, nickel and zinc, restricted by War Trade Board.
- 25—Gray & Davis, Inc., which went into the hands of a receiver in November, 1916, pays all its debts.
- 26—Price of \$875 for Fordson tractor, with plow, fixed by Michigan War Preparedness Board after consultation with Ford representatives.
- 26—Airplane delay rumors found to be greatly exaggerated, Washington learns.
- 29—The first Liberty truck convoy arrives in Baltimore after trip from Lima, Ohio. There were 20 trucks and 3 passenger cars in the train.
- 30—Oil Administrator Requa says that there is plenty of gasoline on hand, and the only possible shortage may arise from transportation difficulty, not from production decrease.

## February

- 2—Chicago Show closes. 150,000 attend. Interest of farmers deemed significant.
- 2—Chevrolet reports sales of \$62,638,303 for 1917. Gain of 32 per cent over 1916.

## April

- 1—International Motor Truck Corp. reports earnings of \$1,127,093 for 1917. Assets increase 50 per cent.
- 2—White Co. reports earnings of \$3,800,308, approximately the same as for 1916.
- 2—Pierce-Arrow company earns \$11 a share for 1917. Gross business increases 75 per cent over 1916.
- 2—Overland profits for 1917 are \$3.16 a share. Net profits less than those of 1916.
- 2—Liberty engine commended by Marshall airplane report. Government red tape blamed for production delays.
- 2—Cars are taxed 10 per cent in France, thereby being placed in luxury class.
- 8—Requirements Division formed to direct and co-ordinate purchases of Government.
- 8—Parrett Tractor Co. reorganized with a capital of \$3,000,000. Claire Barnes and Vincent Bendix interested in new company.
- 10—War Industries Board places aircraft at head of new priority list for fuel supply.
- 10—Ford two-man tank able to carry 1200 lb. of armor makes its first appearance.
- 10—J. D. Maxwell joins Automotive Products Section to work with H. L. Horning.
- 17—Truck, motorcycle and car buying coordinated, by order of Chief of General Staff, which places Quartermaster officials at head of board.
- 18—New England Highways Return Loads Assn. formed to link all of New England.
- 19—Colonel George Pope, treasurer of N. A. C. C., dies.
- 20—M. A. M. A. appoints a war service committee to serve as a point of contact between association and Government.
- 23—After an investigation showing they were enemy-owned the Bosch plants were taken over by the Government.
- 24—Practically all tire companies increase their prices 10 per cent.

## May

- 1—War Corporation with capital of \$500,000, formed by Government to aid in financing war industries.
- 2—Rubber imports cut 37½ per cent by an order of the War Trade Board.
- 7—Court decides that the vacuum tank principle was not infringed by the Thermo-Vacuum system. Stewart-Warner to appeal.
- 8—Curtiss earnings for 1917 figured at \$2,000,000 after deduction of preferred dividends.
- 11—Export licenses restricted by War Trade Board. Exports to Allies must be approved by War Mission before license is granted.
- 13—Manufacturers agree with Government that war needs demand 100 per cent priority on steel and other material needed for war products. No specified curtailment decided on for this reason.
- 13—Manufacturers, through N. A. C. C., accept action of War Service Committee advising schedule of 9 standard tire sizes.
- 13—New York passes lamp law providing that state may test anti-glare devices and approve them.
- 13—Inventions Section created as part of the General Staff of the War Department to investigate inventions submitted to it.
- 14—Archer A. Landon appointed head of the Division of Production of the Aircraft Board, which is now headed by John D. Ryan.
- 15—Henry Ford & Son decide to standardize Fordson tractor equipment, but will not market this directly.
- 15—Airplane mail service New York to Washington inaugurated.
- 15—Manufacture and importation of all farm equipment must be licensed after June 20, 1918, as a means of conservation. Order passed by Congress and approved by President.
- 15—General Electric purchases control of Bijur Motor Lighting Co. for \$500,000.
- 20—Major F. Glover promoted to colonelcy and placed in charge of Motor Transport Service.
- 21—Felix Frankfurter, assistant to Secretary of Labor, placed in charge of executive part of Labor Administration to prevent competition for workers and aid in labor recruiting work.
- 23—Class A, AA and B trucks tested by War Department.
- 23—H. L. Horning resigns from Automotive Products Section.
- 23—Aircraft Board reorganized by President Wilson. John D. Ryan made head of the Bureau of Aircraft Production. Major-General William L. Kenly made head of Bureau of Military Aeronautics.
- 25—Eight thousand Class B trucks ordered by Motor Transport Service.

28—Christian Girl resigns as director of production of the Motor Transport Section. Rejoins Standard Parts Co.

## June

- 1—Ralph De Palma wins Harkness trophy race at Sheepshead Bay.
- 3—Five-ton standardized tractor demonstrated successfully in Washington.
- 5—Canada puts automobiles costing more than \$1,200 in the luxury class and prohibits their importation.
- 7—Profits of Willys-Overland, Inc., estimated between \$7,000,000 and \$8,000,000.
- 8—Three-ton B truck officially adopted for heavy duty hauling by War Department.
- 8—National Advisory Committee on Aeronautics report praises Liberty engine.
- 11—U. S. Highways Committee formed to co-operate with states for better roads.
- 11—No sweeping curtailment of steel for automobiles, according to agreement between War Industries Board and American Iron and Steel Institute.
- 17—Ordnance Department names managers of districts who will have charge of production under General C. C. Williams.
- 17—Maxim Munitions arranges with Darr for distribution of Maxim-Dart vehicles in East.
- 17—Overland decides on program of war economy. Number of models limited to two or three.
- 17—Steel temporarily withheld from non-war industries.
- 18—S. A. E. holds summer meeting at Dayton, Ohio.
- 18—C. C. Hanch made chief of Automotive Products Section to succeed Harry L. Horning.
- 19—G. M. C. forms coalition with Janesville Machine Co. and plans to enter the tractor field extensively.
- 19—Net earnings of the Fisher Body Corp. for fiscal year ended April 30, 1918, amount to \$4,352,078.
- 19—Export restrictions modified to permit automobiles to be shipped to European neutrals and South American countries.
- 22—War Industries Board and American Iron and Steel Institute raise price of iron 45 cents a gross ton, making price \$5.50.
- 25—Motor Transport Service reorganized under Colonel Glover.
- 26—Vesper and committee of N. A. D. A. appear before Ways and Means Committee to present need for equitable car taxation.
- 26—Chevrolet victor in Chicago Derby, breaking De Palma's 1916 record.
- 27—England contracts for entire output of Australian zinc for the period of the war and 10 years after.

## July

- 1—War Industries Board completes program of eliminating all but nine tire sizes.
- 2—M. A. M. A. plans to close Washington office and permit the work to be continued by War Service Committee in charge of A. W. Copeland.
- 8—James S. Harlan, Interstate Commerce Commissioner, outlines plan for store door delivery for New York.
- 8—All shipments of articles of non-Canadian origin imported from Canada require individual licenses, according to ruling of War Trade Board.
- 8—Coal for passenger car makers reduced to 25 per cent of 1917-1918 amount. For war work manufacturers will receive a 100 per cent supply.
- 9—Steel shipments to be made without priority certificates, War Industries Board rules. Reclassification of consumers made.
- 10—Tax recommendation of Treasury Department to Ways and Means Committee calls for 10 per cent retail sales tax on passenger cars.
- 10—Consolidated classification, filed before Interstate Commerce Commission, would increase freight rates on passenger cars 100 per cent and reduce truck rates.
- 10—Treasury Department rules that cars exported cannot be taxed 3 per cent.
- 13—War Industries Board orders a reduction of more than 3000 plow types.
- 15—United States Fuel Administration rules that car and parts curtailment need not be in proportion to fuel reduction.
- 16—U. S. Employment Service completes plans for labor recruiting and co-operating with manufacturers to get unskilled men.
- 17—War Industries Board orders inventory of all steel in factories to show quantity on hand. Automobile industry seeks a 60 per cent steel allotment agreement.
- 18—Charles W. Nash made Aircraft Production head under John D. Ryan.
- 20—Motor truck manufacturers place before Priority Committee of War Industries Board statement of essential nature of motor truck. Priorities Board outlines

liberal program and assures reasonable steel supply.

- 22—Army truck substituted for original Class A type. G. M. C. substituted for original AA standard army type. Class B to be continued, and T.T. four-wheel-drive, adopted for heavy work. Seventy-five thousand of four models ordered.
- 25—Bristol type plane abandoned, because it is hard to fly.
- 28—De Palma breaks world records in Chicago race. Wins 20-mile race at rate of 110 m.p.h.
- 30—General Motors forms definite plan to take over United Motors. To exchange stock at rate of 3/10 of share of G. M. common and 1/10 preferred for each share of United Motors.
- 31—Francis E. Stanley, steam car pioneer, killed in automobile accident.

## August

- 1—War Industries Board requests rubber industry to cut production 50 per cent during August and September.
- 6—Manufacturers vote in favor of 50 per cent curtailment of passenger car manufacture.
- 6—Profiteering on farm implements barred by Agriculture Department.
- 9—Priority Board recognizes trucks as utilities and decides curtailment in manufacture should be avoided as far as possible.
- 13—War Industries Board does not receive manufacturers' offer of 50 per cent curtailment of passenger car production. Says no promises can be made regarding supplying of steel, rubber, etc.
- 14—Ford production totals 700,000 cars for year ending July 31.
- 17—De Palma wins five races and breaks four records at Sheepshead Bay race.
- 20—Motor Transport Corps of U. S. Army formed to control all motorized vehicles excepting creeper-type tractors. Brig. Gen. Drake at head.
- 20—Senate Military Affairs Committee in report condemns airplane activities and recommends establishment of Ministry of Aeronautics.
- 26—War Industries Board to allow manufacturers enough steel to produce 50 per cent of amount manufactured during last 6 months of 1917 during corresponding time of 1918. Makers having more than this amount of steel on hand must turn over excess supply.
- 26—Tentative locations for two Ford plants chosen in Mexico, at Monterey and Guadalajara.
- 28—John D. Ryan appointed Second Assistant Secretary of War in charge of all army air activities.
- 28—Fuel Administration requests owners of passenger cars to stop Sunday motoring east of Mississippi.
- 28—Association of Automotive Wheel Manufacturers organized in Toledo.
- 31—Exports of tires, tubes and oil to Norway restricted. Definite guarantee required.

## September

- 1—Gasoline saving on first motorless Sunday figured at 100,000 bbl.
- 5—N. A. C. C. votes to abandon National shows during war.
- 8—New preference list of 74 industries compiled by War Industries Board headed by aircraft.
- 9—N. A. A. J. abandons Chicago show scheduled for Oct. 28.
- 10—Navy airplane base at Balveston planned, to cost \$3,000,000.
- 10—Ford Motor Co. announces that manufacture of passenger cars will be abandoned immediately. Entire plant to be devoted to war work.
- 10—Manufacturers of motor trucks to be permitted to maintain average truck output during last half of 1918.
- 11—Purchase, production and procurement of motorized army vehicles taken from Motor Transport Corps and placed under Quartermaster Department.
- 16—New York State approves anti-glare devices. Names of 45 tested and approved types made public.
- 21—War Industries Board limits quantity of iron and steel for manufacture of tractors and farm implements during year beginning Oct. 1, 1918, to 75 per cent of amount used during preceding year.
- 21—Standard contracts designed for war work to speed up production and guarantee against fraud.
- 25—Willys-Overland obtains control of 51 per cent of stock of Moline Plow Co., latter to be operated as separate concern.
- 25—Motors Division of Quartermaster Corps organized under Colonel Fred Glover.



- 30—War Board reduces solid tire sizes to 14 standardized sizes. Reductions to be made within 2 years.

## October

- 1—Car manufacturers planning to enter truck field affected by government ruling regarding starting of new industries. Paige, Oakland, Overland, Briscoe and Columbia companies affected.
- 3—Air Service Clubs Association organized with Major-General Kenly as president. To promote efficiency of air service.
- 8—Announcement made that Division of Military Aeronautics will discard \$23,000,000 of aircraft parts.
- 9—Ahara carburetor patent upheld when Stromberg wins decision over Zenith.
- 11—Tractor makers form American Tractor Assn. and will protest curtailment case with War Industries Board.
- 15—General Motors' earnings for first 6 months of 1918 on common are 10 1/4 per cent in excess of 12 per cent dividend now being paid.
- 18—Standard specifications for motor and aviation gasoline adopted following conferences between Specifications Committee of the Allies and the American Committee on Standardization of Petroleum Products.
- 18—Navy uses Liberty engine exclusively in seaplanes. Now has 900 planes so equipped in service.
- 19—Gasless Sundays discontinued. Seven of them saved 1,000,000 gal.
- 21—Merger of four Canadian companies arranged—includes McLaughlin Motor Car Co., Chevrolet Motor Co. of Canada, Ltd., McLaughlin Carriage Co., Ltd., and General Motors Co.
- 21—Ford Motor Co. has biggest year in history. Surplus on July 31, 1918, totaled \$176,242,728.
- 24—Packard Motor Car Co. announces surplus of \$13,657,860 on Aug. 31, 1918.
- 24—Fiat Co. of Turin, Italy, develops worm-drive tractor.
- 28—Republic Motor Truck Co. earnings for year ending June 30, 1918, are \$985,084.
- 31—Hughes aircraft report issued. Vindicates manufacturers.
- 31—Wright-Martin earnings during 13 months ending June 30, 1918, were \$540,678.
- 31—War Industries Board permits electrical and ball bearing manufacturers to sell parts for passenger car repairs.
- 31—American Manufacturers Exports Assn. convenes to plan building up of foreign trade.

## November

- 2—Maxwell Motor Car Co. earnings for year ending July 31, 1918, are \$2,158,836. Net surplus reduced.
- 2—Nordyke & Marmon factory wins pennant for best percentage of Liberty engine quota production during October.
- 4—Working Conditions Service established in Washington to construct uniform standards for working conditions in all industries.
- 4—Ford Motor Co. of Canada, Ltd., gross business totals \$24,608,422 during year ending July 31, 1918. Increase of \$800,000 over preceding year.
- 11—Armistice signed by Allied commanders and Hun envoys.
- 12—Tractor curtailment order modified to permit manufacturers having new designs to go ahead with them. Small manufacturers helped.
- 12—Production restrictions imposed by War Industries Board lifted 50 per cent for remainder of year.
- 15—War Industries Board plans co-operation with agencies for cancellation of contracts.
- 19—Ford Motor Co. plans return to peacetime quantity production basis at earliest possible moment. 25,000 cars released to dealers.
- 22—Export and import regulations modified. Provide for importation of 7500 additional tons of rubber.
- 23—New York State investigation of tractors shows they increase crop yields but do not decrease cost of operations.
- 25—General Motors develops Samson 2-plow tractor to sell for \$650 and compete with Fordson.
- 25—Post Office Department plans to use army trucks with discharged enlisted men as drivers for mail service.
- 26—Bureau of Standards tests substitute for gasoline made by Capt. E. C. Weisgerber. Finds it satisfactory.
- 27—John D. Ryan, Second Assistant Secretary of State, in charge of aircraft production, resigns. No time set for relinquishment of duties.
- 29—Export product list revised. All manufactured rubber articles, but not crude rubber, may be shipped.

- 29—Non-stop flight record broken by de Havilland-4 plane with Liberty 12 engine in 550-mile trip from Dayton to Mineola.
- 30—United States Rubber Co. has record earnings of \$21.64 a share on outstanding common during year ending June 30, 1918.

## December

- 1—First aerial weather forecast issued by Weather Bureau in co-operation with aerial mail service.
- 4—Business meeting of 5000 delegates at Atlantic City under auspices of Chamber of Commerce of United States recommends that government should let business set reconstruction pace.
- 5—Reo annual report for year ending Aug. 31, 1918, shows increase of \$1,300,000 in assets over preceding year.
- 7—Highways Transport Committee forms definite program for snow removal during winter. Asks co-operation of states.
- 7—Ford Motor Co. announces that all sedans will be equipped with electric starters hereafter.
- 9—Postmaster General Burleson, in annual report, says that aerial mail, city motor vehicle and parcel-post motor truck systems will be developed amazingly during the coming year.
- 9—Goodyear announces record profits of \$15,388,190 for the year ending Oct. 31, 1918.
- 9—Lieut.-Col. Jesse Vincent, commended by President for services to America, returns to Packard company.
- 9—Annual report of Secretary of War states total appropriations for motor transportation for year ending June 30, 1918, totaled \$883,000,000, of which \$350,000,000 has been expended.
- 10—Post Office Department increases requisition for trucks. Expected that orders with truck manufacturers will not be canceled.
- 11—All curtailments of material and limitations of manufacture of tractors are removed.
- 11—Joint meeting of state highway officials and Highways Industries Assn. proposes 50,000-mile national highway and Federal Highways Commission.
- 13—Announcement made that all passenger cars and standardized trucks now in possession of the Motor Transport Corps in this country will be retained by army.
- 14—War Trade Board announces that practically unlimited export of commodities is now permitted.
- 18—Court decides Goodyear patents are not infringed in suit brought by Goodyear against Firestone.
- 19—Airplane mail service increased 600 per cent during November.
- 19—Substitute for platinum developed.
- 20—Sale of French war worn vehicles brings \$6,000,000.
- 20—Department of Military Aeronautics plans to sell several hundred planes and engines on the open market.
- 20—Appropriations for air service total \$164,877,363 for the army and \$225,000,000 for the navy.
- 20—Dates set for dealers automotive exhibitions in New York and Chicago.
- 21—Annual report of Department Military Aeronautics made public.
- 21—Col. E. A. Deeds presented with engrossed testimonial on behalf of the Equipment Division of the Signal Corps.
- 21—October exports to Latin America show big drop, probably due to transfer of shipping.
- 21—Annual report of the Bureau of Mines issued to-day.
- 23—Four army training planes flying from the Pacific Coast reach the Atlantic Coast.
- 23—Major General C. T. Menoher made Director of Bureau of Aircraft Production. Col. James A. Mar to be his assistant.
- 23—Congressman Dent introduces bill to validate "illegal" contracts and to provide for payments on them.
- 23—United States had 39 aero squadrons on the battle front when the Armistice was signed.
- 23—Export regulations covering South American shipments revised.
- 24—England partly removes restrictions on use of private cars.
- 24—N.A.C.C. opposes what it terms discriminatory taxation of the automobile industry.

Changes of Capital  
and Refinancing

- Acason Motor Truck Co., Detroit. \$50,000—\$200,000.
- Acme Motor Truck Co., Detroit. \$280,000—\$1,000,000.
- American Machine Products Co., Detroit. \$10,000—\$40,000.
- American Steel Tube Co., Toledo. \$50,000—\$100,000.
- Auto Indicator Co., Grand Rapids. \$15,000—\$50,000.
- Clum Mfg. Co., Milwaukee. \$10,000—\$100,000.
- Columbus Varnish Co., Columbus, O. Increase to \$400,000.
- Comet Automobile Co., Decatur, Ill. \$1,000,000—\$3,000,000.
- Continental Auto Parts Co., Knightstown, Ind. \$10,000—\$50,000.
- Curtis Tire & Rubber Co., Chicago. (Old style) Vulcanized Products Co. Increase to \$1,000,000.
- Cygnat Mfg. Co., Buffalo. (Reorganization of Cygnat Rear Car Co.) Capital \$400,000.
- Defender Auto Lock Co., Detroit. \$2,500—\$25,000.
- Dellon Tire & Rubber Co., Trenton. \$700,000—\$1,000,000.
- Denas Armor-Cased Tire Saving Co., Pittsburgh. \$200,000—\$1,000,000.
- Dietrich Motor Car Co., Youngstown, Ohio. \$15,000—\$25,000.
- Dort Motor Car Co. \$1,500,000—\$2,000,000.
- Erd Motor Co., Saginaw. \$100,000—\$250,000.
- Falls Rubber Co., Akron. \$500,000—\$1,000,000.
- Ford & Son, Detroit. \$1,000,000—\$5,000,000.
- Four Wheel Drive Automobile Co., Clintonville, Wis. \$1,000,000—\$2,000,000.
- Fruehauf Trailer Co., Detroit. \$100,000—\$150,000.
- Gary Motor Truck Co., Gary, Ind. \$125,000—\$175,000.
- General Motors Corp. Pfd. \$50,000,000—\$100,000,000. Com. \$150,000,000—\$200,000,000.
- Genesee Motor Car Co., Utica, N. Y. \$5,000—\$100,000.
- B. F. Goodrich Co., Akron. Reduced from \$86,400,000 to \$85,500,000.
- Goodyear Tire & Rubber Co., Akron. \$50,000,000—\$100,000,000.
- Gray & Davis, Inc. Stock increased \$113,000.
- Gray Motor Co., Wilmington, Del. \$550,000—\$1,000,000.
- Holt Mfg. Co., Stockton, Cal. Increase of \$898,000.
- Hurlburt Motor Truck Co., New York. Increase of \$500,000.
- Hydraulic Pressed Steel Co., Cleveland. \$5,700,000—\$7,200,000.
- Industrial Controller Co., Milwaukee. \$100,000—\$150,000.
- Jones Motor Car Co., Wichita. \$500,000—\$1,500,000.
- Jordan Motor Car Co., Cleveland. \$300,000—\$500,000.
- Kelly-Springfield Tire Co. Reduction of \$248,900.
- Kerosene Equipment Co., Detroit. (Kerosene Carburetor Co.) New capital \$50,000.
- King Motor Car Co., Detroit. \$200,000—\$700,000.
- La Crosse Tractor Co., La Crosse. \$1,500,000—\$2,500,000.
- Lane Motor Truck Co., Kalamazoo. \$25,000—\$225,000.
- Lansing Forge Co., Lansing. \$100,000—\$300,000.
- Liaison, John. Mfg. Co., New Holstein, Wis. \$500,000—\$1,000,000.
- Mather Spring Co., Toledo. \$300,000—\$1,000,000.
- Mohawk Rubber Co., Akron, Ohio. 1,050,000—\$2,050,000.
- Napoleon Motors Co., Traverse City, Mich., formerly Traverse City Motor Car Co. \$150,000—\$500,000.
- Newark Stamping & Foundry Co., Newark, Ohio. \$50,000—\$75,000.
- Noble Motor Truck Corp., Kendallville, Ind. \$1,000,000. (Reorganization of Noble Motor Truck Co.)
- Ohio Happy Farmer Tractor Co., Bucyrus, Ohio. \$20,000—\$40,000.
- Ohio Rubber Co., Cleveland. \$100,000—\$500,000.
- Onelda Motor Truck Co., Green Bay. \$300,000—\$500,000.
- Peoria Tractor Co., Peoria. \$60,000—\$1,500,000.
- Perfex Radiator Co., Racine. \$15,000—\$1,000,000.
- Ohio Rubber Co., Cleveland. \$400,000—\$500,000.
- Saginaw Malleable Iron Co., Saginaw, Mich. \$400,000—\$650,000.
- Sanford Motor Truck Co., Syracuse. \$50,000—\$250,000.
- Seaman Co., W. S., Milwaukee. \$50,000—\$150,000.
- Sloux City Tire Mfg. Co., Sloux City. \$20,000—\$1,500,000.

Smith Wheel Co., Inc., Syracuse. \$1,000,000—\$3,000,000.  
Tower Motor Truck Co., Greenville. \$100,000—\$200,000.  
Triangle Truck Co., St. Johns. \$50,000—\$100,000.  
Turner Mfg. Co., Port Washington, Wis. \$150,000—\$250,000.  
Universal Motor Co., Oshkosh. \$50,000—\$100,000.  
Victor Screw Works, Detroit. \$250,000—\$500,000.  
Weidely Motors Co., Indianapolis. Preferred stock \$100,000—\$500,000.  
Wisconsin Motor Mfg. Co., Milwaukee. Increase to \$1,000,000.

## New Companies

Abbott-Downing Truck & Body Corp., Concord, N. H. (To absorb Abbott & Downing Co.) Concord trucks. March.  
Acme Motor Parts Co., Milwaukee. Parts. \$25,000. June.  
Aeronautical Engine Co., Long Island City. Feb.  
American Motors Co., Milwaukee. \$1,000,000. Internal Oil combustion engines. Jan.  
American Tire Filler Co., Seattle. \$100,000. Composition fillers for tires. April.  
American Tractor Corp., Richmond, Va. \$1,000,000. Traction engines. Jan.  
American Veneer Co., Hayward, Wis. Airplane veneers, propeller materials, gun stocks, etc. \$100,000. Oct.  
Andis Tool Co., Racine. Tools, dies, jigs, etc. \$25,000. Sept.  
Automotive Mfg. Co., Detroit. \$125,000. Parts. April.  
B. & H. Machine Products Co., Detroit. Airplane and truck engine parts. Oct.  
Badger Chemical Co., Stanley, Wis. \$500,000. Wood alcohol. Feb.  
Baker Automobile Top Co., Columbus, Ohio. Tops. Feb.  
Blumberg Mfg. Co., San Antonio, Tex. Farm tractors. July.  
Bollstrom Motors Co., Detroit. \$3,000,000. Trucks and tractors. March.  
Boring Tractor Corp., Rockford, Ill. Tractors. March.  
Bowling Green Die & Tool Co., Bowling Green, Ohio. \$25,000. Aug.  
Canadian Johns-Manville Co., Ltd., Montreal. \$2,500,000. Oct.  
Carolina Aircraft Co., Raleigh, N. C. \$500,000. Airplanes. April.  
Chicago, Waukegon & Hammond Transportation Co., Chicago. Motor truck short-hauling. Jan.  
Chippewa Rubber Co. \$250,000. July.  
Commercial Motor Body Co., New York. Warehouse system. Feb.  
Crescent Brass Foundry Co., Superior, Wis. Automotive and marine brass and bronze goods. May.  
Dart Truck & Tractor Corp. (Dart Motor Truck Co.) Trucks and tractor. June.  
Dependable Truck & Tractor Corp., Galesburg, Ill. Trucks and tractors. July.  
Everwear Rubber Co. \$200,000. Puncture-proof tires. July.  
Foreign Products Corp., Ann Arbor, Mich. \$350,000. Steel forgings for parts. Jan.  
Great Lakes Rubber Co., Milwaukee. \$100,000. Tires. April.  
H. L. & W. Sales & Mfg. Co., Detroit. Tools, jigs and fixtures. April.  
Hammered Piston Ring Co., Newark, N. J. May.  
Hardman Rubber Corp. (To take over Hardman Tire & Rubber Corp.) June.  
Hebb Motors Co., Lincoln, Neb. Patriot trucks. March.  
High Efficiency Motor Corp., Brooklyn. \$200,000. Automobiles and engines. Jan.  
Independent Harvester Co., Ltd., Plano, Ill. \$3,500,000. Farm machinery and tractors. April.  
Independent Motor Co., Youngstown, Ohio. \$300,000. Worm drive trucks. April.  
J. M. Case Trailer Co., Grand Rapids. Sept.  
Johnson Motor Wheel Co., South Bend, Ind. Gas engines. \$100,000. Jan.  
Kalamazoo Munitions Corp. \$100,000. Ammunition. Feb.  
Kaukauna Machine Works, Kaukauna, Wis. Mayer (Little Giant) power hammer. Feb.  
Kuenz Radiator Co., Toledo. \$100,000. Airplane, car and truck radiators. Sept.  
Lambert Trubulpruf Tire Co., Everett, Wash. Trubulpruf tires. April.  
Liberty Tractor Corp., Detroit. \$100,000. Sept.  
Marvel Tractor Co., Columbus, Ohio. Farm tractors. Feb.  
Marwin Motor Truck Co., Kenosha, Wis. \$1,000,000. Trucks and tractors. April.  
Master Truck Transportation Co., Chicago. Chicago to New York Freight Line. Jan.  
Metal Auto Parts, Des Moines. Accessories. July.  
Minerva Engine Co., Cleveland. Truck and tractor engines. Jan.

Motor Appliance Co., East Moline, Ill. Marco speed recorders, Benson automatic speed signal and Ogden automobile parts. July.  
Motor Transport Co., Detroit. \$1,500,000. Inter-city truck lines. Feb.  
Northway Motors Co., Boston. \$5,000,000. Cars and trucks. Jan.  
Overmeyer Airplane Mfg. Co., Cincinnati. Sept.  
Parker Tire & Rubber Co., Indianapolis. Super-sized cord tires. Feb.  
Power Truck & Tractor Corp., Detroit. \$2,500,000. Trucks and tractors. April.  
Preston Motor Car Co., Birmingham, Ala. Light cars and trucks. March.  
Pronovost Wheel Co., Toledo, Ohio. \$350,000. Wheels. Feb.  
Puncture-Proof In-Tire Co., Dover. \$1,000,000. Tire protector. Jan.  
R. & P. Tractor Co., Alma, Mich. \$5,000. Tractors. Feb.  
Racklind & Farber, Indianapolis. Indianapolis to Chicago motor freight line. Feb.  
Rapid Change Wheel Co., Grand Rapids. Supplemental Hub. \$50,000.  
Ross Motor Truck Co., Saginaw, Mich. \$300,000. Heavy trucks. March.  
Rush Motors Corp., Philadelphia. (To take over Rush Motor Truck Co.) March.  
Russell Tire Co., Newark, N. J. \$100,000. Jan.  
Safety Signal Corp., Peoria, Ill. \$200,000. Safety device. Jan.  
St. Louis Aircraft Co., St. Louis. Airplanes. Jan.  
Shaw Foundry Co., Milwaukee. Gray iron castings for cars and tractors. April.  
Star Tractor Co., Findlay, Ohio. \$100,000. One-man tractor. Jan.  
Tractor Motor Co., Hoynes City, Mich. Engines under Field Motor patents. April.  
Tractor Parts Co., Cleveland. \$500,000. June.  
R. V. Trader & Co., McKeesport, Pa. Truck Carburetor. Feb.  
Transport Truck Co., Mt. Pleasant, Mich. \$1,000,000. Trucks. July.  
Tribble Airless Tire Co., Kittanning, Pa. \$500,000. Feb.  
United Motor Parts Corp., Chicago. Accessories. April.  
United States Aero Propeller Co., Milwaukee. Propellers. June.  
United States Gear Shift Co., Eau Claire, Wis. \$1,500,000. Hydraulic gear shift. Jan.  
Universal Motor Truck & Traction Engine Co., St. Louis. July.  
Universal Products Co., Madison. Manufacture and sale of cars, trucks, machinery. \$50,000. Nov.  
Washington Tire & Rubber Co., Spokane, Wash. \$1,500,000. Tires, tubes and tire accessories. April.  
Western Machine Products Co., Cleveland. \$100,000. Accessories. Jan.  
Western Trailer Co., Kansas City. Trailers, trucks and bodies. April.  
Wilson Motor Co., Salt Lake City. Wilco trucks. March.  
Wilson Tractor Co., Peoria. \$5,000. Aug.  
Wisconsin Gear & Axle Co., Milwaukee. Gears and safety castor front axle. April.  
Wohlrab Gear Co., Racine, Wis. Split nut steering gear. \$75,000. Jan.  
World Harvester Corp., New York. \$1,500,000. Auto-Filler. Jan.  
Zelle Tractor Co., St. Louis. \$1,000,000. Jan.

## Demand for Labor in Excess of Supply

WASHINGTON, Dec. 21—The demands for labor is in excess of supply, according to reports received by the U. S. Employment Service from its Community Labor Boards in 34 States. For the week ended Dec. 6, reports from 6000 employers using more than 3,000,000 workers in 109 manufacturing districts showed the Eastern States, with the exception of the Buffalo district, suffering from labor shortage. Buffalo has a surplus of workers due to the recent discharge of airplane employes, and has within its boundaries 6000 men who are temporarily idle. Reports from 87 concerns in Detroit, employing 150,000 men, show the supply just equal to the demand. Pennsylvania districts and the New England States report heavy shortages. The Middle West reports supply just equal to demand, but heavy increases in labor requirements are expected at Chicago during the next few weeks. These are likely to cause a shortage

there, which in turn may be offset by the anticipated discharge of workers in the St. Louis district, where there have been many plants engaged on war work.

The situation in the Far West is reported generally good, with the exception of California. Los Angeles reports a seasonal labor shortage and Oakland records a surplus. Shortages of labor are generally reported from the South.

## New Radio Telephone Tested

WASHINGTON, Dec. 21—An airplane formation of three planes directed by a fourth by means of the new radio telephone was staged here yesterday in an exhibit for the benefit of Government officials. Lieut. P. D. Lucas, guiding a Curtiss plane, talking through the radio phone in an ordinary conversational tone, directed the flight of the other planes a mile away, all four flying at 2000 ft. The 3 planes went through infantry drill side slips, tail spins and other maneuvers as directed. Communication by phone was also maintained with Bolling Field, where phones were installed and through which Lieut. Lucas' commands could be distinctly heard.

## Detailed Statements of Contractors' Claims to Be Filed

WASHINGTON, Dec. 21—The Department of Finance and Accounting of the War Department has prepared a form for filing detailed statements of claims by contractors holding cancelled orders. They are arranged to secure information of:

- Number of parts or articles.
- Name.
- Quantity.
- Kind of materials.
- Weight per pc. rough.
- Weight material on hand (raw, semi-finished, finished).
- Original material value (raw, semi-finished, finished).
- Less salvage value (raw, semi-finished, finished).
- Net material claim (raw, semi-finished, finished).
- Accrued labor.
- Accrued overhead.
- Total claim.
- Is salvage value based on scrap or commercial utilization?

## To Distribute Government Property

WASHINGTON, Dec. 21—P. W. Hare, assistant director of Munitions, and Brig. Gen. T. C. Jamieson, Munitions Bldg. 19th and B Sts., Washington, have been appointed in charge of an organization to dispose of all surplus property acquired by the War Department during the war and including airplanes, airplane engines, accessories, motor trucks, motorcycles and other commodities. It is the intention of this department to so market government property as to interfere as little as possible with business conditions and they will confer when the occasion requires or upon request, with committees representing the industries affected.

## S. A. Export Rules Are Revised

### Shippers Must Give Evidence of Preference When It Is Applied for

WASHINGTON, Dec. 23—In order to make shipments for export to the East Coast of South America and secure preference for these, the shipper's export declaration should bear evidence of the preference to which the shipment is entitled. The declaration, if made for shipment to Argentina, Brazil, Paraguay or Uruguay, must bear the export license number, date of expiration, date of issuance of the license and number of the shipping preference.

Upon presentation of the declaration containing information as outlined in the paragraph above, collectors of customs will not only number and initial the declaration as heretofore, but will also initial the date of issuance of the license and the preference number, if any specific preference number has been given on the license.

In instances where licenses and declarations have already been filed with a collector of customs, and where the copies of the export declaration do not bear the date of issuance or expiration of the license, the shipper may, in order to secure the shipping preference to which his shipment is entitled, present such export declaration, or number thereof, to the collector of customs, who will certify the date of issuance of the license (or the date of expiry). Alternatively, the War Trade Board, either at Washington, D. C., or at any of its branch offices, will, upon presentation of the license number, give a certificate to the shipper, indicating the date of issuance of the license.

Steamship companies have been informed that where the expiration date of the license is given on the export declaration, the date of issuance of such license shall be considered as 90 days prior to the date of expiry.

### Cablings of Import License Numbers No Longer Required

WASHINGTON, Dec. 23—American consuls in foreign countries have been instructed to certify invoices without official notification from the War Trade Board upon production of a letter or cablegram from the consignee giving the import license number, commodity and quantity thereby licensed. All official notifications of license numbers cabled or mailed to consuls by the War Trade Board are still effective, and consuls will continue to certify invoices thereunder. Individual notices will be sent to all importers who have applications for licenses pending before the Bureau of Imports, where official notice to the consul is not sent by the Board due to the present ruling.

Shipping companies will be required to return at their own expense all shipments not covered by consular invoices, where

invoices are required under the State Department's regulations.

The present announcement is a part of the War Trade Board's program to remove as rapidly as possible all regulations which the changed conditions brought about by the armistice have rendered unnecessary. The official cabling system has been continued up to the present time in order to protect importers who obey the regulations, by preventing others from violating them. It is now felt that the relaxation of import restrictions has reached a point where this can be done away with, and that importers who are co-operating with the War Trade Board by complying with regulations may be protected by other means.

### Sales Tax Paid by Manufacturers

WASHINGTON, Dec. 20—The total of \$23,981,268.35 collected on the 3 per cent sales tax on automobiles, motorcycles, etc., in the fiscal year ended June 30, 1918, although chiefly derived from Michigan, also included payments of \$3,152,132.17 from Ohio, \$1,890,511.79 from New York, and \$1,236,679.88 from Wisconsin, and lesser but important amounts from many other states as follows:

States and Territories	Automobiles, Motorcycles, Etc., 3 Per Cent
Alabama	.....
Alaska	.....
Arizona	.....
Arkansas	.....
California	.....
Colorado	.....
Connecticut	.....
Delaware	.....
District of Columbia	.....
Florida	.....
Georgia	.....
Hawaii	.....
Idaho	.....
Illinois	.....
Indiana	.....
Iowa	.....
Kansas	.....
Kentucky	.....
Louisiana	.....
Maine	.....
Maryland	.....
Massachusetts	.....
Michigan	.....
Minnesota	.....
Mississippi	.....
Missouri	.....
Montana	.....
Nebraska	.....
Nevada	.....
New Hampshire	.....
New Jersey	.....
New Mexico	.....
New York	.....
North Carolina	.....
North Dakota	.....
Ohio	.....
Oklahoma	.....
Oregon	.....
Pennsylvania	.....
Rhode Island	.....
South Carolina	.....
South Dakota	.....
Tennessee	.....
Texas	.....
Utah	.....
Vermont	.....
Virginia	.....
Washington	.....
West Virginia	.....
Wisconsin	.....
Wyoming	.....
Total	\$23,981,268.35

The floor tax as filed in the report of the Commissioner of Internal Revenue does not list separately the various industries upon which it was levied and which includes automobiles, cameras, playing cards, cosmetics, medicinal preparations, sporting goods, etc. The total for these preparations is \$3,022,183.36.

## Specifications for Government Oil

### Requirements for Motor, Trans- mission and Slushing Oil and Greases

WASHINGTON, Dec. 23—Following are Government specifications for various oils and greases used by the different departments:

#### CYLINDER OIL

##### 1. General:

(a) This specification covers the requirements of the Ordnance Department for motor oil to be used for the lubrication of internal combustion engines other than airplane engines and motorcycle engines. (For these engines, War Department specification number 3501, "Liberty Aero Oil," dated January 14, 1918, shall be used.)

(b) The oil shall be supplied in three grades, light, medium and heavy. The light oil shall be used where specially specified. The medium oil shall be for general use in winter and for use in new engines at all times. The heavy oil shall be for general use in summer and for use in old engines.

##### 2. Physical Properties and Tests:

(a) The oil must be a refined and filtered mineral oil, or a mixture of such oils. It must be suitable in every way for the satisfactory lubrication of the internal combustion engines specified above.

(b) The viscosity of the three grades of oil, when tested in a Saybolt Universal Viscosimeter at 100 deg. Fahr., must be within the following limits:

Light oil	.....170 to 230 sec.
Medium oil	.....270 to 330 sec.
Heavy oil	.....470 to 530 sec.

(c) The carbon residue determined by the Conradson method must be as follows:

Light oil	.....not more than 0.2 per cent
Medium oil	.....not more than 0.4 per cent
Heavy oil	.....not more than 0.6 per cent

(d) One ounce of the oil must not congeal in a standard four-ounce sample bottle when exposed to the following temperatures:

Light oil	.....25 deg. Fahr.
Medium oil	.....30 deg. Fahr.
Heavy oil	.....40 deg. Fahr.

(e) All tests shall be made in accordance with methods adopted by the American Society for Testing Materials, and War Department specification number 3525, "Pour Test and Conradson Carbon Test," dated February 8, 1918, a copy of which will be furnished on application.

#### TRANSMISSION OIL

##### General.

1. This specification covers the requirements of the Army for a very adhesive mineral oil, which must be suitable in every way for the lubrication of transmission gears and bearings, differential gears, worm drives, winch drives and roller and ball bearings used in connection with such parts of the equipment of motor vehicles.

##### Characteristics.

2. The lubricant must be a petroleum product only, without the addition of vegetable or animal oils or products, or residues or fats of any kind. It must be entirely free from fillers such as talc, resin, tar and all materials of every nature not related to the original product.

##### Physical Properties.

3. Viscosity.—The viscosity must be within the following limits, when the lubricant is tested in a Saybolt Universal Viscosimeter at 212 deg. Fahr.: 195 seconds to 220 seconds.

4. Adhesiveness.—The adhesiveness of the lubricant is one of the most essential qualities. As there is no satisfactory laboratory method for its determination, the adhesiveness will be determined by applying the lubricant to a set of gears operating under practical conditions, and comparing the effect produced by the lubricant with the effect produced by a standard sample of Army specifications, No. 10 under the same conditions.

#### NON-FLUID OIL

##### General.

1. This specification covers the requirements of the Army for purchases of non-fluid transmission lubricant to be used for the axles and transmissions of motor vehicles.

##### Physical Properties and Tests.

2. The lubricant shall be composed of cal-



clum soap and mineral oil, manufactured in accordance with the best commercial process. It must have a consistency similar to that known to the trade as "No. 00 Grease."

3. The lubricant must be a boiled grease, containing not less than 1 nor more than 1½ per cent of moisture in the finished product.

4. **Mineral Oil Base.**—The mineral oil used in reducing the soaps, when tested in a Saybolt Universal Viscosimeter at 100 deg. Fahr., must show a viscosity of not less than 180 seconds.

5. **Saponifiable Fat Base.**—Not more than 10 per cent of either pure tallow oil, neat-foot oil, lard oil or horse oil, singly or in combination, shall be used as a fat base.

6. **Acidity.**—The lubricant must not attack a sheet of polished copper within a period of 48 hours.

7. **Heat Test.**—Two ounces of the grease shall be heated to 212 deg. Fahr., or until the entire mass becomes liquid, and then allowed to cool. The soaps must not separate from the oils during this test and the grease must return to its original consistency.

8. **Fillers.**—The grease shall contain no fillers, such as resin, resinous oils, soapstone, wax, talc, powdered mica, lampblack, sulphur, clay, asbestos or any other artificial thickening.

#### MEDIUM CUP GREASE

##### General.

1. This specification covers the requirements of the Army for a medium cup grease to be used for the lubrication of such parts of motor equipment and other machinery as are lubricated by means of compression cups.

2. The grease must be a well manufactured product, composed of calcium soap and mineral oil.

##### Physical Properties and Tests.

3. **Mineral Oil Base.**—The mineral oil used in reducing the soaps must show a viscosity of at least 180 seconds, when tested in Saybolt Universal Viscosimeter, at 100 deg. Fahr.

4. **Saponifiable Fat Base.**—The grease must have a fat base of 15 to 20 per cent, of either pure tallow oil, neat-foot oil, lard oil or horse oil, used singly or in combination.

5. **Consistency.**—The grease must be a medium cup grease similar in consistency to that known to the trade as "No. 3 Cup Grease."

6. **Moisture.**—The grease must be a boiled grease, containing not less than 1 nor more than 3 per cent of moisture when finished.

7. **Acidity.**—The grease must not attack a sheet of polished copper within a period of 48 hours.

8. **Ash.**—The ash shall not be greater than 2 per cent.

9. **Heat Test.**—Two ounces of the grease shall be heated to 212 deg. Fahr., or until the entire mass becomes liquid, and then allowed to cool. The soaps must not separate from the oils during this test and the grease must return to its original consistency.

10. **Fillers.**—The grease must contain no fillers such as resin, resinous oils, soapstone, wax, talc, powdered mica, lampblack, sulphur, clay, asbestos or any other filler or artificial thickening.

#### SLUSHING OIL.

##### General.

1.—This specification covers the requirements of the Army for a very adhesive, heavy-bodied, straight mineral oil, which must be suitable in every way for the following uses:

For the lubrication and protection of chains, wire ropes and gears of cranes, dredges, steam shovels and all other heavy equipment.

For the lubrication and protection of the gears and ropes of balloon hoists.

For swabbing the wires and cables of airplanes and seaplanes.

For slushing and protecting the bright and exposed metal parts of guns, machines and automobiles during storage or overseas shipment. When used for this purpose the lubricant shall be mixed with an equal amount of kerosene so that it may be applied with a brush.

2. Kerosene may be used to remove this lubricant from the equipment.

##### Physical Properties and Tests.

3. The quality of the lubricant must be equal to or better than that of a standard sample of No. 1 wire rope lubricant, sample of which will be furnished by the Chief of Ordnance, Washington, D. C.

4. The lubricant must be a petroleum product only, free from vegetable or animal oils or products, or residues or fats of any kind. It must be entirely free from fillers such as talc, resin, tar and all materials of every nature not related to the original product.

5. **Viscosity.**—The viscosity must be within the following limits when the lubricant is tested in a Saybolt Universal Viscosimeter, at 212 deg. Fahr., 900 seconds to 1,100 seconds.

6. **Adhesiveness.**—The adhesiveness of the

## Government Maps Air Routes

### Five Planes Return to Langley Field After Covering South—Others Out

WASHINGTON, Dec. 23—Five 2-seated training planes have just returned to Langley Field, Va., after having mapped out a course along the Eastern slope of the Appalachian range to Columbia, S. C., to link into the Southern trans-continental air route now being charted by squadrons of planes working both East and West from fields South of the Ohio River. The total flying time of these planes from Langley Field South to Columbia was 5 hr. and 2 min. The distance in an air line between the two points is roughly 330 miles. Columbia, S. C., is 225 miles from Souther Field, Americus, Ga., and planes flying from Souther Field North have already mapped this course. The course from Washington, D. C., to Langley Field, Hampton, has also been charted. Therefore when the planes flying from the West have reached Americus, Ga., one trans-continental air route will have been charted and ready for flight from Washington, D. C., to the Pacific Coast.

Good landing fields were found at Suffolk, Va., Franklin, Va., Pinehurst, N. C., Camden, S. C., and Columbia, S. C. The pilots reported that the terrain between Franklin and Raleigh was such that no possible sites could be located.

### Four Army Planes Reach Atlantic Coast

WASHINGTON, Dec. 23—The squadron of four Army training planes flying from San Diego has reached the Atlantic coast. This flight in formation approximates 2400 miles. The planes left the Pacific Coast Dec. 4 and they have come East across the continent in short flights limited by the size of their gasoline tanks, none of the planes carrying more

lubricant is one of its most essential qualities. As there is no satisfactory laboratory method for the determination of this quality, the adhesiveness will be determined by applying the lubricant to a set of gears operating under practical conditions, and comparing the effect produced with that produced by a standard sample of No. 1 wire rope lubricant mentioned above under the same conditions.

7.—**Corrosion Test.**—When applied to a plate of polished steel the lubricant must protect the steel for a period of thirty days from chemical vapors, from the action of salt or fresh water and from the action of water containing from 10 to 25 per cent of sulphuric acid. For the purposes of these tests the water and solutions shall be held at a temperature of 60 deg. Fahr.

##### Drying Test.

8. When the lubricant is applied to a wire rope that has not been oiled with any other material, it must not crack, peel or chip after exposure to low atmospheric temperatures for sixty days.

9. When applied hot to the outside of a one-inch wire rope that has not been oiled with any other material, the lubricant must penetrate to, and be absorbed by, the fiber core, and at the end of sixty days, when the rope is put under strain, the oil must be forced out of the core between the wires of the strand.

than an hour and a half's supply at any one time.

The crews, two men to a plane, have gathered data and statistics on landing fields, also made air maps of the route along which they came.

This work is a part of the big reconnaissance now being made by fliers going out in all directions from over 25 fields in various parts of the country.

The material collected, as fast as it is returned to the fields, is being forwarded to Washington for analysis and compiling in the form of a Government air guide or blue book.

Major Albert D. Smith, commanding the air squadron which has come East from the Pacific, reported to-day to the Division of Military Aeronautics in Washington, D. C., that his planes left Americus, Ga., at 9 a. m., Dec. 22, and arrived at Jacksonville, Fla., at noon, having encountered rain and fog all the way and at no time having a ceiling of more than 500 ft. Major Smith expects to fly his squadron to Washington at an early date.

### Cleveland-Chicago Air Mail Postponed

WASHINGTON, Dec. 23—The Post Office Department has suspended the operation of the New York-Cleveland-Chicago air mail route until Jan. 2. Airplanes in the service will be taken apart and reassembled to insure better success when the next attempts are made. The Post Office Department states that the airplanes used in the experiments which resulted in failure last week were hastily assembled and that this caused the mishaps.

### Wisconsin Has 32,013 Vehicles

MILWAUKEE, Dec. 23—Wisconsin absorbed 32,013 passenger and commercial cars during 1918, according to the final registration figures for the year given out to-day by A. J. Cobban, head of the motor registry division of the secretary of state's office in Madison. The total number of licenses issued to private owners is 196,844, of which 189,983 were for passenger cars, and 6861 for commercial vehicles. In 1917 the combined registry was 164,531.

### New York Packard Export Office

NEW YORK, Dec. 21—The Packard Motor Car Co. has opened an export office in New York under the supervision of Fred Cardway. The company now has dealers in nineteen foreign countries, including Hawaii, the Philippines and Porto Rico.

### Schloemer Becomes Royal

OSHKOSH, WIS., Dec. 23—The Schloemer Mfg. Co., 388 Division Street, Oshkosh, Wis., operating a foundry, welding, plating and metal specialty plant, has been reorganized as the Royal Mfg. & Foundry Co., incorporated with a capital stock of \$30,000. The officers of the new company are: President, Frank C. Clark; vice-president and general manager, Robert P. Hainsworth; secretary-treasurer, Peter J. Schloemer.

## Contracts Placed \*

WASHINGTON, Dec. 23—The following contracts were placed by the Motors Division, Quartermaster Department, since the signing of the armistice, and have been approved by the Board of Review:

Nov. 27, 1918

Ford Motor Co., Detroit, 600 new style ambulances, \$420,348.  
Ford Motor Co., Detroit, 500 Model "T" cars, \$208,830.  
Ford Motor Co., Detroit, 500 Model "T" cars, \$220,008.  
Ford Motor Co., Detroit, 500 Model "T" cars, \$208,830.  
Ford Motor Co., Detroit, 500 Model "T" cars, \$223,200.  
Ford Motor Co., Detroit, 500 Model "T" cars, \$249,055.  
Ford Motor Co., Detroit, 5000 Model "T" cars, \$2,542,100.  
Ford Motor Co., Detroit, 50 ambulances, \$34,616.94.  
Ford Motor Co., Detroit, 136 ambulances, \$75,953.28.

Nov. 26, 1918

Swinehart Tire & Rubber Co., Akron, 100 casings, \$23,421.50.  
American Chain Co., Bridgeport, 100 skid chains and 30,000 cross chains, \$15,750.  
Federal Rubber Co., Cudahy, Wis., 5250 ft. 2-in. I. D. 3-ply radiator hose, 4125 ft. 1 1/2-in., \$1,792.50.  
B. F. Goodrich Rubber Co., Akron, 11,995 casings, \$252,784.55.  
B. F. Goodrich Rubber Co., Akron, 7015 casings, \$57,172.25.  
United States Tire Co., New York, 14,025 casings, \$114,303.75.  
Goodyear Tire & Rubber Co., Akron, 7675 casings, \$80,587.50.  
Fisk Rubber Co., Washington, 7070 casings, \$74,235.  
United States Tire Co., New York, 6180 casings 30 x 3 1/2 nonskid clincher, \$64,680.  
Kelly-Springfield Tire Co., Akron, 10,000 casings 30 x 3 1/2 nonskid clincher, \$105,000.  
Fisk Rubber Co., Washington, 1156 36 x 6 cord casings, \$63,695.50.  
Kelly-Springfield Tire Co., Cleveland, 1218 36 x 6 casings, \$67,111.80.  
Kelly-Springfield Tire Co., Cleveland, 578 36 x 6 cord casings, \$31,847.80.  
B. F. Goodrich Co., Akron, tubes, \$26,725.40.  
Fisk Tire & Rubber Co., Washington, 5650 30 x 3 1/2 clincher casings, \$59,325.  
Pennsylvania Rubber Co., Jeannette, 1500 30 x 3 CNS fabric casings, 4500 30 x 3 CNS fabric casings, 250 31 x 4 CNS fabric casings, \$64,220.  
Goodyear Tire & Rubber Co., Washington, 16,500 casings, \$134,475.  
United States Tire Co., New York, 2312 36 x 6 casings, \$127,160.  
Firestone Tire & Rubber Co., Washington, 8000 30 x 3 1/2 casings, \$84,000.  
Kelly-Springfield Tire Co., Washington, 3000 casings, \$31,500.  
The United States Tire Co., New York, 2000 casings, \$43,780.  
United States Tire Co., New York, 14,850 tires as per list, \$253,218.50.  
Swinehart Tire & Rubber Co., Akron, solid pressed-on tires, \$113,759.10.  
Fisk Rubber Co., Chicopee Falls, solid pressed-on tires, \$167,942.20.  
Goodyear Tire & Rubber Co., Akron, 300 tires 36 x 3 1/2, 650 tires 36 x 5, 1000 tires 36 x 10, 700 tires 34 x 7, \$135,002.  
Republic Rubber Co., Youngstown, 300 tires 36 x 5, 700 tires 36 x 6, \$38,380.  
Firestone Tire & Rubber Co., Akron, solid pressed-on tires, \$269,890.40.  
Firestone Tire & Rubber Co., Washington, red tubes, \$28,676.  
United States Tire Co., New York, 5000 30 x 3 1/2 casings, \$52,500.  
B. F. Goodrich Rubber Co., Akron, 19,100 brown tubes, \$36,397.40.  
United States Tire Co., New York, 6565 casings 33 x 4 SSNS cord, \$161,302.05.  
B. F. Goodrich Rubber Co., Akron, gray tubes to be equipped with regular MCH Schroder valves, \$26,725.  
Goodyear Tire & Rubber Co., Akron, casings, \$258,597.05.

Nov. 30, 1918

Texas Co., New York, 18,000 gal. oil, \$990.  
Standard Oil Co. of New Jersey, New York, 58,000 gal. gasoline, \$12,760.  
Standard Oil Co. of New Jersey, New York, 6000 gal. gasoline, \$1,530.  
Standard Oil Co. of New Jersey, New York City, 22,500 gal. gasoline, \$5,062.50.  
Texas Co., New York, 125,000 gal. oil, \$1,860.  
Texas Co., New York, 7000 gal. kerosene, 27,000 gal. gasoline, \$7,560.  
Standard Oil Co. of New Jersey, New York, 27,650 gal. oil, \$6,615.

Dec. 3, 1918

Goodyear Tire & Rubber Co., Washington, 14,800 casings, 16,200 tubes, \$139,898.  
Motors 1083, B. F. Goodrich Rubber Co., Akron, 9795 casings, \$240,663.15.  
Kelly-Springfield Tire Co., Cleveland, 4400 casings, \$35,860.  
B. F. Goodrich Rubber Co., Akron, solid pressed-on tire, \$148,512.40.  
Firestone Tire & Rubber Co., Washington, 22,200 casings, 20,250 tubes, \$205,027.50.  
B. F. Goodrich Co., Akron, 2262 36 x 6 casings, \$124,590.96.  
B. F. Goodrich Co., Akron, 1445 cord casings, \$79,590.60.  
Fisk Rubber Co., Chicopee Falls, casings, \$74,578.20.  
Goodyear Tire & Rubber Co., Washington, D. C., 6565 casings, \$161,302.05.

## Navy Building Transatlantic Seaplane

WASHINGTON, D. C., Dec. 21—The United States Navy is constructing a hydroplane to be equipped with three Liberty engines and capable of carrying 45 passengers, which will be used for a test flight across the Atlantic Ocean, according to reports here. The plane is being built at Rockaway, N. Y. The machine will probably carry three or four occupants when it attempts the transatlantic flight.

## Government to Distribute Surplus Army Stocks

WASHINGTON, Dec. 21—A Surplus Property Division with an office in the Munitions Building will have charge of the disposition of all stocks of commodities and materials which have been purchased for the Army and are in excess of the requirements. No list of the surplus material is as yet available. It will be the policy to dispose of such surplus in so far as is possible to other Government agencies. For example motor trucks and airplanes will be diverted to the Post Office to the largest possible degree. A considerable portion of the balance, it is expected, will be required for export by relief organizations in Belgium and Russia and other countries. Such balance as remains will be distributed in the town market, always in such a manner as to cause the least disturbance. Offers will be first made to manufacturers so that they may purchase and re-sell if desired. Whatever surplus remains will be offered for public sale by advertising and bidding, at auction or in whatever other manner may be later determined.

## Permit Exports to Holland

WASHINGTON, Dec. 21—The War Trade Board will now consider applications for the exportation of all commodities to European Holland. All shipments must be consigned directly to and only to the Netherlands Overseas Trust, and licenses will be valid only for shipment on vessels flying the Dutch flag. Under new rules for exporters shipping to Holland the War Trade Board procedure includes that the exporters must obtain advice from the prospective Holland importer that an import certificate covering the proposed consignment has been issued by the Netherlands Overseas Trust. The exporter must secure the number of this certificate and specify it on his license application blanks.

## Lipsner Lodges Charges

WASHINGTON, Dec. 20—B. B. Lipsner, formerly Chief of the Aerial Mail Service, filed charges against the Post Office management of the service in a letter to Senator Sherman. The letter was presented to the Senate yesterday. Lipsner charges that Otto Praeger, Second Assistant Postmaster General, told him that Postmaster General Burleson was financially interested in the Glenn-Martin Aeroplane Co. He charged that the department is spending millions of dollars in constructing special planes instead of utilizing the planes turned over by the War Department. The charge is made that incompetent men have been placed in charge of the Aerial Mail Service. J. B. Corriden, the new supervisor of the Aerial Mail Service, states Lipsner, has had absolutely no aircraft experience. Dr. L. J. Busslar "from a \$1,600-a-year follow up clerk in my office," says the letter, "has been made Chief of the Section of Maintenance. He is not an engineer. J. Clarke Edgerton, son of the purchasing agent of the Post Office Department and formerly an aviation lieutenant in the Army, has been made Chief of the Section on Flying, which includes testing, experiments and control of flying. He is only 21 years old. For Aerial Mail Division interests two postal clerks have been named."

When told about the letter, Postmaster General Burleson said he did not even know who owned the Glenn-Martin company.

## Bureaus to Assist in Getting Work for Returned Soldiers

WASHINGTON, Dec. 23—Bureaus will be established by the Department of Labor in every community of the country to be known as the Bureaus for Returning Soldiers, Sailors and War Workers, and these will ascertain what employment is open for such individuals. The Bureau will co-operate in each instance with a local U. S. Employment Service. It will afford opportunities for workers to register and will classify them and will maintain such positions open in the community. It will give every possible assistance to every applicant for work. The Bureaus will be organized either through the Community Labor Boards of the Department of Labor, the U. S. Employment Service or in those cases where these bodies are not established the local Council of Defense will create the bureaus.

## Smithsonian Preparing Exhibit

WASHINGTON, Dec. 23—The Smithsonian Institution, United States National Museum, is arranging for a permanent exhibit of the various types of airplanes built in the United States for the War Department during the present war. In addition it is installing a series of airplanes, including the reconnaissance and bombing planes used by the French Government in 1917, and also including the first Government owned airplane built by the Wright Bros.

## Canada May Re-instate Duty on \$1400 Tractor

OTTAWA, Dec. 21—The request of the Canadian Manufacturers' Association, as recently expressed by a resolution passed at Toronto, that the duty on farm tractors be replaced, is causing some interest at the capital. The situation is that the duty has never been really removed, but an order-in-council passed on Feb. 7, 1918, provided for its remission by the Customs Department for a period of one year. In other words, the duty is refunded to importers of farm tractors not exceeding \$1,400 in value. Should no action be taken by the Government prior to Feb. 7, next the duties on imported tractors, as well as the duties on meat, cattle and traction attachments dealt with in the same order-in-council, will again be collectable. Should parliament not meet before February, an extension of the period of remission of duties can be provided for only by a supplementary order-in-council.

### Government Slow in Releasing Plants

DETROIT, Dec. 23—None of the assembly plants of the Ford Motor Car Co. which were taken over by the Government have as yet been released. The factory at Detroit is rapidly getting back to normal production and has practically concluded its war program. The assembly factories, while they have discontinued their work, are still held by the government.

### Ward Will Manage King

DETROIT, Dec. 23—Artemus Ward, Jr., president of the King Motor Car Co., has decided to add the duty of general managership to his office. Benjamin Siegfried, who has had active charge of King affairs for several years, has resigned to take effect Jan. 1. After this time the reins of the King Motor Car Co. will be entirely in the hands of Mr. Ward. Mr. Ward is at the present time building up a new sales organization and intends to get into production about March 1 so as to meet the spring market.

### Reliance Wheel to Start

YOUNGSTOWN, OHIO, Dec. 23—The Reliance Wheel Co. has been organized with a capital stock of \$100,000 to produce a new type of double disk wheel for use on automobiles, trucks, airplanes and tractors. The officers are: president and general manager, Joseph M. Crenan; vice-presidents, T. E. Milliken and A. J. Engel; treasurer, A. A. Aull.

### Harry W. Ford

DETROIT, Dec. 23—Harry W. Ford, prominent in Michigan automobile circles, and organizer of the Saxon Motor Car Corp. and its president and general manager for 4 years, died in New York City last week of pneumonia. He was recently honorably discharged from the army service, after having served in the Motor Transport Corps at Jacksonville, Fla. The late Mr. Ford came to Detroit

from the National Cash Register Co., Dayton, and in 1909 he became advertising manager of the Chalmers Motor Car Co. In 1914 he withdrew from the latter company, of which he was then assistant general manager, and organized the Saxon Motor Car Corp. He was president of the Saxon corporation until about a year ago, when he resigned to enter another line of business.

### Liberty Line Revised

DETROIT, Dec. 15—Although the chassis remains practically as before, the bodies on the Liberty cars have been altered in many minor details by the Liberty Motor Car Co., Detroit. The louvres in the hood have been doubled in number on all the models and a corrugated walnut rim has been placed on the steering wheel instead of the plain walnut rim which was used previously. To make for freer radiation, the front license tag has been placed below the radiator instead of in front of it.

The touring car and roadster are now fitted with an improved windshield in which the upper glass overlaps the lower one, thus doing away with the rubber strip which formerly closed the aperture between the glasses. On these two models the rear curtain light rims are now nickel finish.

The 4-passenger body has been entirely redesigned. It was formerly a chummy or close coupled type and this has been changed to give more room and to make a better looking car. The body is of straight-line design with a bevel edge around the top and there is room for 4 persons and space to spare. The square cornered effect at the rear of the car makes it possible to take advantage of every available inch in building the rear seat and yet keep the body within the proscribed limits. The windshield is set at a slight angle. The door handles are nickel plated.

The Sedan is unlike last year's model in that it has four doors and all windows lower into the body of the doors except the rear, which is stationary. The body has been made more roomy and is equipped with a Perfection heater.

The coupe seats 4 passengers and the driver's seat is just a little forward of the other seat, which, by the way, is 36 in. wide and will accommodate 3 persons. The fourth seat is carried under the cowl when not needed. A dome light provides illumination and a Wilton carpet covers the floor, while the whole interior is finished in gray velour with silk curtains to match, with the exception of the driver's seat and the side of the body at his left, which are finished in leather. Luggage room is provided in the rear deck.

### Springfield Sets Show Dates

SPRINGFIELD, MASS., Dec. 21—Dealers will hold a show in the Municipal Auditorium during the week of Feb. 24. The show committee is composed of Charles R. Culver (Pierce-Arrow), John S. Harrington (Hudson), Frederick Calderwood (Chandler), and Robert M. Sauers (Federal truck).

## Labor Supply Now Equal To Demand

WASHINGTON, Dec. 24—Labor, according to the Department of Labor, now is about equal in supply to demand. Shortages are continuing in New Britain and New London, Conn., and the supply of labor equals the demand in all other sections of New England.

New York City reports a supply equal to the demand with a shortage of common labor and an excess of skilled labor reported in the State. Shortages of labor are found in Pittsburgh, Philadelphia, Harrisburg and other Pennsylvania mining districts. Ohio reports a surplus of 3000 in Toledo, 500 in Cincinnati, and 5000 in Dayton while Akron shows a shortage of 2000 workers. A small shortage is reported in Joliet, Ill., while all other sections of the State report a supply equal to the demand, as does Indiana. Kansas City notes a surplus of 4000 workers. Detroit reports the supply equal to the demand.

The Southern cities, Atlanta, Louisville, Baltimore, Lynchburg and Chattanooga report shortages. New Orleans has a supply equal to the demand and Nashville shows a surplus.

Salt Lake City reports a surplus. Denver and Montana indicate a supply equal to the demand while shortage is reported from Little Rock, Arkansas. The statements from the Pacific Coast indicates a surplus of 7000 workers in San Francisco, 2500 in Oakland, and a like situation in Portland, Oregon, while Los Angeles has a supply equal to the demand.

Reports received from several industries indicate that more workers will be taken on than released during the coming week. The iron and steel industry report from 1072 employers and employing 802,600 workers last week will be using about 799,794 by Dec. 28. The textile industry report from 731 employing 236,207 workers will take on 28,000 additional workers this week.

### To Help Soldiers Get Jobs

WASHINGTON, Dec. 15—The United States Employment Service, Department of Labor, has instructed its State directors to set in motion machinery for immediate establishment of employment bureaus for the use of soldiers, returned and demobilized. These organizations will ask the assistance of all industrial bodies in their community.

### Wood Reports on Stocks of Fuel and Lubricants

WASHINGTON, Dec. 10—Stocks of oil on hand needed for use by the Army according to Brig. Gen. R. E. Wood, Acting Quartermaster General, in depots and camps of the United States or on board ship in transit to France, as of Nov. 1, include 978,579 gals. of aviation gasoline, 2,525,205 gals. of motor gasoline, 240,472 gals. of fighting naphtha, 256,155 gals. of kerosene and 1,075,007 gals. of lubricating oil. There are also 594,559 gals. of fuel oil and 254,117 lb. of grease in the United States.



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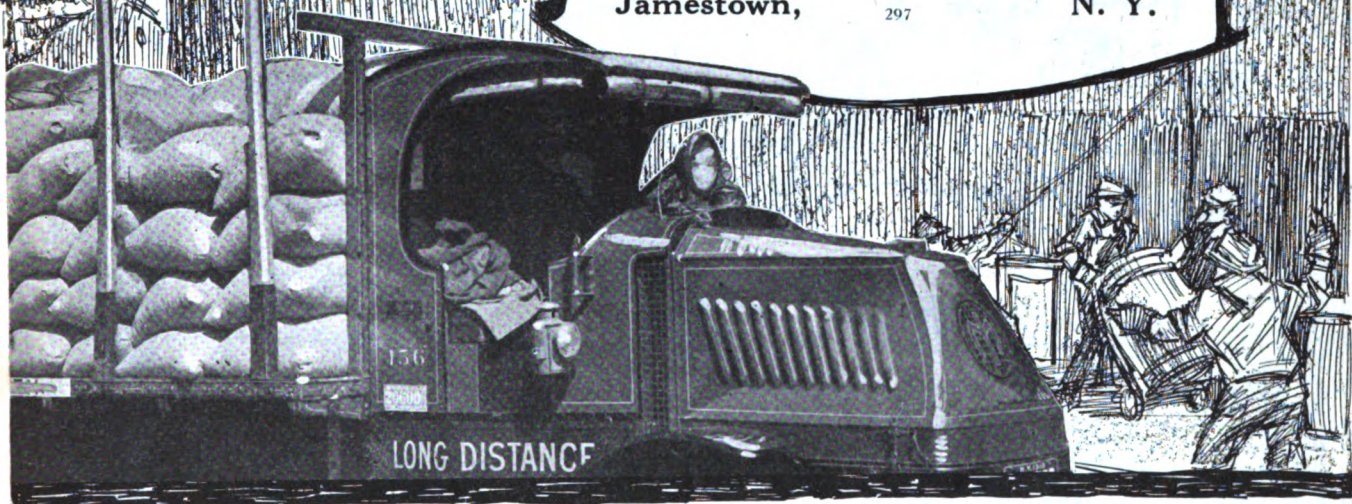
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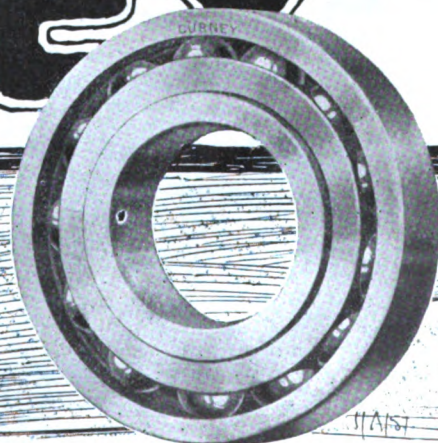
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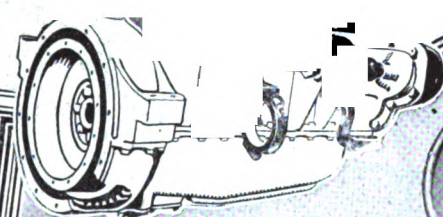
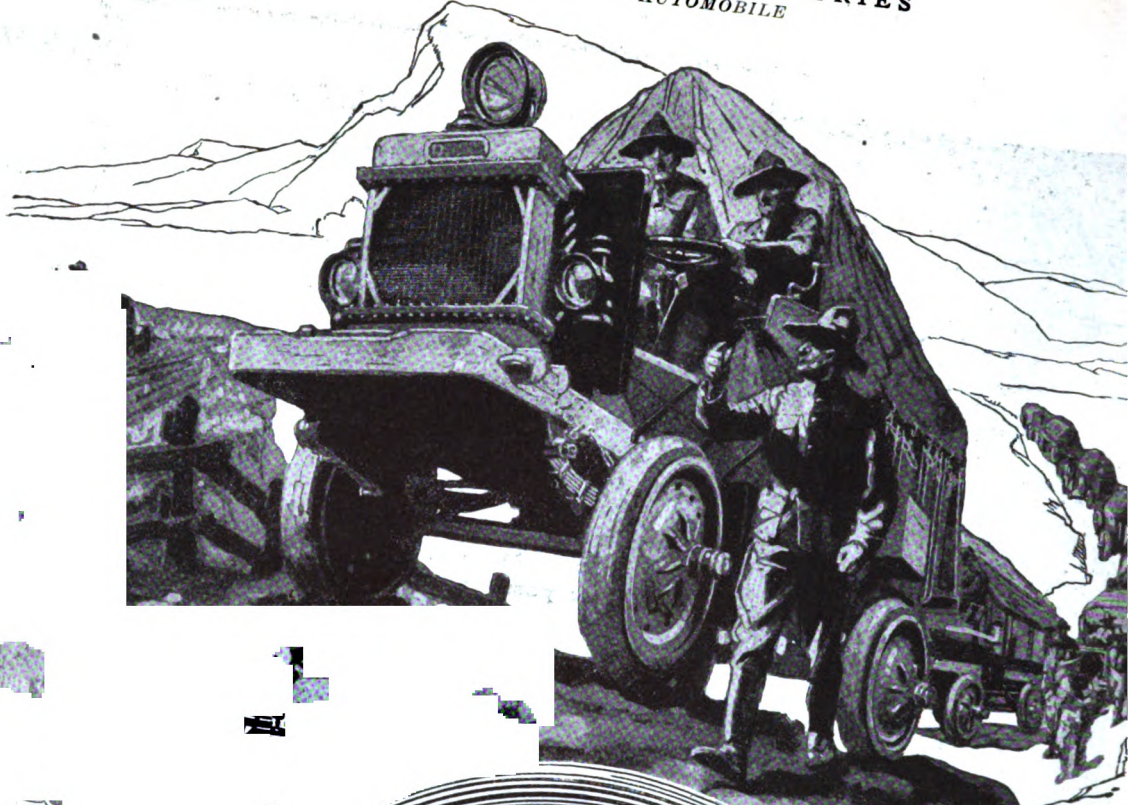
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## CONTENTS

VOL. XXXIX NEW YORK, December 26, 1918 No. 26

Political Plan of Organization Satisfactory....1083

S. W. H. Tractor a New Cleveland Product....1085

Electrical System of the Liberty Engine.....1089

Organization of the French Army Automobile  
Service .....1093

Artillery Tractor Production Well Started When  
the War Ended.....1096

Screw Thread International Standards.....1098

Allen Self-Locking Differential.....1099

Development of the Aircraft Spruce Industry..1100

Pickling with Nitre Cake.....1102

Hair-Line Defects in Crankshafts.....1104

Cultivating the Chinese Automotive Field.....1106

Editorials .....1108

French War-Worn Vehicles Sold.....1116

Latest News of the Automotive Industries.....1112

Government Help for Aviation.....1110  
5% Tax on Trucks Eliminated.....1111  
May Make and Sell "B" Parts.....1111  
October Exports to Latin America.....1112  
Bureau of Mines Annual Report.....1112  
Aircraft Department Annual Report.....1113  
Petroleum Demand Will Increase.....1117  
Mail Trucks Earn Four Times Cost.....1120  
Automotive Chronology for 1918.....1123

Calendar .....1122

INDEX TO ADVERTISERS.....110-111



## READY!

WE ARE READY—TO SERVE YOU.

FROM ONE END of our plant to the other, men, materials and machinery are here to take care of your forgings.

OUR CORPS OF SPECIALISTS is ready to cooperate with your engineers in solving your particular problems.

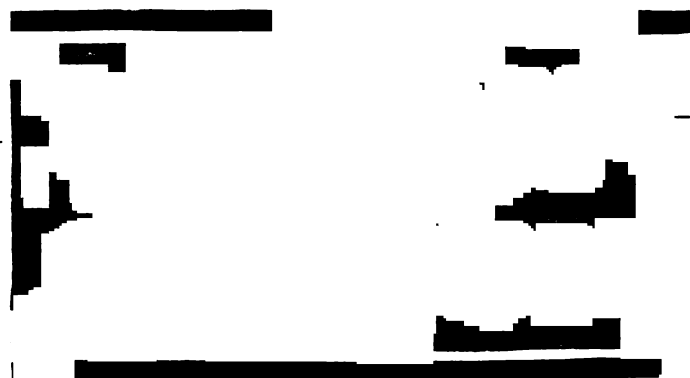
THE WYMAN-GORDON GUARANTEE is ready—to save you anxiety and protect the reputation of your car.

*We await your commands*

### WYMAN-GORDON CO.

Worcester, Mass.

Cleveland, O.







# SPIRAL TUBE RADIATORS

Specially Designed for  
**TRUCKS and TRACTORS**

Sturdy, durable and trouble-free. Built to withstand the gaff of every type of automotive work. Simple to maintain in perfect order.

Logically the radiator for every domestic truck and tractor requirement, by reason of their remarkable efficiency record in the most exacting war service.

Prompt deliveries of quantity orders. Highest quality guaranteed. Let us know your 1919 needs.

Our spiral tubing will prove its manifold advantages to manufacturers assembling their own radiators.

**NATIONAL CAN COMPANY**  
DETROIT U. S. A.

Please mention Automotive Industries when writing to Advertisers

**P**ERHAPS it is hardly the function of the publisher to offer his Christmas greetings to you, but the particular conditions and the season have gripped us—more than usual.

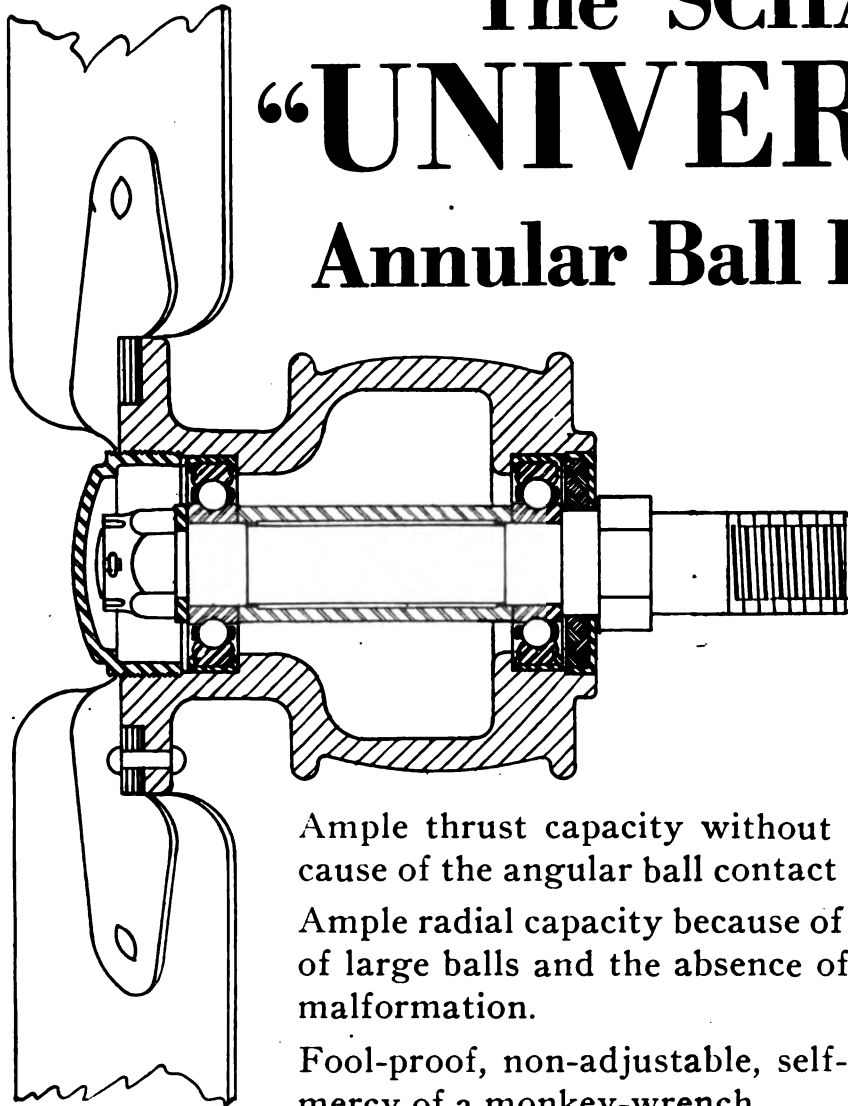
There is so much really inspiring work in front of us—as industrial leaders, designers, constructors—as men and as citizens that we cannot avoid congratulating you on the certainty of a happy Christmas over the peace so recently acquired and an inspiring New Year in the making of peace a permanent industrial service.

Merry with a deeper merriment be your Christmas, happy with a greater inspiration your New Year.

**Mr. Engineer! Mr. Purchasing Agent! Mr. Auto Builder!**

**When you want fans without bearing troubles, specify**

# The SCHATZ "UNIVERSAL" Annular Ball Bearings



*Note the simplicity of this assembly. The "Universal" has equal thrust capacity in either direction; consequently bearing assembly can be made either way.*

Ample thrust capacity without excessive stresses, because of the angular ball contact lines.

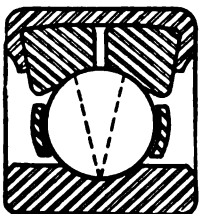
Ample radial capacity because of the maximum number of large balls and the absence of notches or other race malformation.

Fool-proof, non-adjustable, self-contained—not at the mercy of a monkey-wrench.

Silent, reliable, long-lived anti-friction bearings.

Uniformly high quality.

*Write for New Catalog*

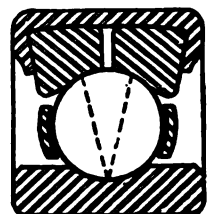


**The Federal Bearings Co., Inc.**

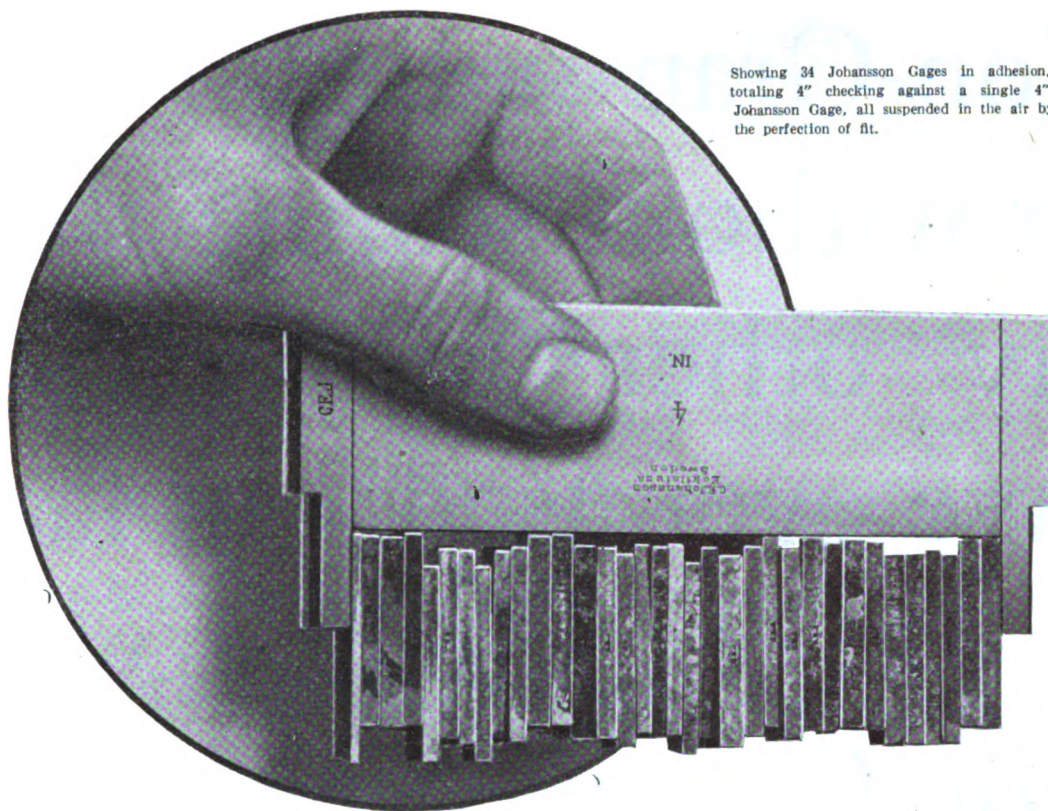
26 William Street

Poughkeepsie, N. Y.

Great Britain: 37 Sheen Road, Richmond, London







Showing 34 Johansson Gages in adhesion, totaling 4" checking against a single 4" Johansson Gage, all suspended in the air by the perfection of fit.

## The Limit System Motor Car

**A** SURVEY of the industry soon brings out the great big fact that practically all of the cars that continue year after year in the public's favor are the cars that are **manufactured**, not **built**. By "manufactured" we mean—produced in large quantities on a strictly interchangeable basis. In other words, manufactured in accordance with the Limit System.

To maintain a Limit System requires limit gages.

To maintain limit gages requires a thoroughly dependable **STANDARD**.

When a shop has such a standard, it can keep the various shop sizes under its control—and this is one of the most important things in modern manufacturing. When a shop has control of shop sizes, there is **GO-TOGETHER-FIRST-TIME** in the assembling department. And more important

than this, there is **GO-TOGETHER-FIRST-TIME** of spare parts when the car-owner has to make replacements.

Johansson Combination Gage Blocks are in use by practically all of the big car makers and parts makers. Naturally, there are some exceptions, but they are rapidly disappearing.

Certain it is, no car of the future can be built on the old cut-and-try, "absolute dimension" basis and become a "big car" from a popularity standpoint.

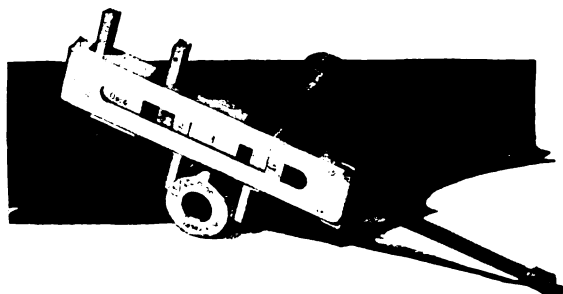
It's the car that gives the motorist the longest ride for his money that continues in the public favor. And this means the Limit System Car.

Johansson Gages are covered thoroughly in our new gage catalog. This catalog is sent free upon request.

# Johansson

**The Swedish Gage Company, Inc., 245 West 55th Street, New York City**

*In Canada—10 Cathcart Street, Montreal*



Please mention Automotive Industries when writing to Advertisers

“Non-Gran will run hotter without scoring than any other bronze we have ever used. In fact, in our experience with Non-Gran we have never had a scored bearing.”

THE original letter from which this excerpt is taken bears the signature of a marine motor manufacturer whose opinion carries the weight of knowledge and experience.



American Bronze Corporation  
Berwyn Pennsylvania



The Spicer Mfg. Corporation having completed its war contracts is now in position to furnish manufacturers of passenger cars, trucks and tractors with universal joints and propeller shafts.

Spicer Universal Joints are Universally Accepted as the Most Dependable Flexible Connection Known to Motor Car Practice.

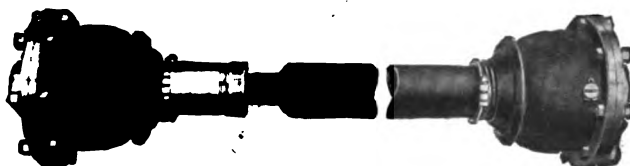
**Grease-Tight                      Dust-proof**  
**Parts Interchangeable**

**SPICER MFG. CORPORATION**  
**SOUTH PLAINFIELD, N. J.**

**SALES REPRESENTATIVES:**

L. D. Bolton, 2215 Dime Savings Bank Building, Detroit  
A. H. Coates, 41 Spear Street, San Francisco, Cal.

FOREIGN: Benjamin Whittaker, 21 State Street, New York.



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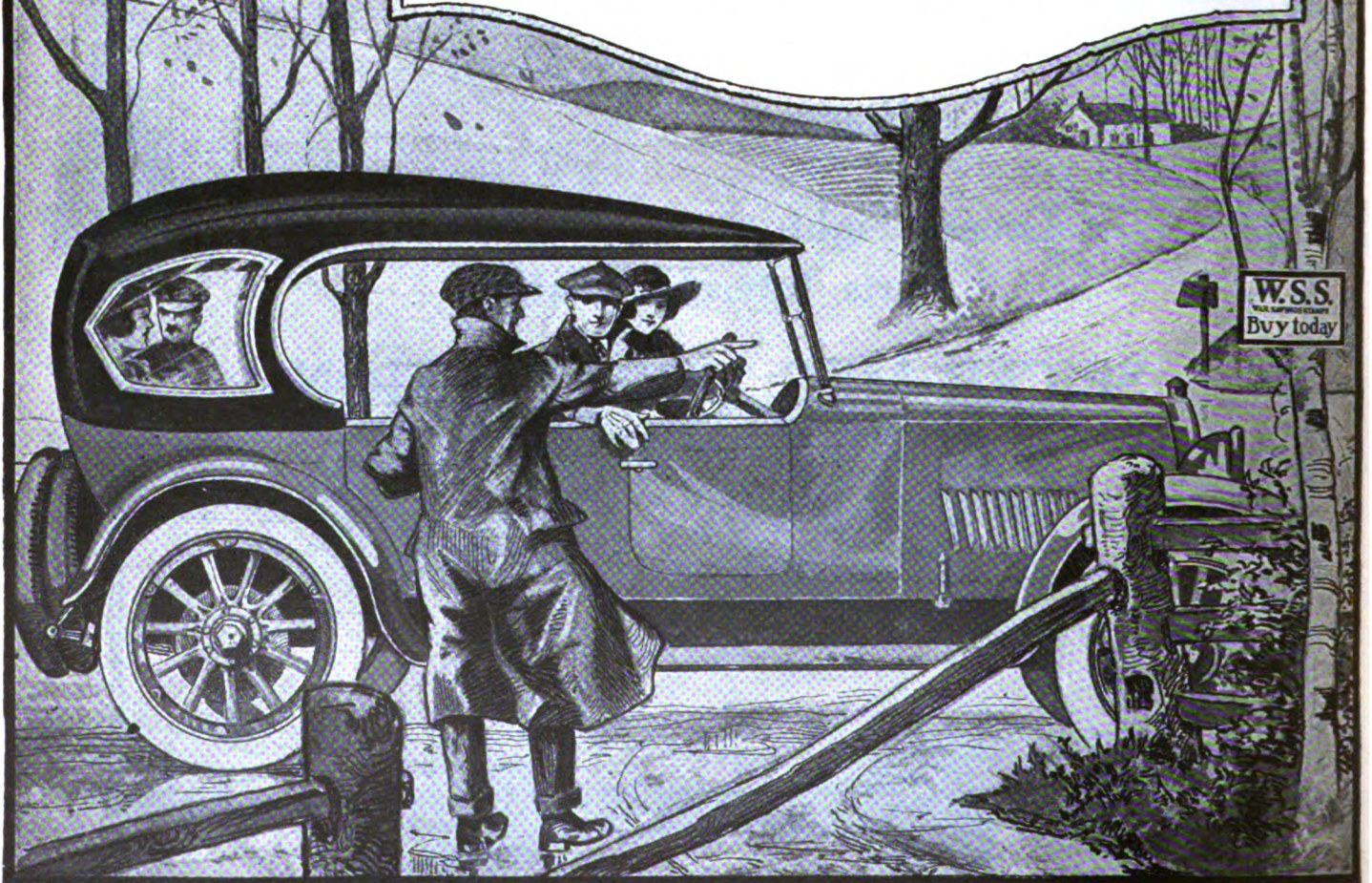
More  
And More  
DRIDEK  
Every Month

The Most Remarkable  
Material Yet Produced for  
Automobile Tops, Curtains  
and Upholstery.

Light, pliable and water-  
proof.

*Send to Dept. A for  
Samples and Price List*

**L.J. MUTTY COMPANY**  
BOSTON, MASS., U. S. A.



Please mention Automotive Industries when writing to Advertisers



# Distinctively Best By Any Test



## HOOVER

STEEL

BALLS

IN spherical accuracy, size dependability, structural strength, surface finish and working durability Hoover Metal Balls are the recognized standard of the world.

*Steel—Bronze—Brass—Aluminum Balls—Solid and Hollow In All Sizes for Every Purpose.*

**HOOVER STEEL BALL COMPANY**  
Ann Arbor, Michigan, U. S. A.





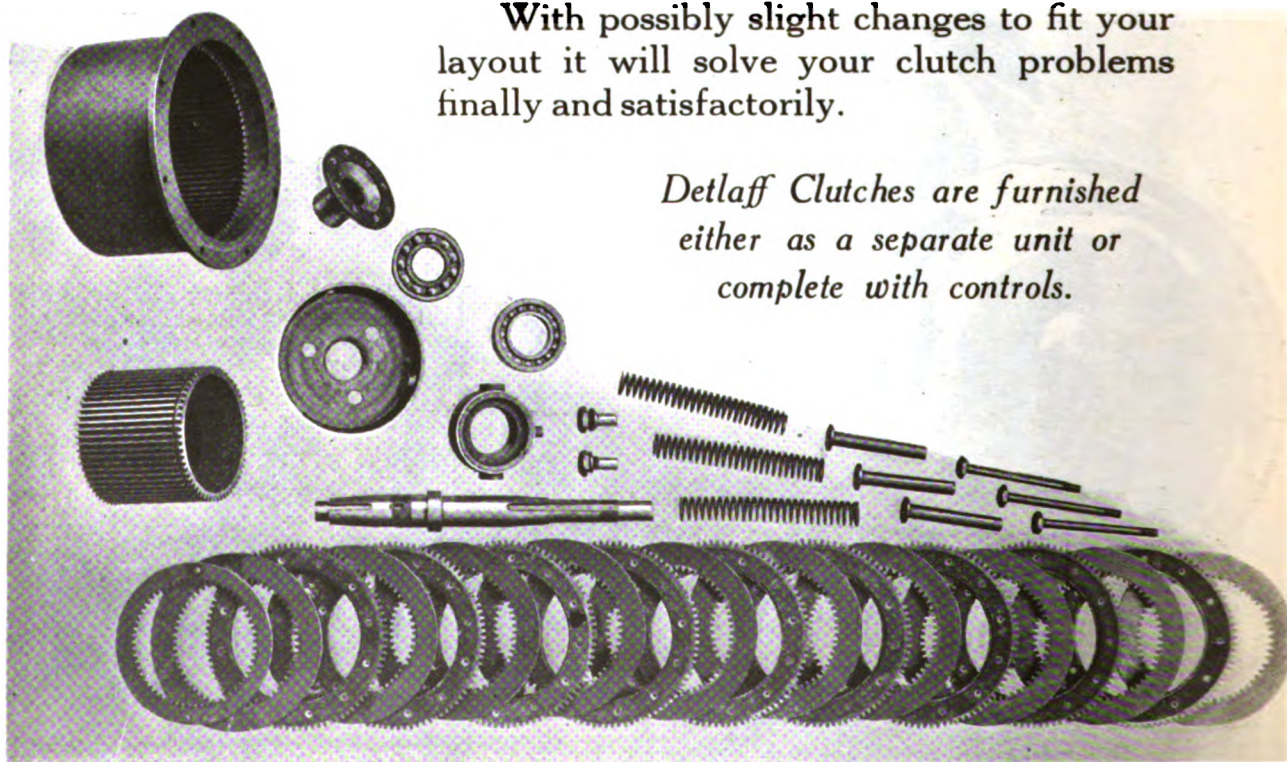
## A Thoroughly Satisfactory Clutch For Heavy Truck Work

THE clutch shown below, has proved to be probably the most satisfactory clutch in use today on heavy motor trucks.

It is the result of the combined efforts of some of the best engineers in the industry, and represents, we believe, the final word in clutch construction.

With possibly slight changes to fit your layout it will solve your clutch problems finally and satisfactorily.

*Detlaff Clutches are furnished  
either as a separate unit or  
complete with controls.*







## For Passenger Cars and Light Trucks There's a Detlaff Clutch, Too

The lighter models of Detlaff Clutches have proved as satisfactory for use with smaller motors, either in trucks or passenger cars.

Each is distinguished for its easy action and freedom from slipping and consequent wear—*A Velvet Clutch With the Bull-Dog Grip.*

### Special Designs for Your Needs

We will gladly work with you on special designs of clutches and controls, either together or separate units, for quantity production.

Our extensive facilities, including both foundries and machine and assembly plants, devoted exclusively to clutches and controls, insure low production costs and prompt, dependable deliveries.

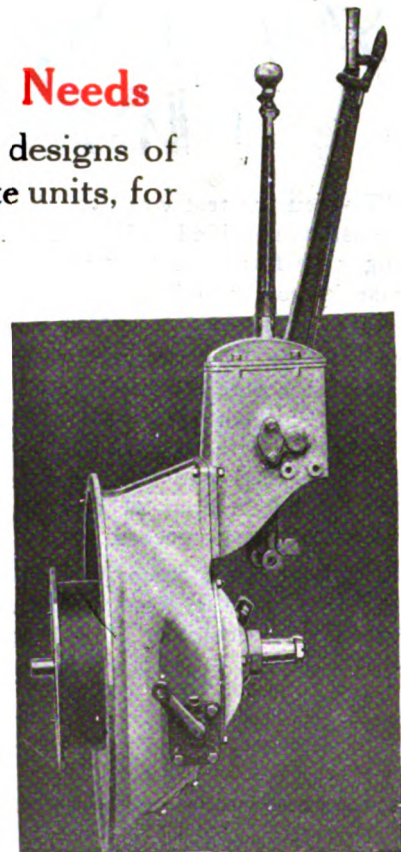
Let us figure with you on these parts.

## A. J. Detlaff Company

123 Lafayette Blvd., East

Detroit

Michigan





**PHILBRIN**  
*Reliable*  
**IGNITION**

*Until They Saw With Their Own Eyes They Refused to Believe!*

**B**UT when the test was over the French Commission specified PHILBRIN, after witnessing a performance marked by a pronounced increase in power and flexibility and a startling economy of gasoline.

The Baldwin Locomotive Works had long before learned, through rigorous comparative tests, that only Philbrin Ignition would enable their big gasoline engines to deliver 100% satisfaction. Uncle Sam had been using their engines behind the battle lines of France and Belgium with extraordinary success.

Yet when France came to America for gasoline locomotives the French Commission questioned the practicability of battery ignition.

And until they saw with their own eyes they

would not believe that any one system of ignition would possibly reveal such a capacity for increasing engine power, flexibility and gasoline economy. *But it did.*

The problem was to produce complete combustion, greatly reduce gasoline consumption, insure easy starting and simultaneously to fire two spark plugs in each of 6 huge cylinders in their firing order. This is a characteristic example of the many ignition difficulties which Philbrin Systems are repeatedly being called upon to solve.

Philbrin Ignition is being used on and is obtainable for Airplanes, Tractors, Trucks, Passenger Cars and Marine Engines of any number of cylinders, of either low or high compression.

*Literature upon request*

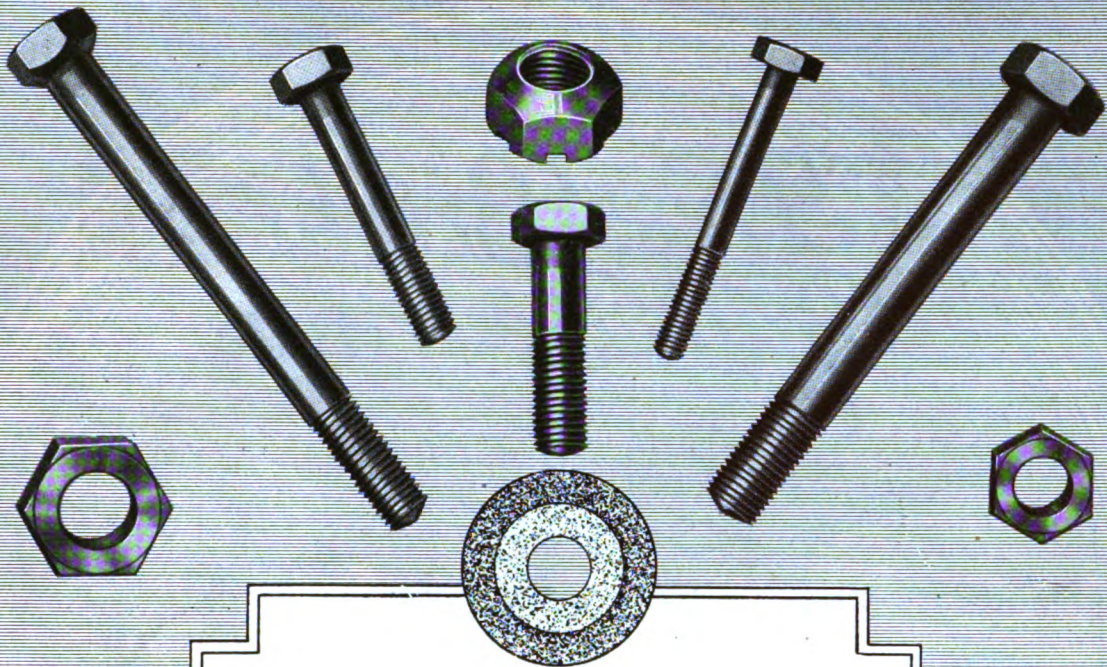
**PHILBRIN**

**PHILIPS-BRINTON CO.,**  
IGNITION SPECIALISTS

501 SOUTH BROAD STREET  
**KENNETT SQUARE, PA.**

Please mention Automotive Industries when writing to Advertisers





**SCREW MACHINE PARTS**  
DO YOU REQUIRE CLOSE TOLERANCES  
AND CAREFUL MACHINE PRACTICE?

OUR plant is accustomed to making screw machine parts under the very rigid requirements called for in the Aircraft Industry, parts whose interior structure must be identifiable—quality the determining factor.

WILL you take advantage of the facilities of a fully equipped screw machine plant, new, modern automatic machines—complete machine shop, laboratories, cyanide case hardening equipment and two electric heat treating furnaces?

*Let us quote you on your screw machine parts. Favor us with your blue prints, specifications, etc.*

**ERIE SPECIALTY CO.**  
8 West 40<sup>th</sup> St., New York City  
Main Plant Erie, Pa.





# Hess-Bright Ball Bearings

## *Ready for the duty asked—*

It's hard, when you see a squadron of planes at rest, to picture them as a mechanical device that has overcome the Law of Gravity. For they are heavier than air. And if you hold a Hess-Bright Ball Bearing in your hands it is equally as hard to picture it as an ingenious device that has all but mastered friction. For it is simply a rugged collar of steel encircling a set of true spheres of steel. And it is so small compared to other important parts

in plane and engine construction. But there are none that are more important. Speed, climbing power, control, engine action—all are dependent on bearing performance. Twenty-six places exist where Hess-Bright Ball Bearings will help to build air supremacy. That's why makers of planes buy the best. For while the Hess-Bright first cost is more, in the long run it is the least expensive. And it has been by the performance it gives that its reputation has been established.

THE HESS-BRIGHT MANUFACTURING COMPANY  
Philadelphia, Pennsylvania

*Where Performance takes Preference over Price*

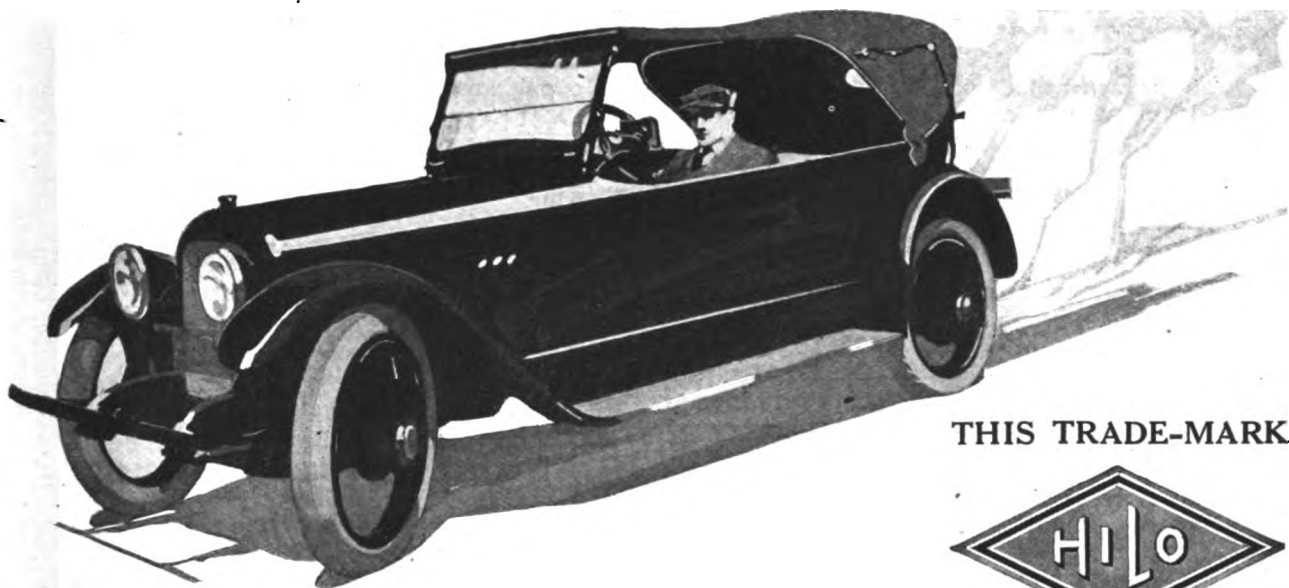
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# DISTINCTIVE APPEARANCE

## *An Added Asset*



THIS TRADE-MARK



Now that the automobile industry is entering a production period that promises the keenest competition in its history, manufacturers are more concerned than ever before regarding Protective Finishes. They demand not only Wear, but the added asset of Distinctive Appearance.

Properly selected finishing materials and correct methods of applying them are a guarantee that the finish on your product will retain its attractive appearance under hard usage.

For example, take the Baked Finish as shown on the Black Japanned Hoods and Fenders of most automobiles—these parts retain their lustre and smoothness long after the finish on the average body is dimmed and cracked.

*Look Into Our Baking Finishes.*

**HILO VARNISH CORPORATION**  
5 GERRY ST., BROOKLYN, N. Y.  
CHICAGO, ILL.

Pacific Coast Representatives:

The Brininstool Company

Los Angeles, Cal.

Please mention Automotive Industries when writing to Advertisers

## ENAMELS—JAPANS— VARNISHES

typifies all that is best in Finishing Materials.

For Automobile Fenders,  
Hoods, Radiator Shells.

936 Black Baking Undercoat and  
934 Black Baking Finishing Japan

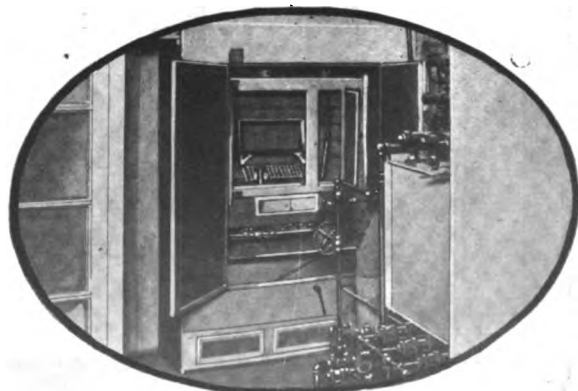
are adapted to use for dipping or spraying  
and for baking in Stationary or Conveyor  
type ovens.

The baking time for each coat may be  
fitted to your production schedule:

300° F. for 3 hours, or  
475° F. for 35 minutes

or at intermediate temperatures in proportionate time.

*Our experimental japanning ovens where  
goods can be baked at temperatures up to  
500° F.*



# "The Right Timken or None"

## A Fundamental Policy of Timken Engineering

To the owner of a tractor, truck or motor car, one Timken Bearing looks very much like another, except in size, for all have the same basic principles of design.

Furthermore all Timken Bearings are of absolutely the same quality, made of the same Timken-made steel, machined, carbonized, heat treated, ground, inspected, tested, and assembled in exactly the same way.

Yet there is a sufficient difference between the bearings on the front axle spindle of your car and the ones at the corresponding point in any other model—even of the same make—to receive careful study by the best engineering brains Timken can devote to it.

Past experience, of course, makes each new installation easier, and the difference between two vehicles is sometimes very slight.

But the all-important fact remains that Timken takes nothing for granted.

It may be only a little variation in the taper or length of a roller, in the

thickness of a cone or a cup, but Timken engineering insists that there can be only one correct Timken Bearing—out of all possible variations—for any particular place in any particular make and model of tractor, truck or motor car.

Therefore every detail in the specifications which can affect the operation of the bearings is given thorough consideration by Timken engineers and discussed in conference with the engineers of the car-builder, axle-builder, or transmission-builder, as the case may be.

These progressive manufacturers not only welcome, but urgently request this co-operation, because they realize how valuable to their customers is the highly specialized experience of Timken engineers, in working out thousands of bearing installations in every past and present type and size of automotive vehicle.

However, if some one manufacturer should prove the rare exception and insist on bearings not suited to his car, because of price or

any other consideration, Timken will, as has been the case on past occasions, pass up this business, whatever it might mean in profit.

*Timken engineering goes beyond the point of insisting on the proper bearings. It also insists on correct mounting of those bearings.*

For the design and construction of the supporting parts, the accuracy with which a cup is pressed into a hub or a cone fitted upon a shaft may affect the future satisfaction of the owner.

The remarkable record of Timken Bearings in service is due to three equally important factors:

1. Fundamentally correct principles of design, applicable to any installation in any type of motor vehicle.
2. Adequate manufacturing experience and equipment, even to the making of the steel itself.
3. Insistence upon proper selection and correct mounting of the one proper bearing for every installation.



THE TIMKEN ROLLER BEARING COMPANY  
Canton, Ohio.

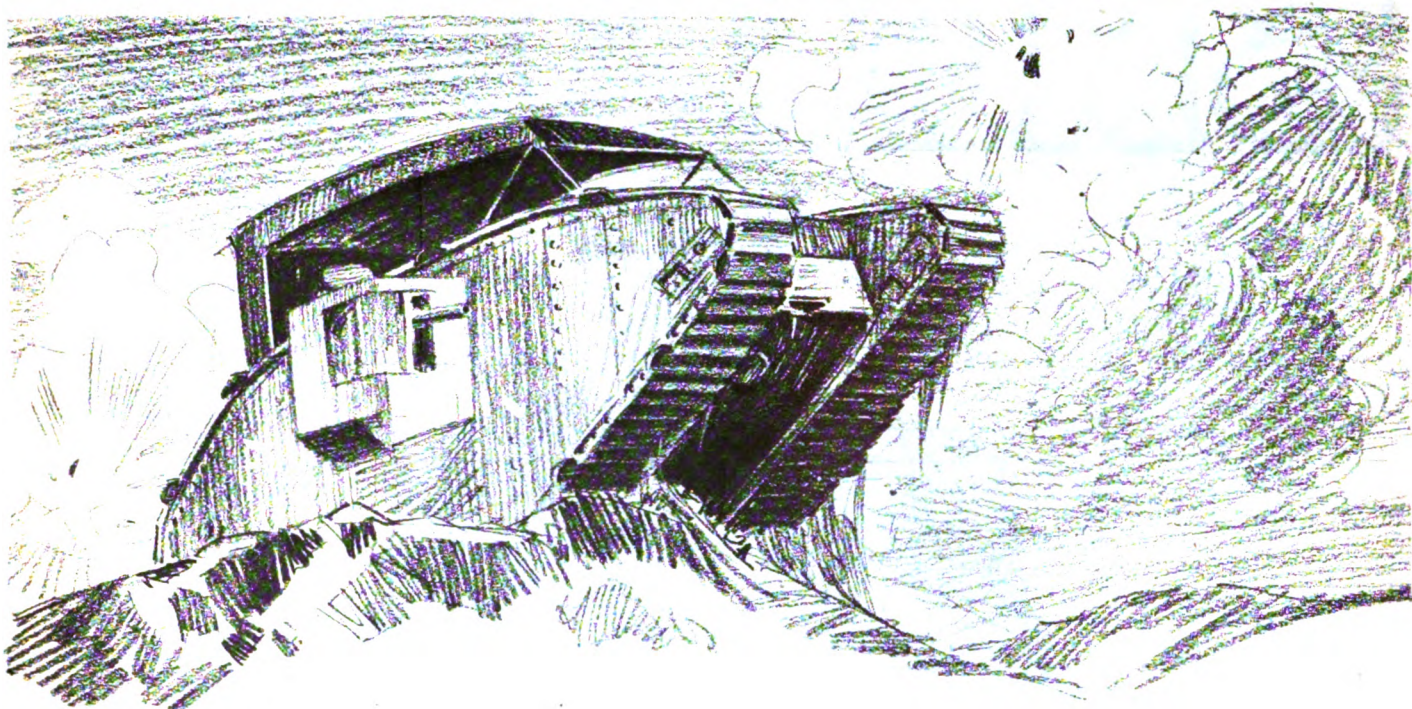


# TIMKEN

## BEARINGS

FOR MOTOR CAR, TRUCK & TRACTOR





# *If TANKS had TOPS*

**D**UXRANE Top Material wouldn't stop the bullets and shell fragments, but it would "carry on" through everything else—rain, snow, sun, and mud, hail and hard usage.

You can "treat it rough" with impunity.

**DUXRANE**  
REG. U. S. PAT. OFF.  
**SINGLE TEXTURE TOP FABRIC**

is not only smart looking and rich in appearance, but it holds its good looks. It has been put through the severe "scrub test" before leaving the factory. It will fold without creasing, stand exposure without fading or losing its smooth, even surface.

It is a thoroughly made, high quality top material.

*Write for Samples*

**O'BANNON**  
COATED  
**FABRICS**

TRADE MARK  
REG. U. S. PAT. OFF.

**O'BANNON CORPORATION**  
200 Fifth Avenue, New York

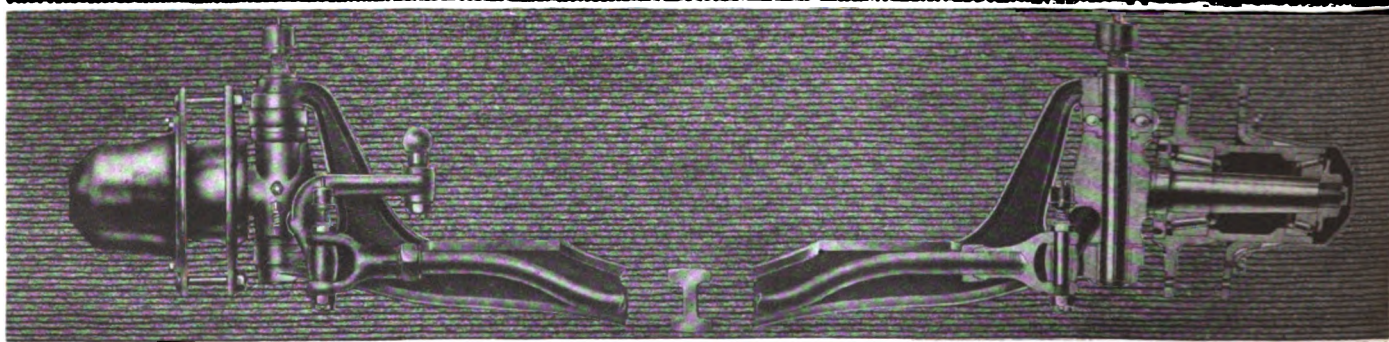
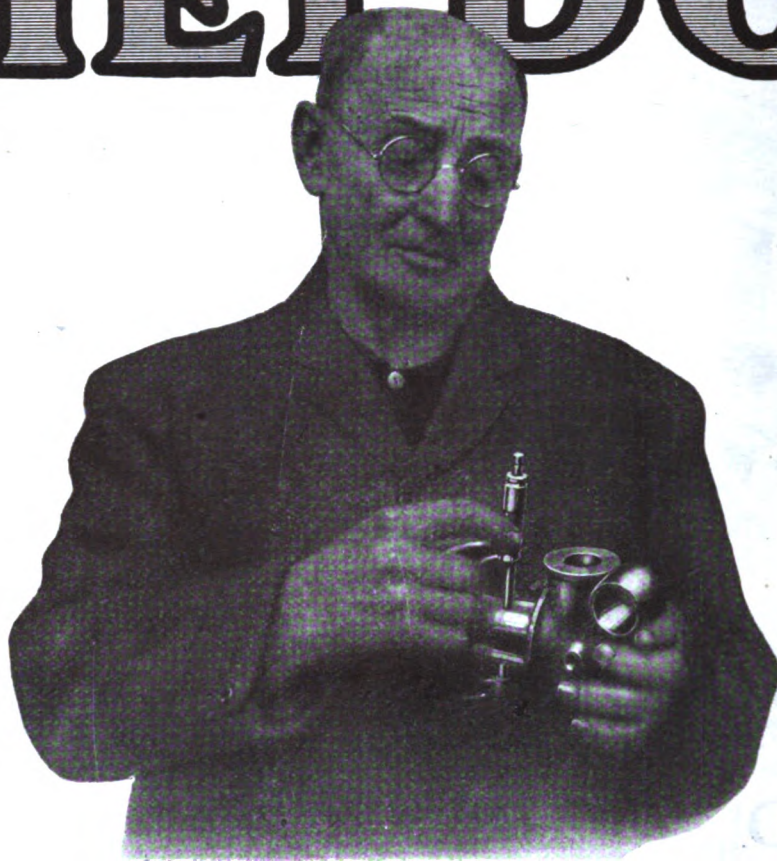
Manufacturers of a complete line of coated fabrics of every description. Ask for samples of Rubberized Top Fabrics, Single and Double Textures, and of Leather Substitutes for entire trimming.

**O'BANNON**  
COATED  
**FABRICS**

TRADE MARK  
REG. U. S. PAT. OFF.



# SHELDON



## PRECISION MEANS SAFETY

Where "short cuts" mean risk, Sheldon takes the longest way around, rather than accept the the doubtful benefits of quicker methods.

It might, for example, be easier—and cheaper—to build a welded steering knuckle. But your truck, its load and its driver are staked against the strength and efficiency of this little part. So Sheldon *drop forges* every steering knuckle in *one piece*, from chrome nickel steel. Then, to

guard against friction and give lasting assurance of absolute safety, it is ground to size within micrometer limits.

This way of doing even the little things naturally makes Sheldon Axles somewhat higher in price than the average. But you don't mind paying a little more to start with, when you get such ever-lastingly economical service as every Sheldon-equipped truck is sure to give.

**SHELDON AXLE & SPRING CO.,**

*Makers of axles and springs for heavy  
duty service for more than 50 years*

**Wilkes-Barre, Pa.**

**The choice of 51 leading engineers**

Premier  
 MOON  
 HAYNES  
 COLES  
 STEPHENS  
 REPUBLIC  
 APPERSON  
 EMPIRE  
 PIERCE-ARROW  
 DENBY  
 KISSEL  
 HUDSON SUPER SIX  
 PILOT  
 The Autocar  
 Lippard-Stewart  
 Russel  
 WHITE  
 GRAM BERNSTEIN  
 LEXINGTON  
 MARMON  
 KING "8"  
 TORBENSEN AXLE  
 COLUMBIA AXLE  
 BETHLEHEM MOTOR TRUCKS  
 SHELTON  
 AUBURN  
 National  
 Trundar Tractor

When you recommend Thermoid Brake Lining to your customers your recommendation is backed by the endorsement of 51 of the leading automobile engineers of the country. They have selected Thermoid for their cars only after the most exacting tests.

**Where Thermoid is used**

Notice the varied types of cars in which Thermoid is used. High priced heavy cars where service—not cost—is the prime consideration. Lower priced popular cars whose makers are willing to pay a little extra for brake lining that gives the maximum safety. It is also used on the leading axles. The engineers designing these axles are particularly well qualified to weigh the merits of brake lining.

**Why Thermoid was selected**

There are three reasons why Thermoid has been selected by this critical body of competent judges.

1—Over 40% more material and 60% more labor are used in Thermoid than in any woven brake lining. This gives longer wear.

2—Thermoid Brake Lining is Grapnalized, an exclusive process which resists moisture, oil and gasoline.

3—Thermoid is hydraulic compressed. It wears down slowly and can be used until it is cardboard thin.

Thermoid is recommended by these engineers for use on new cars because it gives dependable service and helps to build good will for their products. It should be recommended by you for relining jobs because it will help to build good will for you. Write today for information.

*Thermoid Brake Inspection Chart*

At speed of	A car should stop in
10 miles per hr.	9.2 ft.
15 " " "	20.8 "
20 " " "	37 "
25 " " "	58 "
30 " " "	83.3 "
35 " " "	104 "
40 " " "	148 "
50 " " "	231 "

*Will your car do this?*

Every foot of Thermoid is protected by **Our Guarantee. Thermoid will make good—or WE WILL.**

**Thermoid Rubber Company**

Factory and Main Offices: Trenton, N. J.

**Factory Branches:**  
 New York Chicago San Francisco Detroit  
 Los Angeles Philadelphia Pittsburgh Boston  
 London Paris Turin

**Canadian Distributors:**  
 The Canadian Fairbanks-Morse Company, Limited,  
 Montreal


Branches in all principal Canadian cities



Makers of "Thermoid Crolide Compound Casings" and "Thermoid-Hardy Universal Joints"



# Half The Truck Tonnage Of America Is Carried On Firestone Tires



**F**IRESTONE built the first truck tires and has held leadership in this field ever since. The result is that half the truck tonnage of the country is now carried on

## Firestone Truck Tires

The Firestone Giant Truck Tire shown here gives traction that puts trucks through snow-drifts, mud-holes and all the worst road conditions winter brings.

There are many other types and sizes of Truck Tires in the complete Firestone line, including the Giant Pneumatic Cord. Consult a Firestone man. He has every type to offer.

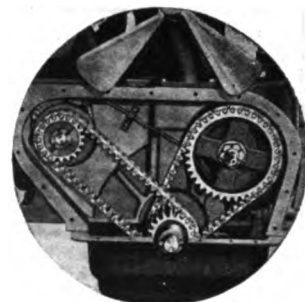
FIRESTONE TIRE & RUBBER CO.  
FIRESTONE PARK AKRON, OHIO  
Branches and Dealers Everywhere





# PEACE BRINGS

## RECONSTRUCTION RENEWALS REPAIRS



Scientific Management Plans Ahead, Using Expert  
Economy Engineering Service

***PEACE NEEDS WILL BE RUSH NEEDS***  
***in all the WORLD'S markets***

**SPEED PRODUCTION AND LOWER COSTS WITH AMERICAN**  
**Efficiency, Quality and Delivery in**

**OUR AMERICAN SHIPS**  
**WILL SELL AMERICAN AUTOMOBILES**  
**in every port of the world**

**"SERVING TOGETHER"**  
will chart the path to a very  
wonderful tomorrow

# A WORLD'S MARKET FOR AMERICAN AUTOS

Our Automotive Industries are admitted by all the Foreign manufacturers as  
the Leaders in Efficiency and High Standard, and under the present stress  
of reconstruction the World Looks to Us for Production and Supply

***When the poise of Industry arrives, competition follows***

**NOW IS THE TIME TO RUSH EFFICIENCY CHANGES AND EXTENSIONS**

**INSURE YOUR PRODUCT AGAINST COMPETITION**  
**by installing "MORSE FRONT END DRIVES," the only**  
**99% efficient Silent Power transmission known to science**

**QUIET AS A BELT—POSITIVE AS GEARS**

Let our expert industrial engineers work with you and design your transmission service

***Morse Engineering Service Assistance Without Obligation***

WRITE DETROIT OFFICE

## MORSE CHAIN CO.

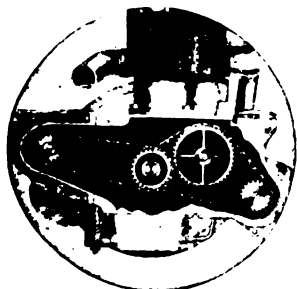
General Office and Works: ITHACA, NEW YORK

*Largest Manufacturers of Silent Chains in the World*

DETROIT OFFICE AND SHOWROOMS  
1003 Woodward Avenue

**Write for 1919 Diary and Mem. Book**  
**Give Firm Name, Position, Address**

Please mention Automotive Industries when writing to Advertisers



## **Foreign Credit Information**

Our Credit Department, in connection with our Buenos Aires Branch and numerous correspondents throughout the World, is in a position to supply to business interests dependable foreign credit information regarding present or prospective trade connections.

### **The First National Bank of Boston**

Capital, Surplus, and Profits, \$27,000,000  
Resources - - - Over \$250,000,000

**Branch at Buenos Aires, Argentina**



# NEW YORK AUTOMOBILE SHOW

**MADISON SQUARE GARDEN**  
*and*

**69TH REGIMENT ARMORY**

(Both Buildings Within a Stone's Throw of Each Other)

**FEBRUARY 1 to 8** *Inclusive*  
**For Passenger Cars**

**FEBRUARY 10 to 15** *Inclusive*  
**For Commercial Vehicles**  
(In Madison Square Garden Only)

*Accessories and Parts Will Be Shown During Both Weeks*

Reserve your space now. Tomorrow may be too late. Diagrams and other information now ready for distribution. The leading makers will be at THE BIG SHOW of the year.

---

**AUTOMOBILE DEALERS ASSOCIATION OF N. Y., Inc.**

CHARLES A. STEWART, Manager

**206 West 55th St., (near Broadway) New York City**

SHOW COMMITTEE:

H. R. BLISS (Dodge Brothers)

CHARLES H. LARSON, (Oldsmobile) Chairman

CHARLES M. BROWN (Winton)

HARRY J. DE BEAR (Maxwell-Chalmers)

R. J. GILMORE (Packard)

WILLIAM C. POERTNER (National-Scripps Booth)

WALTER C. WOODS (Peerless)

CHARLES A. STEWART, Manager



# Don't Let the Winter Storms Tie Up Your Shipping Schedules!

UNCLE SAM has granted Letters Patent on Kissel's ALL-YEAR Cab because—"it is highly desirable to have a motor truck cab that fully protects drivers during the cold, wet months, enabling them to keep their trucks in continuous service during the winter."

This winter, of all winters, calls for not only *continuous* but *increased* transportation. Maintaining schedules and meeting shipping dates *in time* and *on time* are essential.

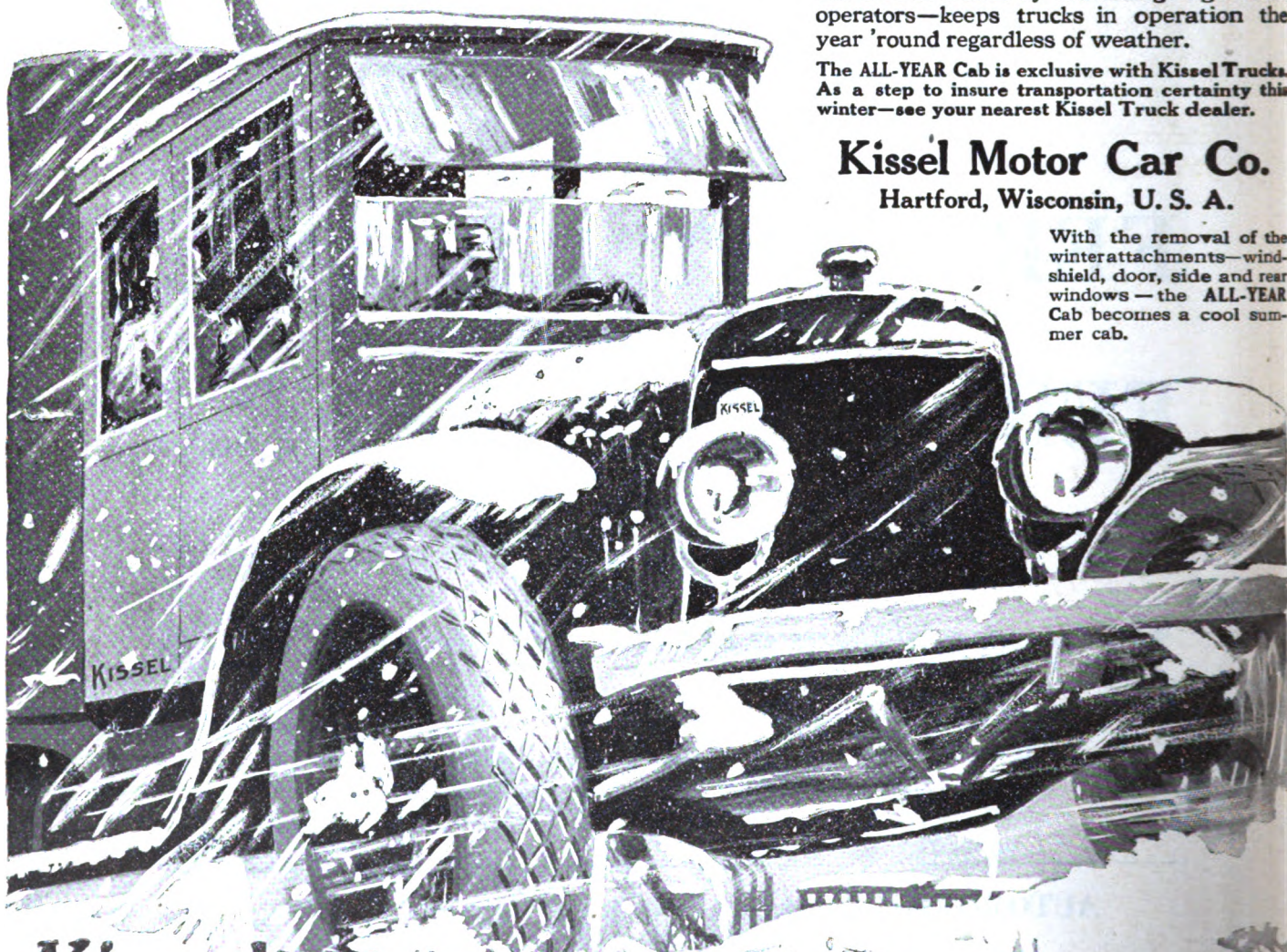
Kissel's weather-proof ALL-YEAR Cab increases the personal efficiency of motor truck drivers by giving full protection in wet and stormy weather—removes the necessity of lay-ups on account of rain or snow storms—discourages speeding to get under cover—diminishes possibilities of accidents and excessive wear and tear—insures competent handling

and care of trucks by attracting high class operators—keeps trucks in operation the year 'round regardless of weather.

The ALL-YEAR Cab is exclusive with Kissel Trucks. As a step to insure transportation certainty this winter—see your nearest Kissel Truck dealer.

**Kissel Motor Car Co.**  
Hartford, Wisconsin, U. S. A.

With the removal of the winter attachments—windshield, door, side and rear windows—the ALL-YEAR Cab becomes a cool summer cab.



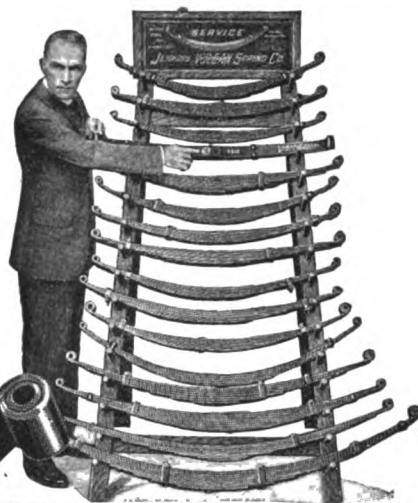
Kissel's **ALL-YEAR Cab**  
for KISSEL TRUCK



# Spring Service for A Nation.

## VULCAN

*The Replacement Spring*



### Sign and Display Rack FREE

The Display rack and Service Sign is Furnished **Free** with the first order, including appropriate advertising helps.

### America's Motorists

have been educated by national advertising to look for VULCAN Service signs when in need of Spring Replacements.

Performance of VULCAN Springs on their cars has convinced them of the Superiority of VULCAN.

### VULCAN Dealers

are profiting by the demand created through national advertising, combined with supreme quality of VULCAN Springs and convenience of VULCAN Service.

### VULCAN Service

embraces the needs of both motorists and dealers, supporting each to the highest degree of efficiency. A constant stock of over 100,000 VULCAN Springs furnishes the source of supply. The individual supremacy of each spring, because of the "built in" quality, assures satisfaction to user and distributor.

Become a VULCAN Dealer and enjoy the benefits of a ready made market.

Write for particulars regarding VULCAN.

**JENKINS VULCAN SPRING CO.**  
Richmond, Indiana

#### BRANCHES.

St. Louis, Mo.  
Minneapolis, Minn.  
Dallas, Texas.  
Reading, Pa.  
Sumter, S. C.  
Atlanta, Ga.

1402 Chestnut St.  
1024 Hennepin Ave.  
209 S. Houston St.  
538 Franklin St.  
29 Caldwell St.  
48 Auburn Ave.

**JENKINS VULCAN SPRING CO. RICHMOND INDIANA**



AN OUTLINE OF THE  
**STATISTICAL NUMBER**  
January 16th, 1919  
**"AUTOMOTIVE INDUSTRIES"**

The changes which have been effected in the automotive field by the war, and the new outlook for reconstruction, suggest the necessity for a comprehensive survey of the conditions and tendencies.

Just now such a survey will perform a service of particular value, presenting the picture of developments in peaceful times and changes from war's necessities.

The estimate of future necessities must be based upon survey and analysis of past performances and present conditions.

It is this important summary which will be presented in "AUTOMOTIVE INDUSTRIES" January 16, 1919.

The outline given is, of necessity, a mere skeleton of what the actual publication will contain. It is offered as an indication of its scope and character and not as a measure of its extent.

It will take up

**FARM TRACTORS**

Production, general, by years and by units.

Usage, in different states and under different conditions.

Market, as indicated by the agricultural requirements, in detail.

The types of tractors and their development.

Export conditions.

**MOTOR TRUCKS**

Production, general, by years and in other details.

Use and possibilities, by states, by capacity and by industries.

Export conditions.

Specifications showing types and developments.

**AUTOMOBILES**

Production, by years, by states and general.  
Use, by states.

Export conditions.  
Types and developments.

Airplanes and motorcycles will be similarly dealt with

Fuel statistics will be given, showing the trend of production and use.

Metal statistics will indicate the trend of prices and the production tendencies.

Standardization will be thoroughly analyzed.

Many other matters will be considered and analyzed in comprehensive detail, but sufficient has been stated to show the important character of this survey and its value as a study and reference to the automotive industry.

It is hardly necessary to refer to the position of "AUTOMOTIVE INDUSTRIES" and its authority in the field.

It numbers among its subscribers the important men in all branches of the field, its pages are read thoroughly by the industrial leaders and the copies are filed in the libraries of its subscribers.

Edited for the industry, it is read by the majority of the men who control the production of automotive apparatus, etc.

It numbers among its subscribers a small but influential group of large distributors of automotive apparatus, a number of executives in allied industries and an effective audience of foreign manufacturers and importers of automotive apparatus in the various countries of the world.

Your advertisement in this issue will be read by the buyers who control the large expenditures in the automotive field.

Copy should reach us promptly, and preferably of a kind suitable to the character of this issue.

**AUTOMOTIVE**  
**INDUSTRIES**  
**THE AUTOMOBILE**

**PARK** INTEGRALLY**COUNTER  
BALANCED  
CRANK-  
SHAFTS**

Patented July 10th, 1917



Quick Get-a-way  
Higher R. P. M.  
Reduced vibration  
Smoother running motor  
Eliminated bearing troubles

We have shipped 64,973 Counterbalance  
Crankshafts to Dec. 20th, 1918

**The Park Drop Forge Co.**  
Cleveland

## Are Your Needs *Similar?*

**F**IFTEEN Manufacturers have indicated to our **CONTRACT WORK DEPARTMENT** that they could use to advantage information as to where they could place the following lines of surplus manufacturing work:

Castings (steel, brass,  
bronze or aluminum)

Dies

Tool

Metal Stampings

Punch Press Work

Screw Machine Work

Machine Parts

Gear Cutting

Grinding

Cam Cutting

Bar and Clutch Work

Forgings

Drop Forgings

Lathe and Milling Ma-  
chine Work

Patterns (wood & metal)

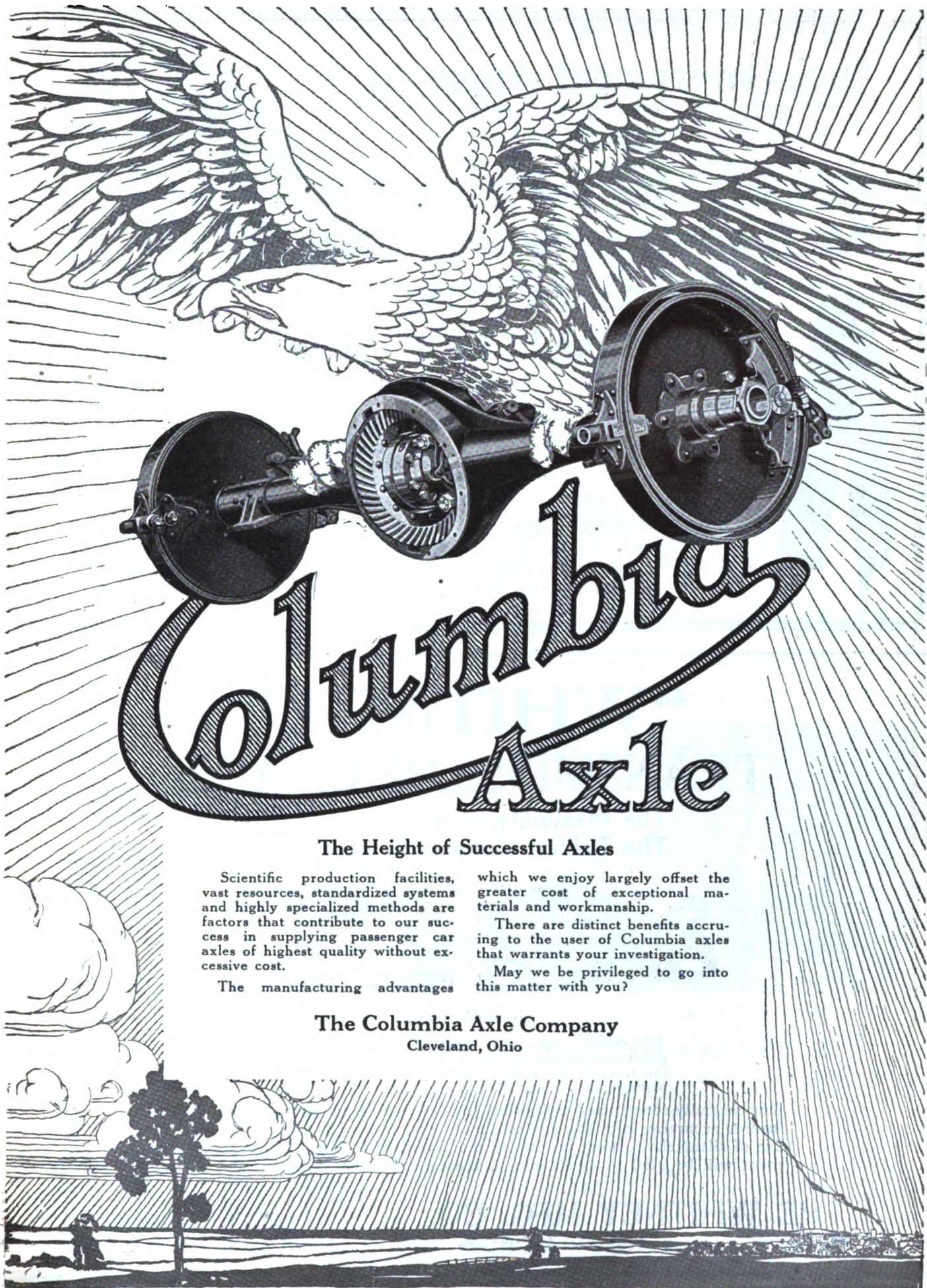
Plating

Automobile Stampings

and other lines.

In this connection you can consult with profit our **Contract Work Department** this issue.





# Columbia Axle

## The Height of Successful Axles

Scientific production facilities, vast resources, standardized systems and highly specialized methods are factors that contribute to our success in supplying passenger car axles of highest quality without excessive cost.

The manufacturing advantages

which we enjoy largely offset the greater cost of exceptional materials and workmanship.

There are distinct benefits accruing to the user of Columbia axles that warrants your investigation.

May we be privileged to go into this matter with you?

**The Columbia Axle Company**  
Cleveland, Ohio

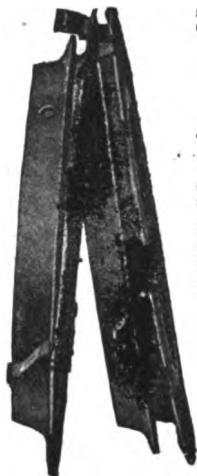
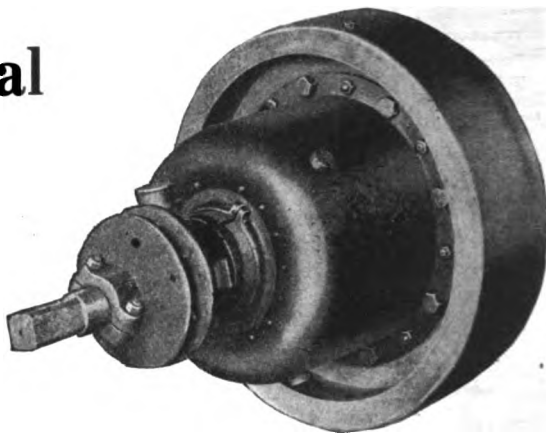


## U. S. Government Approval

AT the very beginning of the war the British Government selected the Four Wheel Drive Truck for the heaviest duty to be performed at the front. The U. S. Government selected the same truck (after thorough test) for use over the rough desert trails near the Mexican border. Later, when we entered the World War, the U. S. War Department adopted the F. W. D. as the standard truck for heavy Ordnance Transport.

The Evans Model "Hele"-Shaw Clutch, and the Evans Alignment Joint, are, and have always been, Standard Equipment on the F. W. D. Truck.

The 3-ton Artillery Tractors selected by the U. S. Standardization Board after exhaustive, rigid tests, and "Standardized" by that Board for U. S. Army use, specify exclusively the "Evans" Model "Hele"-Shaw Clutch.



## Evans Model "Hele"-Shaw Clutch (Patented)

The "Armored" Gasoline Locomotives furnished to the Government in large quantities by the Baldwin Locomotive Works and the George D. Whitcomb Co., are equipped exclusively with "Evans" Model "Hele"-Shaw Clutches.

The "Evans" Model "Hele"-Shaw Clutches, and Evans Alignment Joints, are also exclusively used in the Motor Spraying Apparatus used by the U. S. Department of Agriculture.

The principle of the V-groove or V-shaped Disc as shown in cut is unanimously recognised by leading automotive en-

gineers as far superior to any other type and is the chief reason for the remarkable efficiency of the "Hele"-Shaw Clutch.

It would be well to call upon any of our offices for estimates on your Clutch and Joint requirements. Our Illustrated Clutch Catalog is free for the asking.

"Evans" Universal Joints continue to be largely used for general motor power work. The "M & E" Ratchet Top Grease Cups are produced and furnished in enormous quantities to a host of truck makers.

Important! Mark Your Inquiry for Department No. 3

Manufacturers of  
Evans Universal Joints,  
M. & E. Grease Cups  
and Babbitt Metal

**MERCHANT & EVANS CO.**  
NEW YORK PHILADELPHIA WHEELING  
BALTIMORE ATLANTA CHICAGO  
CLEVELAND ST. LOUIS  
KANSAS CITY



## "WHITNEY" TRANSMISSION CHAINS

The Flexibility of a Belt  
The Positive Connection of Gears



### SILENT TYPE

For driving cam-shafts, magnetos, lighting systems, generators, pumps, self-starters, etc., on automobiles and for machine tools, line shafts, electric motors, compressors, etc., in the factory.

Our carefully constructed cylindrical joint gives a large bearing surface which insures accuracy, long life, and minimum elongation. If you contemplate the use of silent chain, don't fail to try the "Whitney." Our engineering department will be glad to assist you to secure maximum efficiency and service.

**THE WHITNEY MFG. CO.**  
Chains Keys and Cutters

**Hartford, Conn.**  
Hand Milling Machines

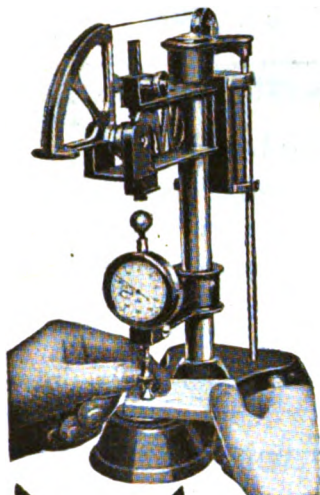
Please mention Automotive Industries when writing to Advertisers

**WWW**

# WIDNEY RESILIOMETER

## A TEST

**PATENTS PENDING**



**In the Hands of Your Laboratory Experts  
enables you to determine for the First time  
a Standard for Compressible Materials**

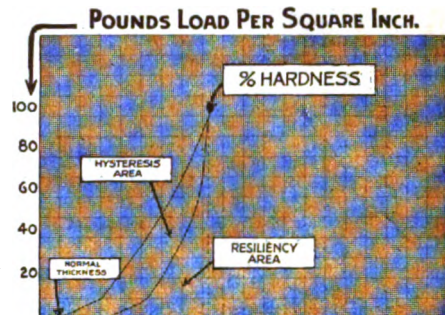
**Felt—Rubber—Leather—Paper—Cork—Textiles**

The Widney RESILIOMETER has been accepted by all the leading Scientists and Engineers as the only accurate means of determining the Normal Thickness, Hardness, Hysteresis and Resilience of any Compressible Material.

It is the first and only precision instrument that determines these ALL-IMPORTANT mechanical qualities with absolute accuracy in a manner that is instantly understood. NORMAL THICKNESS is measured by a micrometer exerting a standard pressure on a given standard surface. The action of the material under successive increments of load determines the HARDNESS. The return of the material toward its original condition under decreasing decrements of load determines HYSTERESIS and RESILIENCE, all of which can be quickly and intelligibly graphed—see typical graph herewith. This instrument is INDISPENSABLE in the intelligent selection, purchase, and use of Compressed Materials. Send us your samples and let our engineering and laboratory experts submit to you a comprehensive graph which will enable you to KNOW, for the first time, whether or not you are using the most suitable material for the purpose.

**ADVANCE FELT SPECIALTY AND CUTTING COMPANY**  
Exclusive Agents for Widney Resiliometer, 323 S. Jefferson St., Chicago

## What it does.



.240" .220" .200" .180" .160" Thickness Reading  
This Graph Shows Information Obtained on Specimen Tested.  
Normal Thickness 250' Hardness 71% Hysteresis 48% Resilience 52%

**WWW**



## "THE CHOICE OF THE GREATEST INDUSTRIES"

# Standardized Trucking

Keep your products on inexpensive platforms and truck them about with one master Stuebing Lift Truck. One man with this system will do the same work formerly requiring five men with ordinary four wheel trucks.



**Standard Parts Co. of Cleveland, O.**

## SPEED—EASE OF OPERATION—ECONOMY

Stuebing Lift Trucks are built of steel; have few parts; standard construction; complete turn of the steering wheels; single pedal action; positive hydraulic check; Hyatt Roller Bearings and other exclusive patented features.

The Stuebing is the CHOICE of such large concerns as Winton Motors, Dodge Bros., Studebaker, Cadillac, Packard, Dort, Scripps-Booth and many others. Send for free book "SYSTEM IN TRUCKING." It will help solve your trucking problems.

**The Stuebing Truck Company** 49 Fosdick Building  
CINCINNATI, O.

**Please mention Automotive Industries when writing to Advertisers**



## We Will Represent You in Europe

Not by correspondence, but through the personal visits of our representatives there, who are thoroughly versed in European mechanical and electrical affairs, and who know where to go and whom to see in order to obtain prompt and successful action.

## In a Permanent and Satisfactory Way

We solicit appointment as your permanent agents in European markets, where we have widely established connections in the Electrical and Mechanical fields, and which we spend a considerable portion of each year in personally visiting.

We are fully equipped to carry out Selling, Testing, or Purchasing Operations.

*We should be glad to furnish full information and references on request.*

## CHAMPION & RYAN

Members of the American Society of Mechanical Engineers, American Institute of Electrical Engineers, Society for Electrical Development, and National Electric Light Association.

299 Broadway

New York



## UNIVERSAL JOINT

Used by thirty of the largest manufacturers of pleasure and commercial vehicles in the United States.

**Especially adapted to trucks and tractors.**

Manufactured by  
Mechanics Machine Co. of Rockford, Ill.

Exclusive Representatives  
C. A. S. Engineering Co., 790 Woodward Avenue, Detroit



## The Factor of Safety

IN THE

## C.A.S. Steering Gear

makes it the best for you, whether you make trucks, tractors or passenger cars.

Protected against strains by Special heat-treated Alloy Steel.  
Worm gear type controls.  
Adjustments take up wear in all directions.  
Bronzed bushed bearings.

Manufactured by  
C. A. S. PRODUCTS CO.  
of Columbus, Ohio

Exclusive Representatives

C. A. S. ENGINEERING CO., 790 Woodward Ave., Detroit

## PRESSED STEEL PARTS

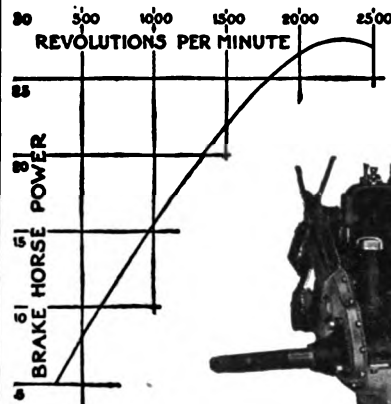
OIL PANS  
GEAR COVERS  
GAS TANKS  
MUFFLERS—DOOR HINGES  
CRANK CASES

Thirty-seven years of successful business, fifteen acres of floor space, a strictly modern equipped plant, an organization of specializing experts are a few reasons why it will be to your advantage to let us furnish estimates from your blueprints.

Our name plate has always stood for quality, integrity and highly developed workmanship. We mean to live up to that reputation.

GEUDER, PAESCHKE & FREY CO.  
1422-1700 St. Paul Ave., Milwaukee, Wis.

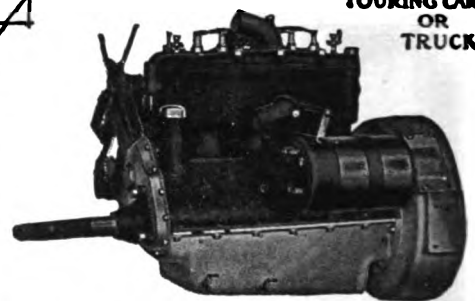
**G.P.&F.SERVICE**  
"KNOWING HOW SINCE '81"



## LE ROI MOTOR

3 1/2 x 4 1/2 MODEL C

FOR THE LIGHT ROADSTER  
TOURING CAR  
OR  
TRUCK



Used by leading manufacturers of best-known American-made light trucks.

The business of manufacturing Le Roi Engines, formerly conducted by Milwaukee Machine Tool Co., is now carried on by

**LE ROI COMPANY**

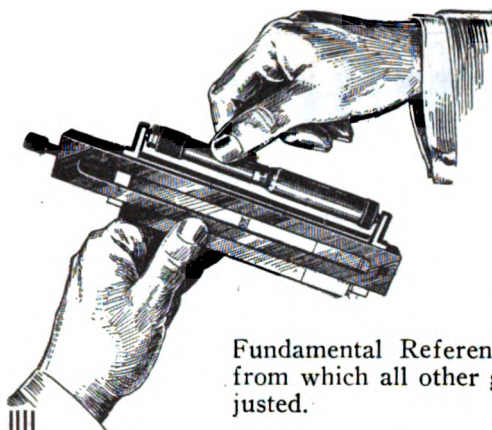
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MILWAUKEE, WIS.



Write for Complete  
Information







A  
Guaranteed  
Accuracy  
of .00001"  
at 68° F.

Fundamental Reference Standards  
from which all other gages are ad-  
justed.

## WISMACH American Gage Standards

An All-American product made by  
experts of life-long experience.

Approved by the U. S. Bureau of  
Standards.

Used by Leading Manufacturers.

These Standard sets can be secured  
quickly and at reasonable cost.

Write for Details and Prices

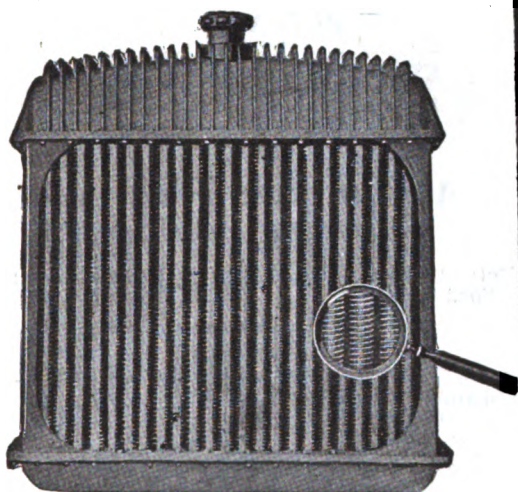
**O. ZERNICKOW**

Sole Distributor

Park Row Building, N. Y. C.



## RADIATOR INSURANCE



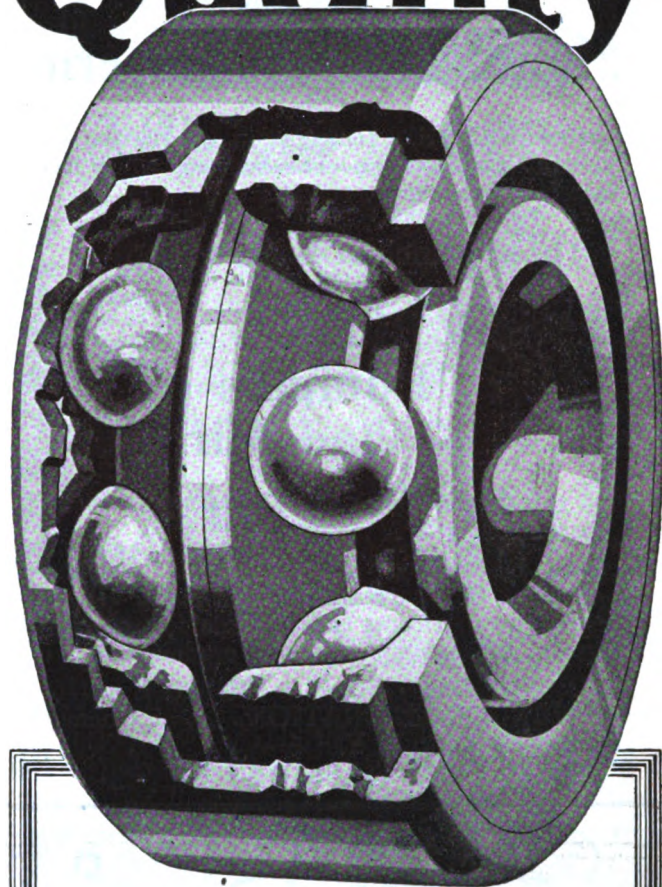
### GUARANTEED FOR THE LIFE OF THE TRUCK

These Seamless Helical Tube Cooling  
Sections are perpetual insurance against  
radiator trouble.

Write for complete information.

**Rome-Turney Radiator Co.**  
Rome, New York, U. S. A.

# Quality



### NEW DEPARTURE DOUBLE ROW TYPE.

**J** A highly successful two-purpose bearing—resist-  
ing radial and thrust loads from any direction  
and in any combination. A single, self-contained  
unit that does the work of three ball bearings,  
used in combination mounting.

Thus, a considerable saving is made in cost,  
installation expense, housing space, machining  
maintenance costs, etc. Non-adjustable and  
tamper-proof.

**Chrome Alloy Steel  
Service-Proven Design  
Precise Workmanship  
A Full Jeweled Bearing**

The New Departure Manufacturing Company,  
Bristol, Conn. 390 Detroit, Mich.

**New Departure  
Ball Bearings**





**We Offer FOR SALE a Well Equipped**

## **Manufacturing Concern**

located in the East, engaged in the making of automobile accessories. This business, which has valuable trade-marks, consists of

**Three Principal Departments—**

**Spark Plugs  
Bumpers  
and Mirrors**

and can be purchased either as a whole or by departments.

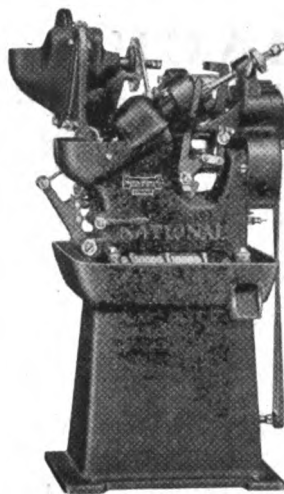
The business as offered includes machine equipment, inventory and finished stock. If so desired, arrangements can be made for the taking over of its complete selling organization.

Correspondence invited. **FINANCE AND TRADING CORPORATION**, 43 Exchange Place, New York, N. Y.

## **Why**

do all the big Nut Plants and Industrials use the

## **National Automatic (Bent Tap) Nut Tapper**



in tapping nuts for automobile, truck, aeroplane, motor-cycle, sewing machine, electrical, and for other particular service?

If you make good quality nuts in appreciable quantities it will pay you to investigate.

**The National Machinery Co.**  
Tiffin, Ohio, U. S. A.

## **Special Steel Mouldings**

We are fully equipped for quick production on all kinds of Drawn Metal Work, Tubing, Mouldings and Special Shapes.

**Motor Truck, Aeroplane and Government Contract Work a Specialty**

*Send Blue Prints for Quotations*

**KAWNEER MFG. CO.**  
NILES, MICH.

**GET IN TOUCH WITH  
THE CROSBY COMPANY**  
BUFFALO, N. Y.

**For Sheet Metal Stamping**  
of Auto Parts

**A Complete Plant with  
Superior Equipment**

Detroit Office  
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Published Weekly  
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Established  
1899

## **MOTOR AGE**

**The Foremost Motor News and Maintenance Magazine**

*Some of its weekly features*

Latest Motor News and Announcements, Questions and Answers, Repairing, Service and Maintenance, Motor Car, Truck and Tractor Development, New Accessories, Racing Reports, Roadside Repairs, Good Roads, Traffic Rules, and many other features of definite value to owners and dealers.

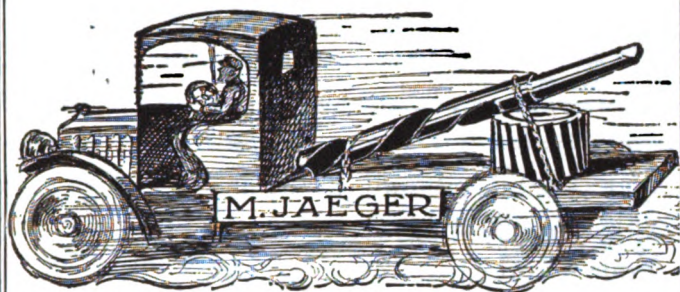
MOTOR AGE has a 19-year service record—it is a permanent institution, well able to make good its policy of furnishing reliable, accurate and constructive news to the motor car trade, motor car users and manufacturers.

Fifteen cents will bring you a copy of the next number. Send for it to-day.

**MOTOR AGE** MALLERS BLDG.  
CHICAGO



# We Can Make Quick Delivery On High-Speed and Carbon Tools



Our line includes Drills, Reamers, Milling Cutters, End Mills, Micrometers, Countersinks, Drill Chucks and special tools.

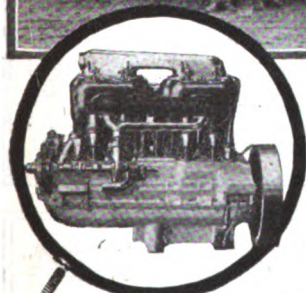
Write us for further information and prices.

**M. JAEGER**

Machinery Tools and Supplies

342-344 Engineers Bldg.

Cleveland, Ohio



## Under the Stress of War Duty

real efficiency is brought to light. Equipment that fulfills war's demands meets every commercial requirement. The army recently contracted for many thousands of F. W. D. Trucks, equipped with

Four and Six-cylinder  
all four - cycle) for  
Trucks, Tractors and  
Commercial Work.

Write for specifications  
of Types and Sizes.

**Wisconsin**  
CONSISTENT  
**Motors**

This signifies Government approval of Wisconsin Motors' continuous, consistent, dependable power. Of proven mastery over every power contingency. The argument that clinches truck and tractor sales.

**WISCONSIN MOTOR MFG. COMPANY**  
Sta. A., Dept. 310 Milwaukee, Wis., U. S. A.

DISTRIBUTORS:

New York Branch: 21 Park Row, T. M. Fenner, Factory Rep. Pacific Coast  
Distributor: Earl P. Cooper Co., 1310 S. Los Angeles St., Los Angeles, Cal.

# STEEL

WHEN YOU WANT IT

## THE LID IS OFF

Most of the steel restrictions have been abandoned. Get busy on your own line of products now; the steel you require is right here in our warehouses, ready to mark and ship in a hurry. A tip to you is to get all you can while you can, right away, while our stocks are full. We'll probably have a-plenty right along, but we've surely got it now.

Any kind, shape, size and quantity. Let us know your immediate requirements.

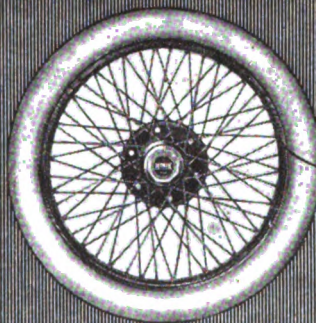
**Century Steel Works**  
Poughkeepsie, N. Y.

**Aborn Steel Company, Inc.**  
40 Clarke St., New York, N. Y.

Buffalo, N. Y. .... 520 Marine Bank Bldg.  
Philadelphia, Pa. .... 269 Drexel Bldg.  
Rochester, N. Y. .... 133 Andrews St.

183

# WIRE WHEELS

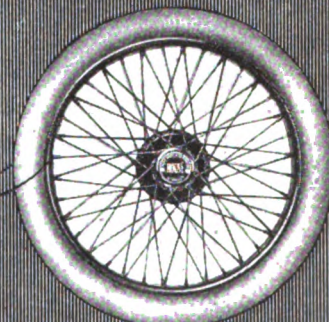


**HOUK**  
QUICK CHANGE

for 150 makes of cars.  
Write for full information  
and prices on wire wheels  
for any make or model of  
car.

**HOUSE**  
for Fords

List price for set of 5 wire  
wheels, 4 inner hubs, 4 hub  
caps, hub cap wrench, spoke  
nipple wrench, 1 hub dust cover  
for spare wheel, \$65. White,  
black, red. Color optional.



**Dealers!** Wire Wheels are *sellars*! Get particulars of wire  
wheel service and sales agent's propositions.

**Ford** distributors and accessory dealers should write for service and  
sales proposition for HOUSE Wire Wheels for Ford cars.

**WIRE WHEEL CORPORATION OF AMERICA**  
(Successors to Houk Mfg. Co.)

835 Eleventh Ave., at 57th St., New York

Exclusive Canadian Representatives:

DUNLOP TIRE & RUBBER GOODS CO., Toronto



# Union Drawn Steel Co

Beaver Falls, Pa.

Manufacturers of

**BRIGHT FINISHED STEEL SHAFTING,  
SCREW STEEL, CHROME NICKEL and  
CHROME VANADIUM STEELS in  
FLATS, SQUARES, ROUNDS,  
HEXAGONS and SHAPES;  
also ELEVATOR GUIDES.**

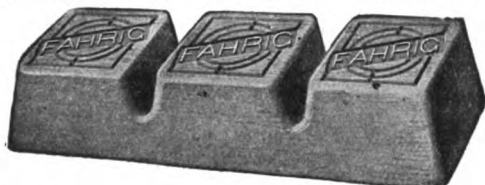
BRANCH OFFICES: Boston, Buffalo  
BRANCH OFFICES AND WAREHOUSES: Chicago, Cincinnati,  
Detroit, New York and Philadelphia

## LIGHT AND HEAVY METAL STAMPING



**WORCESTER PRESSED STEEL COMPANY  
WORCESTER MASS.**

**When You Hear of 90-10 It Means  
The Famous Tin-Copper Alloy  
FAHRIG ANTI-FRICTION METAL**



**THE BEST BEARING METAL ON THE MARKET**

For service in Aeroplane, Truck or any other engine bearing. This alloy made by our special process is used like a regular babbit, but is superior in anti-friction qualities and durability.

The only one we make—the only ones that make it

**FAHRIG METAL COMPANY**

34 COMMERCE STREET, NEW YORK

Our Metal Stampings Will  
Substantially Improve  
Your Product.  
Let Us Show  
You.

**100% STAMPINGS**  
For  
Every Purpose

Inquiries to Nearest Office  
**PHILADELPHIA**

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Chicago  
St. Louis

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**HALE & KILBURN CORP.**

## GREY IRON CASTINGS SEMI-STEEL

Motor Castings Our Specialty—  
We Can Save You Machine Shop Losses

— DAILY CAPACITY 200 TONS —

**Campbell, Wyant & Cannon Foundry Co.**  
MUSKEGON MICHIGAN



There's Assurance of Quality  
in

**BOSSERT SHEET METAL STAMPINGS**

—and that's because they're made in the most efficient plant of its kind in America—both as to equipment and organization.

There's not a pressed steel part used by the automotive industry that we're not equipped to make—and make right. We also do annealing, case hardening, nickel plating and electric and oxy-acetylene welding.

Let us estimate on your needs.

**The Bossert Corporation, Utica, N. Y.**

**Muskegon  
Motor Specialties  
Company**



**INTEGRAL  
Cam Shafts**

"They have a REPUTATION of being the BEST CAM SHAFTS MADE"



**For Airplanes, Tractors, Trucks  
HENRY & ALLEN, AUBURN, N.Y.**



## Absolutely Accurate Crankshaft Machining

20 years experience. New machinery of the latest design.  
Highest quality work and prompt delivery guaranteed.  
Ample capacity for large orders.

**"MOLTRUP FOR QUALITY"**

**Moltrup Steel Products Co.,** Beaver Falls, Pa.

### Steel for Service

A gear breakdown always means a new gear secured from the storeroom or from the manufacturer, and a loss of time while the machine is idle.

Many manufacturers are using gears made from

### Carnegie Rolled Steel Blanks

because severe industrial use has proven that they wear three to seven times as long as cast steel gears. If properly heat treated they never break.

Protect your gears against breakdowns.

### Carnegie Steel Company

General Offices, Pittsburgh, Pa.

1023

✱ Complete Line of ✱

## GREASE CUPS, OIL CUPS AND OIL HOLE COVERS



Plain

SPRING SHACKLE  
BOLTS

HUB CAPS

METAL STAMPINGS  
IN LARGE QUANTITIES

Manufactured by  
**Bowen Products  
Corporation**



Sectional

**Successors to THE WINKLEY COMPANY**  
866 Warren Ave. W. Detroit, Mich.

# LADISH

"DEPENDABLE FACTORS IN THE AUTOMOTIVE INDUSTRY"

Every drop forging leaving our shops lives up to the established reputation of efficient service under all conditions.

Our vast organization of expert drop forgers is at the disposal of engineers and manufacturers.

**LADISH DROP FORGE CO.**  
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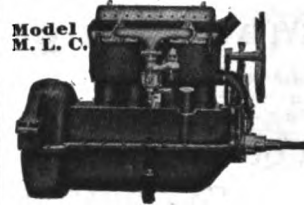
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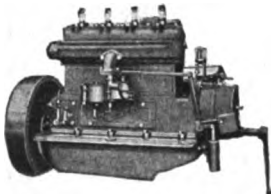
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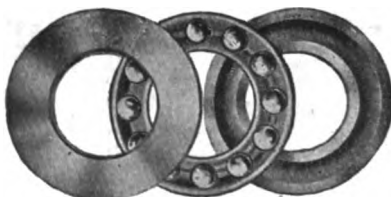
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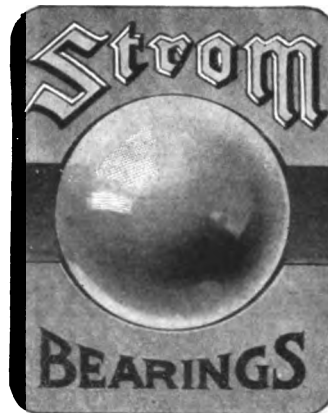
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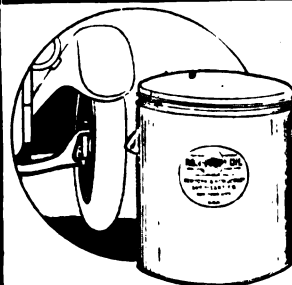


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